Training Australia's Wind Energy Sector Workers

Bill Mundy

Victorian Skiils Authority Fellowship, 2024

International Specialised Skills Institute

Victorian Skills Authority

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Table of contents

01 Acknowledgements

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02
Executive summary

Context

The original aim of this fellowship was to identify the need for a response to the growing workforce needs of the wind energy generation sector in Australia. However, with the advent of the Covid-19 Pandemic and the inability to be able to travel the Fellow has moved from a position of understanding the need, to having understood the need. The Fellow through this report will attempt to compare the response established by the Fellow to the wind energy generation sector in Australia through the development of Federation Universities Asia Pacific Renewable Energy Training Centre (APRETC)1 to the work being done in the US, UK and EU jurisdictions. The APRETC initiative is a response aiming to address workforce skills training required by industry through a mix of non-accredited and accredited training.

In 2016 the Fellow recognised the need for a local workforce response to the rapidly growing renewable energy sector in Western Victoria as the number of new wind farm projects commenced construction with increasing numbers of imported workers.

At the time, addressing the need for a local workforce response was considered important by industry stakeholders as they grappled with the increasing costs associated with the deployment of foreign workers in regional Victoria. Yet at the time no action was being taken either nationally or locally to address the issue. The development of a workforce locally through a structured training program in partnership with industry was considered a low priority.

Through continued industry consultation by the Fellow, it was established that a need did exist for a local response to the development of a workforce focusing on the vocational training requirements of the industry. Industry members clearly identified that the importation of foreign workers was not a sustainable solution to their workforce needs and that there was a need to establish local training pathways that supported the ability for workers to transition from the fossil fuel energy generation sector to the renewables sector as well.

The need for a comprehensive response was further heightened because of the Covid-19 pandemic and international borders closing and the increasingly higher legislated targets for the generation of renewable energy as a percentage of overall generation as a part of the energy transition.

Further, the industry participants (Acciona, Vestas, Nordex, Senvion, Suzlon, and Direct Wind Services) identified the need for the development of simulated training facilities that enabled a more realistic representation of the experience of working at heights and undertaking a rescue from heights. It was also clearly articulated through extensive

1 https://federation.edu.au/connect/partnerships/centres-and-groups/apretc

consultation with industry participants to the Fellow that there was a need for dedicated training to support the pathway for employment of young people as the current workforce employed was aging.

With support from the Victorian State Government the Fellow was able to engage the services of consultants who helped shape through the preparation of a formal business case2 the need for a dedicated centre to address the vocational workforce needs of the wind energy generation sector as a part of the transition of the energy networks. From this work APRETC was born, the year was 2019.

With the business case complete and a clear opportunity for the development of a centre presented the sourcing of funding for the necessary infrastructure became the priority. It was clear through conversations with bureaucrats that funding opportunities would be limited. At the time the Victorian Government had initiated their Victorian Renewable Energy Auction Scheme (VREAS) to build increased renewable energy assets to meet their target of 40% renewable energy generation by 2025.

As a result of the strong industry partnerships developed from 2016, the Fellow was able to negotiate for the support of the APRETC initiative as a part of the bidder's response to the VREAS and in so doing was able to gather $1.8million for the development of the APRETC initiative. By the end of 2019, with funding support now in place three distinct elements of the APRETC initiative were now able to commence. First being the development of a high-risk training centre, second, the development of an apprenticeship program for blade repair technicians and finally the development of a non-accredited or accredited training for the delivery of turbine technicians.

With the onset of the Covid-19 Pandemic work slowed although the Fellow continued to develop the relationships, industry partnerships, course requirements, physical equipment, site requirements and planning needs. APRETC was emerging as the single and only comprehensive response to the workforce needs of the wind energy sector and because of the closure of international borders due to the pandemic the importance of it become even more relevant to industry participants as well. Sovereign capacity to build and maintain a workforce for the wind energy sector was and is now critically important in sustaining the growth of the industry as the Australian economy transitions to becoming less carbon reliant.

A change of government federally in 2022 saw an increasing focus on decarbonising the economy with energy generation central to decarbonisation. With a similar focus across the globe governments were implementing policy changes to ensure the transition in the energy sector was done at pace. The US setting the pace with the implementation of the Inflation Reduction Act of 2023 by the Biden Administration which has the potential to provide massive taxpayer subsidies to renewable energy projects.

With a global transition now in place, the necessity to develop a local workforce response to the needs of the wind energy sector for both the construction and maintenance of wind energy assets both onshore and offshore and ultimately the entire supply chain is critical to ensure Australia maintains pace and becomes a global superpower in the development and generation of renewable energy resources.

Visiting the KVCC in the US, highlighted that responding quickly to industry requirements necessitates a different approach to the development of qualifications with ISO accreditation demonstrating cost savings, increased customer satisfaction and improved employee engagement.

Whilst visiting private training organisations delivering GWO training it became evident that to accelerate the delivery of the GWO training required to be completed by construction and maintenance employees working in the sector an opportunity exists for the development of these skill sets to be

2 Asia Pacific Renewable Energy Training Centre, Federation University Australia, Professor Helen Barlett, Vice Chancellor (11 Jan. 2019)

recognised nationally under the Victorian Governments Workforce Skills Sets Fund.

In relation to GWO training there is a necessity for the APRETC initiative to broaden the scope of training currently delivered to include advanced rescue, first aid, rigging, dogging and ultimately at the right time aligned with the development of the offshore wind sector sea survival.

The Fellow has found that as Australia continues to build out its wind energy generation assets a tipping point will become evident at which time an apprenticeship program for Wind Turbine Technicians will be viable across multiple TAFE providers nationally, in the Fellow's opinion when 2 Gigawatts of installed capacity is reached a single nationally accredited apprenticeship program will be justified. In the interim the BZEE Turbine Technician Training program will meet entry level technician requirements.

When considering a national apprenticeship for wind turbine technicians it is essential that the combination of electrical and mechanical skills is achieved, providing productivity improvements and a more highly skilled workforce. A mechatronics apprenticeship would have broader appeal across many sectors where electrical and mechanical systems work together. The Fellow acknowledges the difficult workforce environment that achieving this outcome would have to overcome but irrespective believes that in a constrained workforce setting it is essential that new solutions are brought to bear to solve both labour availability and productivity issues.

The development of the APRETC initiative also offers the Federal Government an opportunity to support the centre through its TAFE Centres of Excellence Funding program, where the work already done to deliver for the industry could be both recognised national and additional support provided through the funding available.

Finally wind energy projects both onshore and offshore provide significant community benefit funds as a part of their construction and operation in regional communities, those funds are typically used to support the development of the communities in which they are constructed. It is clear with lower levels of educational attainment in regional communities, the advent of the community benefit funds can support communities to achieve better outcomes. It is essential for this to be the case communities influence the outcomes of the funds made available not governments or its agencies mandating outcomes or controlling the funding streams.

03
Fellowship Background

The Covid-19 Pandemic has driven a global repositioning of the importance to decarbonise economies, as a result investment as a part of stimulating countries' economies has in many instances been directed toward the building of renewable energy assets. More recently with the election of the Albanese Federal Government the push to decarbonise the Australia economy because of the climate crisis3 has received a boost with a government seeing the potential benefits to Australia becoming a potential renewable energy superpower.

In 2022 alone the renewable energy sector in totality generated 39.5% of Australia's energy needs4. Coincidentally during 2022 Victoria also generated 36.8% of its power requirements from renewable energy sources5. As proportion of the total amount of renewable energy generated in Australia, renewable energy generated by wind represented 35.6%6.

The Victorian Renewable Energy Target set at 95% by 2035 will see a significant increase in the amount of wind energy generated. The increased generation will come from both onshore and offshore wind farms with the first Australian Offshore Wind Energy Zone announced by the Australian Federal Government off the coast of Gippsland in December 20227

The development of large-scale renewable energy generation assets in the majority occurs in regional and rural Australia providing well paid construction and operational roles. It is forecast that up to 44,000 people will be employed in the renewable energy sector as a whole under the Australian Energy Market Operators step change scenario8. The rapid growth of the industry in the past years has seen skill shortages exist which has necessitated the importation of skilled labour to allow for the continuation of construction and operation of renewable energy assets across all classes of assets.

Currently the renewable energy generators employ in total 25,000 people, of which wind energy generators employ 7,000 or 28%9. Depending on the growth scenarios modelled in the Clean Energy Council's report the current number of jobs could well increase by in-excess of a further 8,000 roles by 203510. Globally the Global Wind Organisation as a part of their Global Wind Workforce Outlook Report

3 Slezak, Michael, and Loretta Florance (2023). 'IPCC climate scientists issue 'a survival guide for humanity', warning window closing to reduce emissions', ABC News,https://www.abc.net.au/news/2023-03-21/ipcc-report-how-to-keep-global-warmingbelow-1-5-degrees/102112836
4 Clean Energy Australia Report, Clean Energy Council, Resources Hub, (31 Mar. 2023), pg 7 https://www.cleanenergycouncil.org.au/resources/resources-hub/clean-energy-australia-report
5 Clean Energy Australia Report, Clean Energy Council, Resources Hub, (31 Mar. 2023), pg 8
6 Clean Energy Australia Report, Clean Energy Council, Resources Hub, (31 Mar. 2021), pg 8
7 https://www.dcceew.gov.au/energy/renewable/establishing-offshore-infrastructure/gippsland
8 Clean Energy at Work, Clean Energy Council, Resources Hub, (2 Jun. 2020), pg 5 https://www.cleanenergycouncil.org.au/resources/resources-hub?start=&end=&search=clean+energy+at+work
9 Clean Energy at Work, Clean Energy Council, Resources Hub, (2 Jun. 2020), pg 5 & 6
10 Clean Energy at Work, Clean Energy Council, Resources Hub, (2 Jun. 2020), pg 9

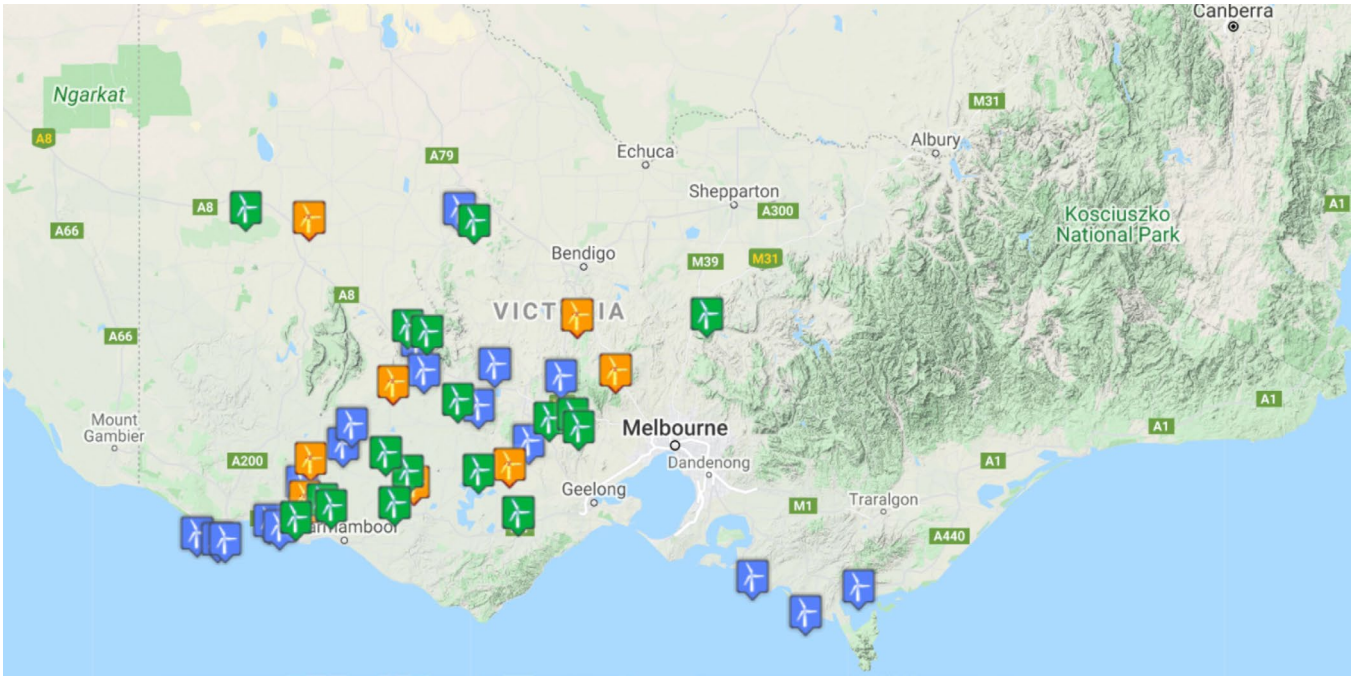

Figure 29. Location Map of Victorian Wind Farms in operation, proposed or under construction.

forecasts that there will be 480,205 people requiring safety training to continue employment as a part of onshore and offshore wind energy projects.11

Australia is blessed with clean renewable energy assets including abundant wind resources spread across the nation and extending into its offshore exclusive economic zone. Figure 1 shows the number of wind farm projects throughout Victoria at the time the Fellow prepared this report.

To meet this need both a construction and maintenance workforce will be required. Up until the Covid-19 Pandemic the response to workforce shortages being experienced by the major wind turbine manufacturers responsible for the installation and maintenance of their fleets was to import the necessary skilled workforce from overseas. In 2019 the western region of Victoria imported workforce was estimated to be costing the local economy $24M annually, rising to $80M by 202512.

Through thorough researching into international best practice and industry consultation the Fellow discovered that there is a need to develop a local workforce to install, service and maintain the wind energy assets of the nation, this is even more of an imperative because of the drive to decarbonise. To do this Australia needs to develop a co-ordinated response that looks to provide a solution to the three main areas of skills need associated with working with wind turbines, namely.

- High Risk Safety Training, incorporating working at heights, confined spaces training, manual handling, first aid, fire response training, traffic controller, rigging, dogging, and working confined spaces etc.
- Blade Technician Training, as an apprenticeship
- Turbine Technician Training as a post trade or pre-trade qualification

11 Global Wind Workforce Outlook Report, Global Wind Organisation, Publications and Statistics, (1 Jun. 2021), pg 8 https://www.globalwindsafety.org/statistics/global-wind-workforce-forecast-2021-2025

12 Asia Pacific Renewable Energy Training Centre, Federation University Australia, Professor Helen Barlett, Vice Chancellor (11 Jan. 2019)

Working at heights of over 100mtrs in remote locations in windy conditions poses a significant safety risk to employees working to install or maintain wind energy assets. The wind turbine manufacturers in response to the need to co-ordinate and ensure safe working at heights have collaborated to create their own safety standards at a global level through the development of the Global Wind Organisation (GWO) headquartered in Copenhagen.

GWO creates and maintains safety standards for the industry globally and accredits registered training organisations in Australia to conduct training on its behalf and maintains a global register of the currency of training received by people working in the industry having undertaken GWO training. The focus being the delivery of the GWO Basic Safety Training, Basic Safety Refresher, Advanced Safety Training, Basic Technical Training and Blade Repair Training. GWO provides further standards for its audits across the globe as well as standards for the teachers delivering the GWO training.

Working at heights in Australia requires mandatory training to be undertaken to conform to local state regulatory requirements as a part of ensuring a safe working environment for employees.

The maintenance of wind turbine blades is a specialist task that involves the use of composite compounds, the skills required for this role can be developed through an apprenticeship program using already established qualifications customised to suit the industries requirements. The development of an apprenticeship program will provide the industry with the opportunity to introduce school leavers into their workforces providing a workforce regenerative opportunity.

Whilst the industries need for turbine technicians is not as easily solved with an apprenticeship program. Globally the practice of recruiting turbine technicians from the ranks of the local employed workforce currently working as electricians, mechanical fitters or automotive technicians has been commonplace, however apprenticeship programs are now available in the UK and EU and the USA is moving to develop an apprenticeship program through the development of a Wind Turbine Technician, Competency-Based Occupational Framework13.

This practice of recruiting locally from the ranks of existing businesses has a negative effect on the local employed workforce in the region the Wind Farm has been built. An alternative exists in the delivery of a dedicated pre-trade / post trade program aimed at developing a skilled turbine technician. Meeting the need for skilled technicians through a pre-trade / post trade program is commonplace globally, examples existing in Europe, South Africa, and the USA.

The Training Centre for Renewable Energy Non-Profit Association (BZEE) in Germany founded in 2000 by the German Wind Energy Industry, the German Wind Energy Association and the German Chamber of Commerce and Industry was established to meet the need through the development of a pre-trade / post trade training program that focuses heavily on training based in an applied workshop environment. The training program offered under licence is delivered globally through a network of training organisations (see https://www.bzee-network.com/netzwerk/ for further details)

Methodology

A mixed research methodology has been taken to the preparation of this report combining both qualitative and quantitative approaches.

In summary the quantitative research component from 2016 has consisted of desktop research, industry consultation, government agency consultation, development of industry and educational contacts across the globe and the completion of the Fellowship travel component across the US, UK, and EU in 2023.

The qualitative research component of report is supported through Clean Energy Council, Global Wind Organisation, Federation University and the Global Wind Energy Council and UK Data Statistic.

13 https://www.apprenticeship.gov/apprenticeship-industries/energy

Fellowship Period

The Fellowship has been conducted from 2020 to 2023 however it is worth noting that, research activities into the industry need and consultations have been occurring since 2016 as a part of the inception of the APRETC initiative and that irrespective of the completion of Fellowship the Fellow will continue to work to build the APRETC initiative through the connections the Fellowship has created for the Fellow.

Fellow's Biography

Bill joined Federation University in 2016 coming from a 12-year career with Telstra Country Wide as an Area General Manager. As the University's Associate Director of Partnerships and Growth, Bill's role is to work with industry partners stretching across the University's Campus's to deliver education, research and workforce solutions that support the industries in regional Victoria. Since coming to the University Bill has led the development of the University's Asia Pacific Renewable Energy Training Centre (APRETC) initiative aimed at addressing the vocational training needs of the wind energy sector. Through his work Bill has secured for the University and the APRETC initiative industry funding of more than $3 million, which has supported capital, operational and scholarship costs. Bill has also secured Victorian State Government funding totally more than $9 million for the APRETC initiative.

Commercially focused and having had a career stretching across dairy farming, agricultural equipment sales, IT sales, consulting and Telco Bill brings a wealth of knowledge and connections in support of the University's ambitions to assist the transition to a zero-emissions economy powered by renewable energy assets.

Bill has an MBA in Marketing and holds numerous certifications attained at an industry level during his working career.

Definitions

APRETC	Asia Pacific Renewable Energy Training Centre
KVCC	Kalamazoo Community College
ISO	International Standards Organisation
GWO	Global Wind Organisation
BZEE	Training Centre for Renewable Energy Non-Profit Association (in German Bildungszentren für Erneuerbare Energien eingetragener Verein)
OEM	Original Equipment Manufacturer
LOTO	Lock Out Tag Out
USA	United States of America
US	United States
MW	Megawatts
IRA	Inflation Reduction Act
YOY	Year on Year
Q1	Quarter 1
GWEC	Global Wind Energy Council
GWO BRT	Global Wind Organisation Blade Repair Training
GWO BST	Global Wind Organisation Basic Safety Training
GWO BSR	Global Wind Organisation Basic Safety Refresher
GWO BTT	Global Wind Organisation Basic Technical Training
RTO	Registered Training Organisation
O&M	Operations and Maintenance

GW	Gigawatts
AUD	Australian Dollars
OSWF	Offshore Wind Farms
UK	United Kingdom
WSSF	Workforce Skills Set Fund
BTEC	Business and Technical Education Council
STEM	Science Technology Engineering and Maths
VRQA	Victorian Registrations and Qualifications Authority
OTCD	Office of TAFE Coordination and Deliver
DWT	Deutsche Wind Technik

04

Fellowship Learnings and Findings:

Introduction and Overview

Initial significant research had been done by the Fellow prior to the completion of the overseas travel component of the Fellowship. From 2016 the Fellow has been constantly working with industry partners to ensure the areas of focus developed by the APRETC initiative are consistent with industry demand and global standards. The work undertaken prior to the awarding of the Fellowship enabled the Fellow to not only complete comprehensive business case materials but also build significant international networks that have assisted in the continual refinement of the APRETC initiatives goals.

Internationally standards setting organisations GWO and BZEE provide a guide to the development of local teaching resources meeting jurisdictional regulatory requirements. These standard settings organisations are important due to their global acceptance by industry as critical training pathways to enable employment and safe operations in the wind energy sector.

USA Findings – Kalamazoo Valley Community College

Figure 1. Entrance to KVCC Groves Campus, Kalamazoo, Michigan US.

Figure 2. At KVCC Groves Campus with the team from the Wind Academy

In 2001, the State of Michigan provided a grant program for the development of training centres that focused on industry workforce development in response to the need for more focused workforce development programs to meet the needs of industry. KVCC was one of 17 Community Colleges chosen to develop the centres. With matching funding raised from industry partners and the College the new Michigan Technological Training Centre (MTEC) was established, at the conclusion of the grant funding period the centre reverted to KVCC as the Groves Campus.

The development and delivery of industry responsive training from the Groves Campus was hampered by the existing College academic process of program identification, development and delivery resulting in slow and unnecessary complexity for industry partners. As a result, the College took the decision to implement a separate workforce training development and delivery process, continuing the focus from the original grant, and housing it at the Groves Campus. Many workforce training programs are developed with industry input and delivered while including industry best practice determined from feedback surveys. Technical programs like the Wind Technician Academy and other highly technical programs were placed under the oversight of the Wind Energy and Technical Training Services department. The College recognized that the department would have to operate under a Quality Control System which the industries it served could recognize. The department of Wind Energy and Technical Services became certified to ISO 9001:2015 in 2020. The industry customers recognize the ISO 9001 Quality Management System, which is a known quality management system used by industry customers.

Moving away from the College's centralised system of qualification management was a significant change in direction and met with resistance internally, but ultimately has proven to be at the core of why KVCC is a magnet for industry to approach for the delivery of industry responsive training.

The achievement of ISO 9001 certification by KVCC was done over a period of 12 months costing approximately $20,000USD, with the prior 24 months being a preparation period. The Wind Energy and Technical Training Services department has now been certified for a period of 4 years and in that period, they have seen the following benefits:

- Student Satisfaction Increase (Student Satisfaction now running at 90% across courses delivered
- Industry Satisfaction Increased
- Systemised approach to qualification development
- Systemised approach to breaches of the quality system
- Cost savings associated with consumables (in the first 12 months of implementation cost savings achieved in the purchase of consumables due to a centralised and systemised approach to their purchase equated to the cost of achieving certification)
- More engaged teaching and administration staff (there is now a very clear process for quality system breaches and clear accountability providing staff confidence the changes will be undertaken to improve student and industry customer satisfaction)
- Provides more opportunity for teachers to undertake industry-based placements and training to support their relevance to the training provided.

Providing training across a number of domains, one of the key focus areas for the college is the delivery of wind turbine technician training via their academy. The training provided is entry level based on the standards established by BZEE. Consisting of a 6-month program delivered face to face the program has a heavy emphasis on the development of hands-on skills covering mechanical, hydraulic, electrical, meteorological, and safe working skills. Delivered to groups of not more than 12 students at any one time the program places 90% of its students in wind turbine technician positions at completion.

Industry members actively participate in the programs delivery providing guest lecturing sessions and career guidance opportunities for the students. Critically, industry members see the program as

a recruiting opportunity and actively compete for students to apply for their available roles.

The program provides students with foundational knowledge in the maintenance of a wind turbine, not specific to any OEM platform. Electrical competency extends beyond LOTO including principles of electrical engineering, cable finishing, generators, and electric motors etc. Students completing the training can immediately enter work with OEM's or contractors undertaking basic maintenance duties. Consisting of theory and practical sessions the practical sessions are undertaken in a workshop setting where actual wind turbine components are used for simulated maintenance and training purposes. Significantly the college teachers have had the freedom to build and maintain their simulated training equipment, using college equipment to fabricate whatever is needed to deliver the course successfully.

Figure 3. KVCC Groves Campus Wind Academy Training Workshop

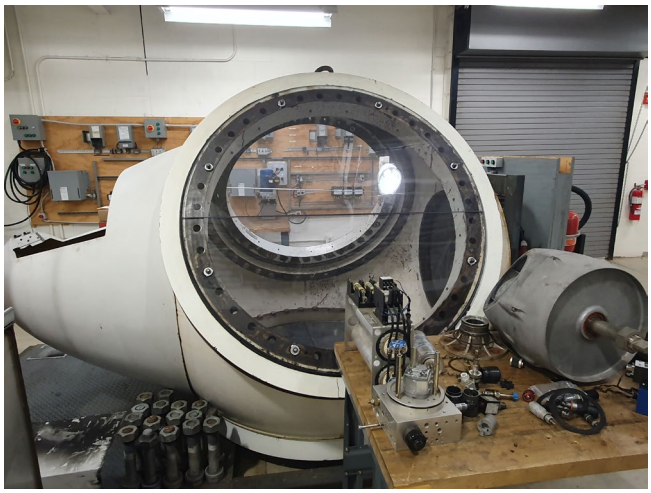

Figure 4. KVCC Groves Campus Wind Academy Training Workshop

Figure 5. KVCC Groves Campus Wind Academy Training Workshop

Figure 6. KVCC Groves Campus Wind Academy Training Workshop

An integral part of the program is field immersion / experience; this is achieved through the college having the contract to maintain a small wind farm easily accessible from college, the skills of the teaching staff and students are used to maintain the fleet of turbines.

Currently in the USA no apprenticeship programs for a wind turbine technician are in existence, however the US Department of Labour, Office of Apprenticeship has recently released a Work Process Schedule which is used by employers for the development and registration of an apprenticeship. The demand for technician roles is driven by not only the overall transition to renewable energy but also the Biden Administrations IRA, which in the American Clean Power latest quarterly report14 a pipeline of 145,592 MW of renewable energy is under development which is a YOY increase of 13% and a 43% increase on Q1 2021.

At a global level the GWO and GWEC, Global Wind Workforce Outlook 2022-202615 forecasts that globally more than 500,000 additional wind turbine technicians will be required to construct, install, operate, and maintain the global fleet of onshore and offshore turbines forecast to be commissioned by 2026.

It is clear not only has KVCC been able to better respond to emerging and immediate industry need in a timely manner through the implementation of ISO 9001 certification it is also evident that the KVCC Wind Academy as a part of the Groves Campus is delivering an industry responsive turbine technician training program, which is extremely popular with industry. Delivered in a non-apprenticeship context the program has become the backbone of recruitment of industry participants and with increasing investment in renewable energy projects in the US is likely to become even more important to supporting workforce development. A clear opportunity exists for the delivery of this program in Australia as a response to the need for more trained wind turbine technicians.

UK Findings

Altitec

Altitec is an independently operated, respected global specialist wind turbine blade inspection and repair business headquartered in London. Since 2008, Altitec blade technicians have delivered more than 20,000 man-hours of work repairing wind turbine blades on hundreds of wind turbines in Europe, Africa, Australia, and the Spanish Americas. They offer rotor blade services and comprehensive engineering services. Their blade experts inspect and repair wind turbine rotor blades by drones, telescopic handlers, the latest rope access techniques, or blade access platforms.

They deliver GWO Blade Repair Training (GWO BRT) certified training for wind turbine blade repair technicians to support the wind industry's growth and the continuous need for wind turbine blade inspection and repair technicians globally including in Australia.

Altitec commenced delivery of GWO qualifications to support its workforce requirements with blade repair contracts in Australia, the organisation needed a way to train and develop a localised workforce where no training existed. The GWO BRT is a two-week program – skill set – that equips people with the basic skills needed to repair a wind turbine blade. It doesn't provide comprehensive knowledge in the understanding of composite materials or resins which is key shortfall for students in the skills attained as a part of the course.

A key requirement of the delivery of GWO BRT for new students is the need for them to be able to work at heights since the delivery of blade repairs on a wind turbine is done predominately, either from an elevated platform or via rope access. The wind energy sector requires that blade technicians and turbine technicians are all trained in the Global Wind Organisation Basic Safety Training (GWO BST) program which is considered the standard for safety training in the sector.

14 American Clean Power,, Quarter 2, 2023 Quarterly Market Report, Pg 5.
15 Global Wind Workforce Outlook 2022-2026, Global Wind Organisation and Global Wind Energy Council, (28 Sept. 2022), Pg 8, https://gwec.net/more-than-half-a-million-wind-technicians-needed-by-2026-for-wind-energy-construction-and-maintenance/

The GWO BST delivered in Australia includes national units of competency in working at heights, first aid manual handling, and fire extinguisher (currently delivered as skills sets in Australia individually). The relationship between the GWO BST and GWO BSR and GWO BTT is shown in below in Figure 2 as a part of the GWO Entry Level Technician Training pathway[16].

For students undertaking GWO BRT and GWO BST in Australia they pay a fee to private Registered Training Organisations (RTO's), Altitec being one of those providers of the GWO BRT.

Whilst being only a skill set and having supported the development of the industry, OEM's through meetings with the Fellow have clearly identified that a more comprehensive response to training blade technicians is required. An apprenticeship for blade technicians has been established as a part of the APRETC initiative to satisfy this requirement based upon the Certificate III Engineering – Composites (MEM31119).

With the GWO BST skill set based training funded as a fee for service course with included national units of competency being a compulsory requirement for working in the wind energy sector as a blade or turbine technician there remains an opportunity to support students with state based funding support in form of skills sets based funding as a part of the Funded Course List, in doing so defraying the cost to enter the sector and acting as an incentive for students to consider the sector as a career option.

Figure 7. With the Altitec Team in London (below)

16 Global Wind Organisation, Entry Level Technician Framework V2, May 2023, Pg 14, https://www.globalwindsafety.org/standards/entry-level

AIS Survivex

A global training organisation AIS Survivex provides Training and Management Services to 70,000 plus students globally employed in the oil and gas and renewable energy sectors. They are also the largest provider of GWO training in the United Kingdom servicing all the O&M's and developers of wind energy projects both on and offshore. Their delivery extends to all GWO programs from basic safety to rigging and signaller.

With the comprehensive GWO offering servicing the wind energy sector it's clear that an opportunity exists for the APRETC model to deliver similarly in Australia.

Figure 8. AIS Survivex training pool used for OPITO and GWO Offshore Survival Training

SSE Renewables

SSE Renewables is major developer of renewable energy projects in the UK; a top 100 listed company in the UK employing 12,000 operating globally it represents a reputable partner for Australian project developers.

With 4GW of projects in operation and 15GW of projects in the pipeline SSE Renewables has significant experience in the delivery and operation of wind energy projects. With thermal energy assets SSE Renewables has focused on how it can support its employees and the communities itself operates in to transition from the thermal sector to the renewable energy sector. Working closely with employees SSE prides itself in the work it has done to ensure a just transition environment has been created for those who see an opportunity for themselves in the renewable energy sector.

Whilst for communities SSE Renewables has £310M[17] ($609M AUD) in funds made available to communities as a part of its community benefit funds. Key to the distribution and management of the community development funds has been the deep and comprehensive community engagement undertaken by SSE in the development and distribution of the funds made available to communities, supported by its 7 core principles of funding[18]:

- **Value based approach –** our commitment to communities and sustainability is embedded in our corporate values and culture.
- **Focused on communities –** we know local people are the experts of their own area and we will work with them to provide flexible interventions which are tailored to their specific local needs.
- **Transparency –** we will treat communities with respect and provide honest, open and meaningful engagement at all stages of our relationships with them. We ensure we are inclusive of all of the community.
- **Lasting Legacy –** we focus on what communities need now and in the future. We aim that communities are left in a sustainable position after our interventions. We prioritise supporting communities net zero transition.
- **Good Governance –** we commit to an approach which: builds trust with communities; uses proportionate paperwork; makes timely decisions; communicates with purpose; provides flexibility and reports transparently.

These principles underpin the focus SSE Renewables has on delivering a real and tangible benefit to the communities that are affected by the delivery of the OSWF it manages. Critically important to the support provided to communities is the ability

17 Community Investment Review 2021-2022, (2022), Pg 3, https://www.sserenewables.com/media/ixid3n2e/gb-and-roi-review-2022.pdf
18 Community Investment Review 2021-2022, (2022), Pg 4, https://www.sserenewables.com/media/ixid3n2e/gb-and-roi-review-2022.pdf

for communities to decide where they see the greatest need for support to be provided; it is clear from the conversations had by the Fellow with SSE Renewables that deep, meaningful, and consistent community engagement is essential to ensuring that projects have community endorsement.

In contrast currently there exists in Australia, by the Victorian Government a proposal under the administration of the newly established office of Vicgrid to centrally manage community benefit funds from developers of OSWF's and related transmission infrastructure. From international experience this isn't an appropriate methodology to adopt, and a report published by UK based Onward a not-for-profit think tank in July 2023[19] clearly indicates that 48% of rural voters want their communities to decide the outcomes of community benefit funds as opposed to 11% wanting local government to decide.

The Fellow strongly recommends against any form of centralised community benefit fund management and alternatively recommends the continued practice of community-based management and decision making associated with community benefit funds established by energy infrastructure developers.

For employees transitioning from the thermal divisions of SSE to the SSE Renewables, they have seen the opportunity to work for the renewables division as an exciting opportunity with long term employment prospects. Employees in the thermal divisions bring easily transferrable skills while the only challenges experienced by employees transitioning were the adjustment to the differing culture in the renewables division particularly around shift structures and renumeration.

The Fellow had the chance to visit the Port of Montrose where SSE Renewables has its operational and maintenance functions based for the Seagreen wind farm. With over a gigawatt of generation the farm is one of the larger farms in the UK, some 27 kilometres from the coast, featuring 114 Turbines generating 1075 Megawatts of energy, the farm produces enough energy to power 1.6 million average Scottish homes.

The Seagreen wind farm has an operational life of 25yrs and as a result the infrastructure in place at the Port of Montrose includes warehousing, logistical support, and operational control. The estimated beneficial economic impact of the Operations and Maintenance (O&M) activities undertaken from the Port of Montrose is $1 Billion AUD over the operational life.

With awarding of the project in 2010, the project has taken 13 yrs. to come into operation. Construction commenced in the first quarter of 2020 for onshore components of the project and the fourth quarter of 2021 offshore construction commenced, first power was delivered to the national grid in Summer of 2023. The projects scale is enormous and is demonstrated by a few statistics gathered over the period:

- Circa 400 jobs during onshore construction in Scotland created.
- Circa 58 full time equivalent positions in Aberdeen during the construction period
- Marshalling yard supported 141 skilled jobs at the Port of Nigg near Inverness, including the creation of 48 new jobs for the Seagreen contract.
- Circa 200 to 300 full time equivalent positions in Angus/Dundee during the construction period (civils works for both the substation and circa 19Km onshore cable installation).
- At the height of offshore construction up to 30 vessels operating at one time.
- More than 700 people offshore during the construction period.
- 169 vessels of varying types used during the offshore construction phase.
- 7500 people registered to work on the project since construction began.

19 Power to the People (How to unlock energy infrastructure by securing community support) (July 2023), Pg 10, https://www.ukonward.com/reports/power-to-the-people-how-to-unlock-energy-infrastructure-by-securing-community-support/

Pictures of the scale of the project can be seen below.

Figure 9. Tealing Substation in the foreground 19kms from landfall serviced by 3 underground transmission cables, measuring 45,000 square meters in area.

Figure 10. Foundation Jackets leaving the Port of Nigg on their way to the Seagreen Offshore Farm.

Figure 11. Port of Nigg, with Jacket Foundations ready for transport, lit by the Northern Lights.

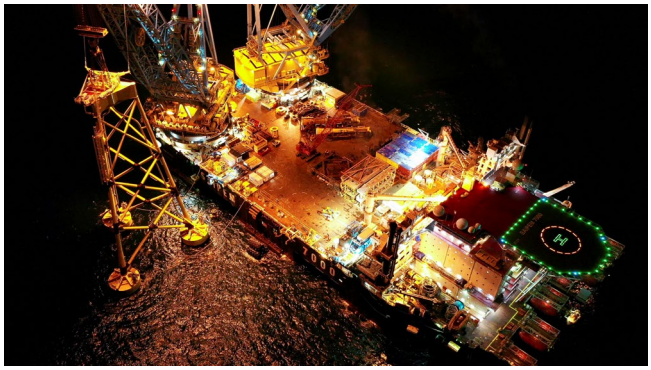

Figure 12. Jacket installation at sea by one of the many construction vessels.

Figure 13. Installation of the Offshore Substation on the jacket foundations, completed wind turbine in the background.

Figure 14. Completed Offshore Substation

Vestas, the OEM supporting the operations and maintenance of the 100 plus turbines installed has an employed workforce covering technicians, warehousing, administration, and management employees. A 365-day maintenance program operates dependent on weather impediments, with a 2 week on 2 weeks off roster in operation seeing 40 plus technical Vestas employees on farm per roster. A modern support vessel (SOV) the Edda Wind with the capacity to carry 60 people provides the marine transport and logistical support to the farm.

As the OEM Vestas has in place an apprenticeship program for its turbine technician roles providing a workforce development solution to their technical needs. Partnering with Northeast Scotland College, Vestas apprentices participate in a two-year college-based program and then continue their studies and employment with Vestas whilst being assessed on site by college teachers.

The apprenticeship is a combination of operational maintenance skills, electrical skills and engineering skills. The apprentices are highly skilled and capable upon completion with essentially a mechatronics qualification.

Figure 15. Fellow standing dockside of the Service Operations Vessel (SOV) Edda Wind

Grimsby Institute

Based in the town of Grimsby in Northeast Lincolnshire, England the Grimsby Institute has a rich history of providing vocational training in support of the local economy. Grimsby itself located on the southern bank of the Humber Estuary was once the home of the world's largest fishing fleet working the North Sea. That tradition of servicing the local industries continues with the delivery of vocational qualifications that now support the Services and Operational Centres for Offshore Wind Farms Westernmost Rough, Race Bank and Triton Knoll.

The Dogger Bank Offshore Wind Farm claimed to be the world's largest is also near Grimsby. Offshore Service Operations are undertaken from Grimsby Harbour by Orsted, RWE and Innorgy. Each one having its own dedicated operations centre based at the harbour. Siemens Gamesa a Turbine OEM have operations in the region as well and are supplier of turbines to several OSWFs.

Grimsby Institute offer an apprenticeship program for Wind Turbine Technicians based on the Level 3 Maintenance and Operations Engineering Technician Apprenticeship. Considered an advanced apprenticeship the Institute delivers its program over a period of three (3) years with the following attributes:

Year 1 of the apprenticeship is spent entirely at the Institute with apprentices studying full time gaining the underpinning knowledge they require to become a maintenance and operations engineer. Concurrently the apprentices commence study in a Business and Technical Education Council (BTEC) Extended Diploma in Electrical / Electronic Engineering (Level 3). Included in the first year of study are a broad range of basic hand skills (working with hand tools, marking, and measuring etc) progressing to computer aided design, welding and fabrication, pneumatics etc as well as the mandatory GWO training. The qualification doesn't provide a full electrical qualification rather an awareness of electrical circuits and theory and electronic systems and theory.

- Year 2 the apprentices commence working with their host employer, typically Orsted. A continuing connection with the Institute exists through attendance once a week on Campus ensuring the completion of their BTEC qualification. An Institute Teacher attends the workplace ensuring the apprentices are gathering a portfolio of evidence of competency.
- The final year of the apprenticeship is spent entirely at the host employer with attendance at the Institute with the apprentices attending Campus to undertake the final or end point examination which involves knowledge-based exams, practical assessments, and a technical interview. Apprentices are provided with ample opportunities to undertake mock examinations annually.
- In the final year many apprentices choose to continue enhancing their electrical skills via the Electrical, Higher National Certificate (HNC) Level 4.

In the UK organisations with an annual wages commitment of more than £3M (circa $5.9M AUD) pay a 0.5% Apprenticeship Levy, which is returned to the organisation as a subsidy at the time of employment of an apprentice. Clearly an incentive for the employment of apprentices by employers. The UK government provides a maximum £26,000 (circa $50,000 AUD) training subsidy to the Institute for the delivery of the course over the 3-year period.

Grimsby Institute have a dedicated engineering and renewable energy training centre that has numerous simulators used for the purposes of understanding the maintenance and operations of a working wind turbine.

Figure 16. Fellow standing outside the engineering and renewable energy training centre Grimsby Institute, Lincolnshire UK

Figure 17. Large scale simulated nacelle with working componentry

Figure 18. Festo Nacelle Simulation Tool with Siemens Gamesa Operating System which is fully programable for the purposes of fault simulation.

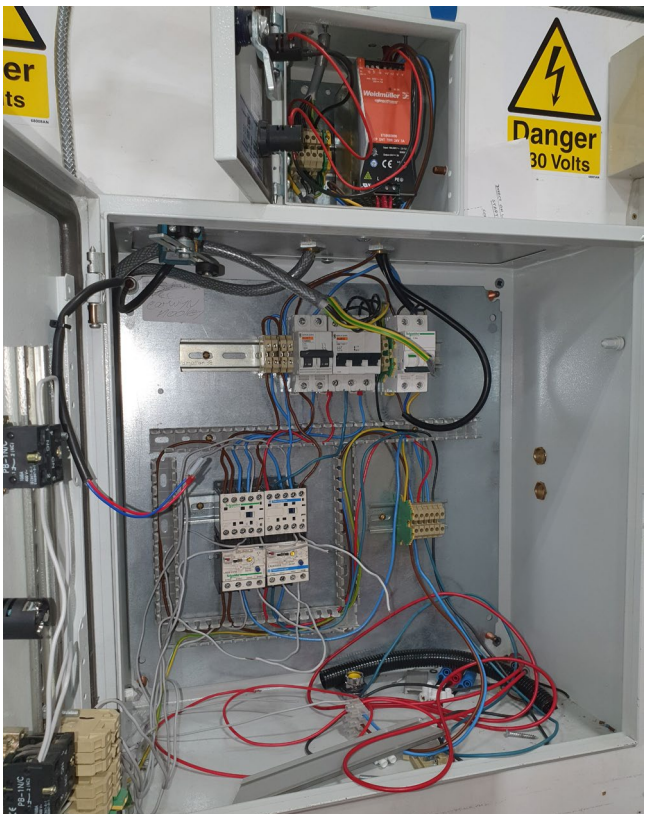

Figure 19. Simulated wiring cabinet used for simulated wiring training, showing PLC's and LOTO to the far right.

A clear opportunity exists for Federation University in the development of the APRETC initiative to learn from the content taught in the apprenticeship program as a part of informing the development of the wind turbine technician training program to be delivered by Federation.

Although the Fellow was unable to establish a clear metric that identifies the industries need for an apprenticeship program since many variables influenced the development of the apprenticeship program by Grimsby and other Institutes in the UK, the Apprenticeship Levy legislated by the UK Government has heavily influenced the adoption of the apprenticeships by industry participants.

However, in an effort to try and identify an indicator for the need for an apprenticeship program based on installed generation capacity with an Australian installed generation capacity comparison see the table below, the data sources for the below table are the UK statistics (https://explore-education-statistics.service.gov.uk/data-tables/fast-track/1fd795dd-b330-4973-805c-76b01c091c20 and mailto:renewablesstatistics@energysecurity.gov.uk) whilst the Australian installed capacity amounts are drawn from the Clean Energy Councils Annual Clean Energy Reports). The 7% notional allowance of the overall apprenticeships delivered being for wind technicians is a best guess estimate based on consultation the Fellow had with his UK counterparts at Grimsby Institute, since no detailed data exists indicating the ultimate role the Mechanical / Electrical or Instrumentation Apprentices end up in.

Year	# Apprentices studying mech/elec and instrumentation	Assuming 7% are wind turbine technicians	Installed GW of On and OffShore Wind UK	Installed GW of Onshore Wind AUS
2017/18	910	64	3GW	0.6GW
2018/19	1020	71	2GW	0.6GW
2019/20	1090	76	2.5GW	0.8GW
2020/21	1080	75	0.5GW	1.1GW
2021/22	1510	106	1GW	1.4GW
2022/23	1740	122	3GW	

Table 1. Installed Capacity and apprenticeship demand UK versus AUS

The above table shows that the historic levels of installed wind energy generation do not justify an apprenticeship program. It is evident using the UK installed generation as a guide that annual installed generation will need to exceed consistently 2GW to sustain a broader apprenticeship program. Clearly though the number of apprentices is not high at a national level relative to installed generation, giving rise to it being questionable as to the sustainability of multiple TAFE's delivering an apprenticeship program in the future.

Therefore, until the level of installed generation reaches the notional threshold of more than 2GW the solution to provide a workforce remains in the delivery of a short course delivering entry level skilled technicians, the BZEE qualification represents a well-recognised solution to address the need for a trained workforce.

In Victoria alone according to the Victorian Governments website (https://mapshare.vic.gov.au/planningwebmaps/RenewablesSummary.html) there is a total of 2.4GW of wind energy projects either in construction, approved not operational or undergoing planning approval, which represents a 55% increase in overall current wind energy generation, together with the 9GW of generation planned for offshore, it is likely that in the future an apprenticeship program in Australia will be warranted, especially when all states projects are considered as a part of the overall construction, approval, planning numbers.

Orsted

The Fellow had the opportunity to visit the Grimsby operations and maintenance centre of Orsted based at the Grimsby Harbour a part of the Humber Estuary on the east coast of the UK in Lincolnshire.

Orsted, a Danish multinational headquartered in Fredericia in Denmark is one of Denmark's largest energy companies and is one the largest developers of Offshore Wind Farms globally. In Grimsby they have an operations and maintenance facility which employs more than 200 people providing operational and maintenance support to the Hornsea Offshore Wind Farm's phase 1 and 2 with phase 3 under construction and phase 4 undergoing planning presently, whilst also providing support to Westermost Rough, Lincs, Race Bank, Gunfleet Sands. With final completion of the Hornsea phases 3 & 4, total generation of 8.6GW's will have been constructed.

Key statistics from the 2022 Economic Impact Study20 of Orsted's presence in the Humber region of the UK demonstrate the significant value bought to the region and the value that will continue to be delivered because of the ongoing operations and maintenance of the offshore wind farms, these include:

£9.5B of investment to date in the Westermost Rough, Lincs, Race Bank, Gunfleet Sands and Hornsea 1 &2 OSWF.

£14B of further investment will occur because of the development of phases 3 & 4 of Hornsea OSWF

It is forecast that £2.2B of gross value added will be delivered to the national economy, with a little under half delivered in the past decade and the remainder forecast to be delivered in the coming decade.

750 supply jobs are sustained through the investments of Orsted

7,500 construction jobs are delivered as a part of the Orsted work in constructing OSWF's.

1,100 broader economy jobs will be sustained from the investments by Orsted

- £1.7B of gross value added to the Humber region alone with just under half in the past decade and the remainder in the coming decade forecast
- £45M directly invested in skills development in the region.
- 14 Apprentices trained since 2017. The current cohort of 33 apprentices, is made up of greater than 30% females.
- Further 80 Apprentices forecast to be trained across technical and non-technical roles.

It's clear from the above statistics that although the bigger number of employees and overall investment occurs at the time of construction, the longer-term operations and maintenance activities in the

20 Economic Impact Study of Orsted Investments in the Humber Region, May 2022, Pg's 2-3, https://orstedcdn.azureedge.net/-/media/www/docs/corp/uk/hornsea-project-two/rsted-economic-impact-in-humber---may-2022---v9.pdf?rev=bb86b69faa1745398ec5579e812f51fe&hash=1AD6593E223BD3BFA7998FFAC321A8D8

region deliver significant value to the community and particularly lead to the investment in workforce training, given the 25-year lifespan of an OSWF.

Working with Grimsby Institute Orsted offer apprenticeships for wind technicians, in 2023 they offered 12 apprentice places with well over 500 applications received. The application process is managed by Grimsby Institute with applicants screened before a shortlist of 100 applicants are taken through to an assessment day where the applicants are assessed as to their abilities to conduct research, perform as a team member, and undertake a technical task, followed by individual interviews.

Historically apprentices who have successfully applied and undertaken the program have gained employment with Orsted although this is not guaranteed at the completion of the apprenticeship. For those applicants who have been unsuccessful in the application to become an apprentice with Orsted, Grimsby Institute work closely with them to understand what alternative pathways may exist for them to undertake an apprenticeship or further study. Apprentices as young as 16 have commenced with Orsted more commonly though apprentices are in their 20's and have had little to no experience with the wind energy sector but are attracted by the opportunity to work in an industry that is seen as exciting and working to deliver a better future for the planet.

Given the apprenticeship program in the first year involves predominately institute study Orsted actively maintain contact with the apprentices providing them with induction training, supporting the delivery of their GWO training and visiting the students at the Institute, all of which helps to build a bond between the apprentice and Orsted whilst the apprentice is not spending time at their host employer Orsted. As the host employer Orsted dedicates significant number of resources to ensure the successful completion of the apprentices, with dedicated human resources support made available to the apprentices.

Orsted has a long history of supporting communities which host the offshore wind projects it constructs, operates and maintains with funding of £1.2M ($2.3M AUD) provided annually across the current OSWF's in operation to communities for projects that will support their long-term sustainability; of note is the dedication in their community benefit funds of an amount specifically for skills development with educational projects from across the communities benefiting the development of science, technology, engineering and maths (STEM) skills in the younger members of the communities.

A clear focus on local community engagement is seen as essential in the development and delivery of the community funds. With several community benefit funds to manage Orsted has partnered with GrantScape a highly respected not-for-profit organisation specialising in the establishment, management, and administration of community benefit funds. Having distributed £90M in community grants since inception in 1997, GrantScape have a well-honed process of community consultation and engagement which takes the form of online surveys, face to face consultation with key stakeholders and town hall style meetings.

In administering Orsted's community funds, there is a consistent focus on addressing similar themes in the communities, these being Community Activities and Services, Community Buildings and Facilities, Sports and Recreational Activities, Environment and Wildlife Projects including Public Open Spaces and STEM education and skills, clearly a community focused not for profit driven model that delivers for communities and its commercial partner Orsted is providing benefits to both parties manged at a local level.

Acciona

Acciona is a global leader in the development of renewable energy projects and in Australia has a total of 1.6GW of wind energy projects either completed or under construction. As a part of the Fellows visit to Europe a visit to Acciona's corporate headquarters was undertaken.

During the visit the Fellow had the opportunity to meet with the innovation team responsible for developing the next breakthroughs in technology that will support the company as it looks to build out further renewable energy projects globally.

Critically the key areas of innovation that will advance the wind energy sector are in the areas of asset optimisation and maintenance cost reduction. Australian Universities and TAFE institutes should consider providing increased levels of applied research to the sector focusing on how overall cost to maintain and operate both onshore and offshore wind farms can be reduced.

A further key area of research need and opportunity is the area of Wind Turbine Blade Recycling, as identified in the Clean Energy Councils, April 2023 report titled "Winding Up Decommissioning, Recycling and Recourse Recovery of Australian Wind Turbines[21]", that by 2034 a total of 15,000 tonnes of blade composite waste will have been created as a result of the decommissioning of wind farms across Australia and that in any given year a total of 4,000 tonnes of waste will be created. Clearly without a well-defined pathway for this waste product there is a high likelihood of it entering the landfill waste stream which isn't an optimal solution to the reuse or recycling of the composite materials.

As a result of the connection with the Madrid based Acciona team the Fellow was provided with and introduction to Tesicnor a subsidiary of Acciona. Established for over 20 years Tesicnor has developed considerable capacity and capability in the delivery of GWO training. Tesicnor delivers GWO training, curriculum development services (including virtual reality), train the trainer services, product development and consulting services based in Pamplona, Spain. Tesicnor offers a model that could be replicated in Australia to service the wind energy sector.

Figure 20. The Fellow with members of the Acciona Innovation Team in Madrid Spain

Iberdrola

The Fellow had the opportunity to visit the Iberdrola global training centre in Madrid, Spain. A company training facility servicing approximately 13,000 Iberdrola employees annually from across the globe it provides a range of training specific to Iberdrola assets including generation and transmission. As a developer of energy assets including nuclear generation Iberdrola delivers projects across the spectrum of generation including wind, solar, battery storage and hydro, the centre supports the skills training required to construct and maintain those assets. Iberdrola works with a range of wind turbine suppliers.

With a focus on knowledge management, relationships and training, Iberdrola has focused on supporting its training centre to delivery on skills that enable its people to deliver on its business objectives. Providing GWO training and specific skills-based training across the company's installed onshore and offshore assets the centre continues to be an engine room for employee growth and development. The centre develops curriculum and resources to support the delivery of training for its employees.

Opportunities exist for collaboration with the centre as a part of their workforce development goals

21 Clean Energy Council, Winding Up Decommissioning Recycling and Resource Recover of Australian Wind Turbines, April 2023, Pg 6, https://assets.cleanenergycouncil.org.au/documents/Wind-turbine-recycling-report-2023.pdf

particularly for engineering graduates as the centre hosts research and development activities supporting the company's objectives across generation, transmission, distribution, and wholesaling.

Figure 21. A nacelle used for training purposes (ground mounted) with Perspex windows to allow for easy access to under take training activities

Vestas

125yr old Vestas a Danish company starting manufacturing wind turbines in the 1970's and has grown to become one of the world's largest wind turbine manufacturers with over 170GW of wind turbine capacity installed in 88 countries, Vestas employs 29,000 people designing, manufacturing, installing, and servicing wind turbines. Critical to the success of Vestas is its service and operations division, which employs apprentices across the division.

In a labour constrained market Vestas uses apprenticeships as an attraction strategy and internally promotes employees with significant skill but no formal qualification into apprenticeship programs. This practice is prevalent particularly in the manufacturing of the wind turbines, but also exists in the operational and maintenance of Vestas turbines with apprentice wind turbine technicians and apprentice blade technicians employed.

Apprentices are commonplace in European nations Vestas has operations located in, whilst in Australia the only apprentices currently employed by Vestas are in wind turbine blade maintenance. Apprentice blade technicians are trained at Federation Universities APRETC precinct undertaking the Certificate III of Engineering – Composites (MEM31119) which has been contextualised to the role of a blade technician.

In the service division a hierarchical structure exists for the classification and training of a service technician beginning with a Level E Technician who is unskilled entering as a trades assistant role. Although hierarchical the structure provides a clear learning pathway for Vestas service technicians, supported by internal and external training to increase their competency.

As technicians gain more skills and competency, they achieve Level D and C classification where they operate under the supervision of highly skilled Level B and A Technicians performing specific task with limited variation which are well documented. An apprentice will begin their career as a wind technician at Level D or C.

A Level B Technician is a fully qualified mechanical fitter or electrician who has completed their apprenticeship. A technician at this level can perform all manner of service tasks including troubleshooting and supporting the training of other colleagues, whilst a Level A Technician will take on the role of leading service teams.

The need for more technicians at an entry level is critical as Vestas looks to respond to the transition to renewable energy generation globally and build a sustainable workforce model, with fewer higher skilled technicians and more technicians with entry level skills. Clearly the development of the BZEE qualification as a Level D technician in Australia by Federation University as a part of the APRETC initiative will support the supply of technicians at the trades assistant level offering a pathway to achieving an apprenticeship as a mechanical fitter or electrician. It is also evident that a shift in workforce dynamics is required to maintain cost competitiveness in the service division, where increased numbers of lesser skilled technicians supervised by a smaller number of more highly skilled technicians will represent the workforce makeup in the future.

Figure 22. The Fellow at the Vestas Head Quarters Aarhus, Denmark with Maiken Jensen, Education Consultant Vestas.

Global Wind Organisation (GWO)

The Global Wind Organisation is a not-for-profit organisation established by wind energy sector participants with the specific purpose of developing global standards for working safely in wind turbines, blade repair, turbine maintenance and associated work tasks consistent with the construction and maintenance of a wind turbine.

Safety is of paramount importance when working on a wind turbine and a large part of the global standards developed by GWO are dedicated to the safe construction, assembly, and maintenance of a wind turbine. The standards developed by GWO are just that, a guide to the development of content and require those organisations delivering the GWO training to contextualise the development of content in line with the requirements of the jurisdiction for they are being developed in. GWO training is also skill set based and not designed to be implemented into an apprenticeship model.

GWO have developed a pathway framework to become a wind turbine technician see Figure 2 below. The framework designed to suit the GWO standards doesn't consider the Australian vocational system nor does the GWO BTT delivered as a skill set over a one-week period provide sufficient skill development to become a technician. The GWO Entry Level Wind Technician Standard, provides an insight into the target group of students where it indicates the standard is aimed toward vocational training institutes and transitional workers22. Clearly a one-week training course at a vocational level as a pathway to becoming a wind turbine technician for unskilled students isn't sufficient.

The necessity for a more comprehensive pathway training course is evident and to address this need the Fellow has continued to work with colleagues from within the University and BZEE to build a robust and comprehensive training program that prepares students to become turbine technicians at an entry level, with skill development across electrical, mechanical, hydraulic, meteorology and safety systems.

22 GWO Entry Level Wind Technician V3, December 2023, Global Wind Organisation, Page 7, https://www.globalwindsafety.org/standards/entry-level

Figure 23. Global Wind Organisation Entry Level Technician Training Pathway

BZEE – Training Centre for Renewable Energy Non-Profit Association

BZEE - Training Centre for Renewable Energy Non-Profit Association (in German Bildungszentren für Erneuerbare Energien eingetragener Verein)

The BZEE competes directly with GWO in the development of best practice standards for the wind energy sector, its flagship standard developed for turbine technicians delivered over 6 months covering 960 hours and including an industry placement is seen as the model for the development of wind turbine technician workforce. The standard covers health and safety, electrical, mechanical, and hydraulic systems, whilst also covering turbine blades, wind energy technology and operational management.

A skill set delivered over an extended period the BZEE has the capacity to become the pathway for students to become wind turbine technicians in Australia, the pathway is illustrated in Figure 3 below. The benefit to industry in establishing this pathway is it provides a guaranteed workforce development model delivering a skilled workforce able to undertake basic maintenance procedures with limited supervision. The pathway would incorporate all the necessary GWO training ensuring that upon employment there is little other than mandatory internal training required to be undertaken before the new hire can become an effective and productive member of any construction or maintenance OEM team or contractors working to service the needs of the OEM's.

Critically the BZEE qualification provides several clear advantages to the overall training environment associated with turbine technicians, these include:

1. Meeting industry workforce demand at a time when there is increasing demand for trained technicians globally.
2. Provides a pathway for people, young, old, indigenous etc, to enter the industry who don't wish to undertake a formal apprenticeship but

3. want to gain accredited training with a focus on units of competency that could be recognised as a part of future training opportunities.
4. Provides a pathway toward an electrotechnology or mechanic fitter apprenticeship.
5. Supports increased workplace productivity through skills gained to complete LOTO.
6. Reduces the barriers to entry for people wishing to enter the wind energy sector or more generally the energy transition.
7. The skills gained have applicability across both onshore and offshore wind turbine maintenance.
8. Provides the basis for the development of a more comprehensive apprenticeship qualification once installed capacity increases to 2GW annually in mechatronics, which would have broad appeal across many industries.

The development of the BZEE qualification also aligns with the Victorian Governments Clean Economy Workforce Development Strategy 2023-2033[23]. The strategy identifies 3 key pillars for attention, renewable energy being one where the transition away from thermal fuels is essential, whilst it also has identified five strategic priorities these being:

1. Reimagined skills model.
2. Flexible education and training product design.
3. Timely provision of education and training.
4. Enhanced workforce planning and attraction.
5. Stewardship of the skills transition.

Significantly the development of the BZEE qualification addresses many of the strategic priorities, it:

- Reimagines the skills model, creating pathways for participation in the renewable energy pillar and creating a qualification with crosscutting skills embedded in its foundation.
- The BZEE qualification is a real demonstration of the development of a flexible product design, offering crosscutting skills developed with the assistance of the Victorian Registrations and Qualifications Authority (VRQA) with the opportunity for specialisations from the qualification to be incorporated into existing apprenticeship programs.
- Developing the BZEE qualification has already seen a Federation University TAFE teacher sent to the USA to undertake the BZEE qualification and receive international certification in its delivery. Furthermore, opportunities will exist for upskilling of the existing University workforce to deliver the qualification and it is already evident in other areas of delivery relating to the APRETC initiative that industry professionals are looking to gain the Certificate IV in Training and Assessment so as they can contribute in a teaching capacity.
- As a qualification the BZEE will provide an attractive pathway for underrepresented cohorts to enter the energy sector, therefore contributing to enhancing workforce attraction, planning and diversity.

The Fellow through the APRETC initiative has ensured that Federation University has exclusive rights to deliver the BZEE standard in Australia. With the support of the Victorian State Government, Federation University will build a wind turbine technician training centre and the BZEE standard as an Australian qualification in 2024. It is anticipated that the delivery of the first BZEE Wind Turbine Technician Training program will commence in late 2024 or early 2025. To commence training both the training centre and the curriculum developed will require certification from BZEE and VRQA.

The BZEE qualification is a key plank in the development of the wind energy workforce of the future in Australia and will provide a pathway toward a national apprenticeship program in the future once a minimum installed capacity of at least 2 GW is reached annually of wind energy projects. The recent announced Capacity Investment Scheme[24] by the Australian Federal Government will see an additional 32 GW of renewable energy projects

23 https://www.vic.gov.au/clean-economy-workforce-development-stbyrategy-2023-2033
24 https://www.dcceew.gov.au/energy/renewable/capacity-investment-scheme

developed, wind energy projects will be a key part of the new developments. This along with the development of Australia's first offshore wind energy zones in Victoria with an ambitious 9GW of generation expected will ultimately lead to the achievement of the 2 GW of installed capacity annually, although it will be some years away.

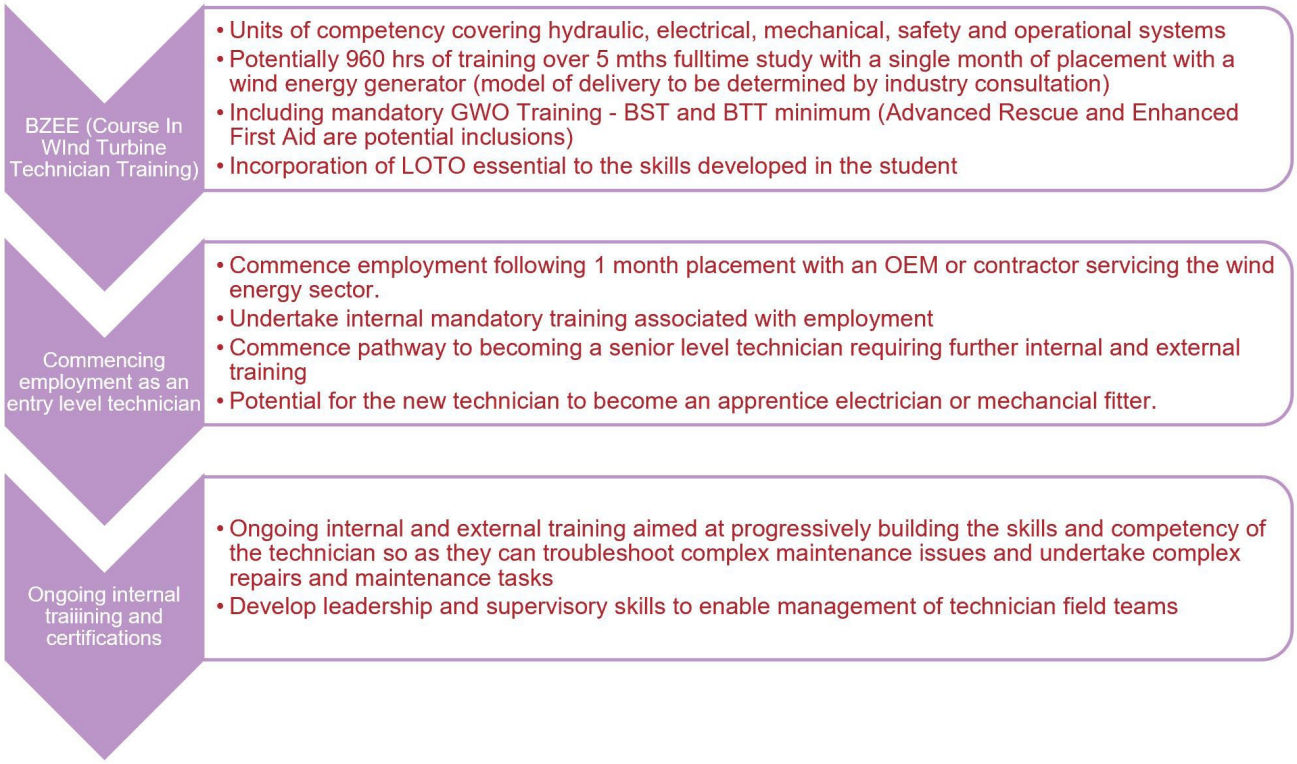

Figure 24. BZEE / Course in Wind Turbine Technician Maintenance Pathway for employment

Nordex

A wind turbine manufacturer with its home in Germany has its global training academy based in Hamburg, with satellite sites across the globe. With 60 regional trainers delivering training to employees and contractors the number of people trained exceeds 3,000 globally. A key area of demand for Nordex is electrical skills in Australia.

As a major OEM Nordex suffers from similar workforce issues as those experienced by Vestas. Like Vestas and other OEM's it tries to support the need for trained technicians via importation of skilled workers from across the globe, this inherently causes issues as those highly skilled technicians require their electrical qualifications to be reassessed in Australia prior to them undertaking any work on a turbine in Australia which requires adjustment or work to be undertaken on an electrical circuit.

It is understood by the Fellow that the recertification process is arduous and effectively is often seen as an unwarranted and expensive additional cost and as a result these highly skilled technicians simply supervise other technicians. A potential lost opportunity is occurring when these technicians are present for general knowledge transfer.

Nordex uses the BZEE qualification as a pathway for the development of technicians, effectively outsourcing their workforce development requirements. Once hired though technicians undergo extensive internal training in the regional training facilities using simulated equipment and Nordex nacelles. Nordex do not currently hire apprentices as a part of their OEM maintenance activities, they do however as a part of their manufacturing activities.

Figure 25. The Fellow at the Nordex Global Training Academy with the Nordex Team, Hamburg Germany.

Deutsche Wind Technik (DWT)

Established in 2017, as a contractor DWT provides outsourced maintenance services to both onshore and offshore wind turbine OEM's. Based in Husum, Germany DWT provides services to OEM's globally and to service its need for technicians has established its own training centre.

Supporting OEM's maintenance requirements forms the basis of the DWT business, with many long-term contracts in place. With 2,500 employees DWT is a significant subcontractor to the OEM's and with its scale has the capacity to support an apprenticeship program.

With an annual intake of 24 apprentices and with 100 apprentices in the business at any one-time DWT uses the BZEE qualification as a basis for their apprenticeship program. Partnering with local colleges, new apprentices are screened for language, literacy, and numeracy competency. Apprentices upon completion of their program are fully qualified electricians but importantly come with mechanical, hydraulic, and operational skills as well. DWT have three permanent teachers on staff at any one time. DWT would be considered a private RTO in Australia.

Attracting apprentices to the program hasn't been a challenge given the reputation DWT has in the marketplace and the benefits package made

available to the apprentices. Upon entering the program which is delivered as a mixture of onsite training in the field alongside qualified technicians and in the DWT, academy workshops apprentices can take advantage of onsite accommodation, 4 weeks annual leave and a company vehicle. Becoming a wind energy technician is seen as a very attractive career with the potential for national and international travel.

Throughout their program the apprentices are provided with the opportunity to work on at least 4 different nacelles all of which are at least 15 years old but are effective as training simulators with working hydraulic and electrical systems. The apprentices training is further supported with dedicated electrical training rooms and mechanical workshops. The use of low pressure simulated hydraulic rigs and laser alignment rigs are pivotal to ensuring a practically based training environment.

As a part of their training apprentices are required to disassemble and reassemble a Yaw Gear Box, building electrical control circuits including programmable logic controls, print parts using 3D printing and scanning processes, refurbish nacelle parts etc. In the future DWT envision that virtual reality learning will play an important part in the teaching of technicians as a complement to physical training within the workshop environment. DWT anticipates that it will purchase a third-party virtual reality platform to facilitate the use of 3D technology in the training environment.

Providing GWO training as a part of its apprenticeship program, DWT has extensive GWO training capability with lifts, heights training rigs and a simulated hub for rescue training. DWT has also developed its own inhouse occupational, health and safety training to support various OEM's including having developed safety equipment which is unique to its organisation.

The DWT model of training apprentices represents a model that could be replicated in Australia. A mechatronics apprenticeship incorporating a full "A" Class electrical licence upon completion as is the model in Germany would have significant benefits to not only the wind energy sector. The industrial and manufacturing sectors would benefit from the development of a qualification that covered both mechanical and electrical skills. Significant productivity benefits would be evident with the development of a skilled mechatronics technician but the challenges of doing so in the current industrial environment in Australia are lost on the Fellow. The challenges of industrial demarcation should not be seen as a barrier but rather an opportunity for change to improve productivity across a myriad of sectors.

Figure 26. The Fellow at the Deutsche Wind Technik, training Academy, Husum Germany.

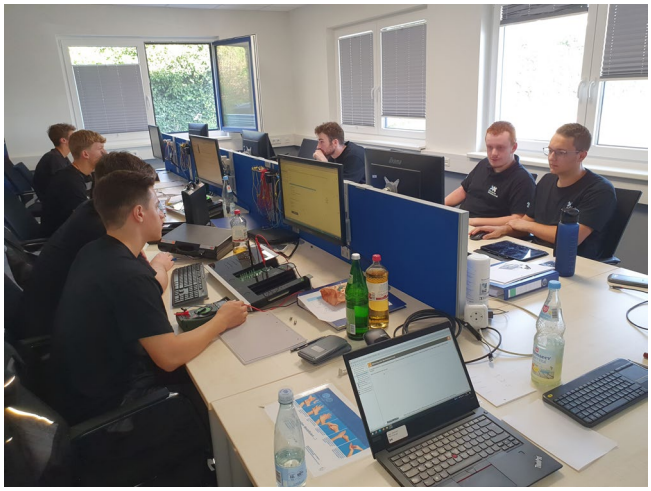

Figure 27. Apprentices at the Deutsche Wind Technik Academy undertaking electrical skills training using computer aided training programs.

Figure 28. The Fellow standing above a Vestas V80 Nacelle used for training purposes at the Deutsche Wind Technik Academy

Husum Wind Fair

The Fellow completed his Fellowship journey with a visit to the Husum Wind Fair which is the biggest expo staged for the wind energy sector in Europe. Alternating between Husum and Hamburg the fair attracts more than 600 exhibitors and 12,000 visitors from across the globe.

The Fair provided the Fellow with the opportunity to see some of the latest technologies being deployed into the wind energy sector both onshore and offshore, covering digitisation, repowering, robotics, construction methodologies, us of AI, training and education, recycling, hydrogen production and storage technologies.

The Fellow came away from the Fair feeling the need to establish a study tour to the 2024 Fair which will be held in Hamburg, where government, industry and stakeholders would be invited to participate.

05

Considerations and Next Steps:

The fellow has a number of recommendations which apply to Federation University, Policy Makers, the Victorian Skills Authority (VSA) / Office of TAFE Coordination and Delivery (OTCD) and TAFE's more generally.

For Federation University the following should be considered:

ISO 9001 Quality Management Systems Certification.

That Federation University TAFE and TAFEs more generally consider undertaking ISO 9001 Quality Management Systems certification as an alternative to the current process of VET Program Approval and Maintenance Procedure for industry short courses. Existing processes are internally focused with little relationship to common practices used in industry. Expected outcomes from the adoption of ISO 9001 Quality Management Systems Certification would be:

- Overall administrative cost savings
- Student Satisfaction Increases
- Industry Satisfaction Increased
- Systemised approach to qualification development
- Systemised approach to breaches of the quality system
- Cost savings associated with consumables.
- More engaged teaching and administration staff
- Provides more opportunity for teachers to undertake industry-based placements and training to support their relevance to the training provided.
- Increased industry opportunities for collaboration

Increased delivery of GWO qualifications

With the increasing focus on GWO qualifications by industry members and recognition of the GWO standards internationally as a legitimate training standard for the industry and notwithstanding the increasing demand for skilled employees it is recommended that Federation University look to advance the development of other GWO qualifications that can be delivered from the APRETC precinct including but not limited to:

- Advanced Rescue Training and Refresher
- Enhanced First Aid Training and Refresher
- Crane and Hoist Standard
- Slinger Signaller Standard
- Lift Training Standard
- BST Sea Survival Unit (late 2020's)

It is further recommended that Federation University look to work proactively with the Office of TAFE Coordination and Delivery to understand what funding support may be available to enable

the employment of curriculum development and teaching professionals to fast track the development of the GWO qualifications and the equipping of the University to deliver the skills sets.

GWO BST/BSR Skills Set Funding

As the minimum and mandatory qualification required to enter into the wind energy sector within construction, maintenance or operations there is an opportunity for the GWO BST/BSR with included national units of competency to be supported by Victorian State Government Workforce Skills Sets Funding (WSSF) Program. It is recommended that:

- Federation University makes application to the stream 2 of the WSSF Grant Program for the development of the GWO BST/BSR into Skills Sets Programs that can be funded under the provisions of the Victorian Skills Set Funded Course List.
- Federation University makes application to the Victorian State Government to have the GWO BST and BSR listed as skills sets funded as a part of the Funded Course List

For Policy Makers the following consideration should be considered:

Community Benefit Funding

The potential plans by Vicgrid to establish a centralised process for the development and administration of community benefit funds as a part of the delivery of new energy projects across the state shows a clear lack of understanding of the benefits that come from communities directly engaging with new energy projects in their back yards.

The Fellow recommends that Vicgrid don't proceed with a centralised model and that rather developers of new energy projects are provided with the opportunity to continue the work they are doing in directly engaging with communities which will host their projects. In doing so the communities determine the necessary funded projects they require to improve their communities health and social well being.

An alternate model to the one proposed by Vicgrid that could be considered by the State of Victoria and the developers of the energy related projects could be to contract a not-for-profit organisation like GrantScape (https://grantscape.org.uk/about-us/) to undertake the community consultation, administer and manage the community funds independent of government but with close support from the benefactor organisations.

Centre of Excellence Support

The Federal Government announcement of $31 million for the development of TAFE Centres of Excellence in 2023, provides an opportunity for the turbocharging of the APRETC initiative. With additional Federal support the APRETC initiative could be expanded to provide additional qualifications and infrastructure aimed at supporting the wind energy sector.

For the VSA and OTCD the following consideration should be considered as a part of producing a new apprenticeship qualification in support of the development of an apprenticeship program for wind turbine technicians:

Wind Turbine Technician Apprenticeship Program

The opportunity for a dedicated wind turbine technician apprenticeship needs to be considered in the longer term, as mentioned in this report an enabler for the development of a nationally recognised apprenticeship program will be the installed capacity of wind energy projects needing to reach a minimum of 2 GW per annum.

Setting aside the installed capacity requirements for a wind turbine technician apprenticeship program to be successful it will be essential that in its development a fresh approach is taken to the way in which electrical skills are delivered particularly the ability to provide sufficient electrical skills that would enable LOTO to be achieved at the very minimum by the qualification. Achieving a dual qualification with the right mix of mechanical and electrical for

the maintenance of equipment would have wide application across maintenance roles in all parts of the economy.

The Clean Economy Workforce Development Strategy 2023-2033 articulates a necessity to develop crosscutting skills development to enable the transition to a cleaner economy. The development of an apprenticeship program for wind turbine technicians as a mechatronics qualification with electrical and mechanical competencies would be crosscutting and innovative and address many of the industry workforce productivity issues that currently exist in the wind energy sector and others across Australia.

Nationally there is a focus on how to innovate in the TAFE delivery area, the Fellow would recommend that the OTCD and its Federal counterparts work to understand how a mechatronics apprenticeship can be achieved in the current industrial relations landscape and not back away from the hard conversations that need to be had to enable the breaking down of industrial barriers that would facilitate a mechatronics apprenticeship.

06
Impacts of Fellowship:

The impacts the fellowship has had on the Fellow are extensive across professional and personal realms.

Personally – Engaging in the application process alone was area of personal growth for the Fellow, at the time of application the Fellow seriously questioned if there was a place for his application, but the encouragement of colleagues and Victorian Education Department Staff demonstrated that the Fellows application had a place and would be well received. The recognition by departmental staff of the work done to date on the APRETC initiative was humbling.

Expertise – Throughout the development of the APRETC initiative and the wait for the travel to take place the Fellow has gained considerable expertise in understanding the training needed to support of the growth of the wind energy sector. In addition, the Fellow has become more knowledgeable in supply chain requirements, community benefit programs and the needs of the offshore wind energy sector. All areas that are aligned to the work of the Fellow and have broadened the Fellows knowledge base.

Knowledge transfer – The Fellow has been engaged throughout the period leading up to and after the travel component of the Fellowship by colleagues, forums, industry forums, various state and federal government departments to share his knowledge which is humbling and rewarding. The knowledge gained has helped support the development of State and Federal responses to the development of the wind energy sector.

Professional Position – The Fellow has because of his work seen his promotion to an Associate Directorship Role with Federation University and is recognised within the University as the key person in relation to the energy industries requirements across both vocational and higher education. In recognition of the work done by the Fellow the University highlights its industry partnerships through the APRETC initiative, pointing to it continually as an example of industry / university and government partnership that is workforce oriented and industry lead.

Professional Future – The Fellow has recognised the inherent value in the knowledge and expertise he possesses and as a result has moved to commercialise that knowledge and expertise with the formation of a consulting company B Mundy and Associates. The focus for the consulting company will be support the development of workforce capacity and capability, supply chain requirements and support for the thermal energy workforce as it transitions. Formed in 2023 the Fellow anticipates working in an ad hoc consulting capacity whilst continuing to undertake his role at the University, accepting only tasks which are complementary to the University and the APRETC initiative.

Networks – The Fellow prior to his travel had a significant network across industry and government, but since returning from overseas those networks are now international and growing. The development of these international networks has helped inspire the Fellow to develop his own consultancy.

Sectoral Impact – The Fellow has had significant impact at a TAFE sectoral level to date and will continue to do so, through national forums and the desire to influence the development of a mechatronics apprenticeship to service the wind energy sector. The current workforce demands of the wind energy sector and the necessity to transition away from thermal generation will continue to see the Fellow and his work influence the outcomes of new qualification design, delivery, and support for the University so as it can continue to grow the APRETC initiative.

Critically the Fellow sees the need for innovative apprenticeship design to be achieved and will continue to advocate for the development of a mechatronics program that would transform not only the wind energy sector but support productivity improvements across many sectors. The Fellow fully appreciates though the significant challenges that come with advocating for change but has been emboldened by the Fellowship experience and will continue even in the face of adversity.

Personal Impact – The Fellow has felt an immense sense of pride in the development of the APRETC initiative. Consistently whilst travelling overseas the Fellow spoke of the initiative, its achievements to date and plans and at no stage did the Fellow receive feedback indicating the initiative was ill conceived or unwarranted, resoundingly industry partners and educational institutions encouraged the Fellow to continue his work and consider doing more.

Entering the education and training sector from the corporate world wasn't a planned career progression but it has been one to the most rewarding experiences in the Fellows career journey and the impact the Fellow has had in the short time he has been a part of the sector has helped shape who he is and his plans for the future.

07

Sector Engagement (Dissemination):

The Fellow has been constantly consulted over the course of the last 5 yrs. because of the development of the APRETC initiative by industry representative bodies, government departments, corporations, politician's, and individuals.

The Fellow has presented the work in the development of the APRETC initiative to a variety of stakeholder groups including VET Development Centre, Jobs and Skills Australia, TAFE Directors Australia, Clean Energy Council Summit, and SEC.

The following dissemination opportunities have occurred or are forecast by the Fellow.

Attendance at various conferences as a speaker providing insight into the APRETC initiative and work undertaken to develop a response to the workforce needs of the wind energy sector.

Whilst the Fellow will continue in his role as the Chair of the Ballarat Energy Network, member of various project control groups associated with the delivery of the APRETC initiative and member of the Grampians New Energy Taskforce.

08
Conclusion

The opportunity to compare the work undertaken by the Fellow as a part of the APRETC initiative with the training response by institutes and industry participants across the globe has shown that the Australian Training System can lead in a manner like European and US jurisdictions where training responses to the needs of the wind energy sector are well established.

A clear opportunity exists to expand the GWO training offered via the APRETC initiative which would support the growing needs of the industry. It is also evident that the work currently underway to deliver a dedicated wind turbine technician training workshop and associated course based on the BZEE global standard will directly support the impending development of the offshore wind energy sector.

The need for a nation-wide wind turbine technician training apprentice program isn't currently required and should there be a desire to create an apprenticeship program in the future it should be based on the amount of installed capacity annually occurring for wind energy projects with a minimum of 2 GW being considered the baseline. Further any apprenticeship program should have a mechatronics focus combining mechanical and electrical skills into one program delivering a skilled technician that has the capacity to disconnect and reconnect electrical power components at a bare minimum.

In the interim the delivery of the BZEE as a pathway to becoming a technician is well supported internationally and when delivered as a part of the APRETC initiative by late 2024 it will provide adequate training capacity in support of the needs of the industry.

Further opportunities exist for the Victorian State Government to support the delivery of the GWO training via the APRETC initiative with the GWO training programs delivered by Federation University receiving support via being listed on the funded course list as skill sets. This would have the effect of lower the overall cost of training to enter the industry and support those providers of the GWO training who have a skills first funding contract.

Federally the Australian Government has an opportunity to recognise the work already completed by Federation University by nominating the APRETC initiative as a centre of excellence under the $31 million program for Centres of Excellence announced in 2023. Leading the nation in the development of a comprehensive response to the wind energy sectors training needs APRETC has no peer within the bounds of the nation and with the support of the Federal Government could be become the Asia Pacific hub for wind energy training offering an opportunity for international students' participation.

At an organisational level Federation University together with other TAFE's and Dual Sector Universities should consider the potential for implementing ISO 9001 Quality Management Systems Certification for their short course or skill sets delivery programs, making them more responsive to industry demand, more industry aligned, faster to market and delivering cost benefits.

Critically the Fellow saw as a part of his visits to Scotland and the UK more generally the importance of community deciding the outcomes for community benefit schemes attached to major renewable energy projects. Any consideration by jurisdictions to centralise or control community benefit programs is not recommended and should be discouraged. The energy transition is being delivered in regional communities across Australia and those communities will inherently when asked what areas they see as needing support in their region nominate educational outcomes. This being the case TAFE's and Universities across the nation have a unique opportunity to receive direct support in the form of cash contributions from renewable energy projects which will assist regional communities address educational outcomes and at the same time provide a workforce response for the sector. APRETC and Federation University stand as an exemplar of how this can occur.

Finally, though what was abundantly clear to the Fellow in his travels was the importance of industry alignment and how critical it is to maintain direct connections with industry participants, enabling the development of industry responsive courses that support the workforce development needs of the sector as it looks to grow. Industry alignment can come through industry advisory groups, supporting industry conferences and conventions, participation in industry wide advisory bodies, ensuring industry representation in the governance structures associated with the project developments and providing opportunities for industry members to provide feedback on as part course development etc through showcase events.

09
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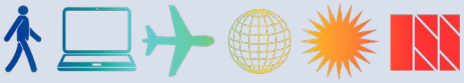

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