REGISTERED
NATIONAL QUALIFICATION

Title:	**National Certificate in Sustainable Energy (Hybrid-wind) Level 3**[1]				
Version :	1	**Qualification type:**	National qualification	**TQF level:**	2
Credits :	45	**TQF Registration code**:	QR-03-NQ-018-04-0504-23-01		
Approval date:	27 April 2023			**Next review:**	27 April 2028
Qualification developers:	1. Pacific Centre for Renewable Energy and Energy Efficiency (PCREEE), Tonga; 2. Department of Energy, Ministry of Meteorology, Energy, Information, Disaster Management, Environment, Climate Change and Communications (MEIDECC), Tonga				
Purpose:	The *National Certificate in Sustainable Energy (Hybrid-wind) Level 3* (*NCSEL3-HW*) offers specialisation in *hybrid-wind energy* systems. 'Hybrid' power systems, as the name implies, involves the combination of two or more modes of electricity generation together. Hybrid systems provide a high level of energy security. The *NCSEL3-(HW)* is one of a number of national qualifications in Sustainable Energy with specialisation in wind-based hybrids as a renewable source of energy. The learner will gain an understanding of how wind turbines are viable alternatives for power generation either independently or in *hybrid power systems*. In particular the learner will explore the most common generation sources for a hybrid power system in the Pacific region: wind turbines and photovoltaic with a diesel generator as backup. This national qualification, together with other national qualifications in *Sustainable energy* and *Energy efficiency,* will promote the use of the formal technical vocational				

[1] This Tonga national qualification, *National Certificate in Sustainable Energy (Hybrid-wind) Level 3*, is adapted from Pacific regional qualification *Regional Certificate 3 in Sustainable Energy (Hybrid-wind strand)* which has been accredited by the Pacific Community's Educational Quality and Assessment Programme (EQAP) and registered on the Pacific Register of Qualifications and Standards (PQRS);

This Tonga national qualification, National Certificate in Sustainable Energy (Hybrid-wind) Level 3 is therefore considered equivalent to the Regional Certificate 3 in Sustainable Energy (Hybrid-wind strand) and to any other approved qualification which has been adapted from it.

This qualification adaptation is the outcome of a close collaboration between the Tonga National Qualifications and Accreditation Board (TNQAB) and the qualification developers (which is Tonga Department of Energy, MEIDECC, and the Pacific Centre for Renewable Energy and Energy Efficiency (PCREEE), and made possible through financial support from the EU-PacTVET Project.

	education and training (TVET) sector to facilitate building national and regional capacity to: 1. Raise the level of awareness and knowledge on alternative renewable energy sources and renewable energy technologies (RETs). 2. Develop technical skills and knowledge to support processes for installation, operation and maintenance of RETs, and 3. Undertake planning, development, monitoring and assessment and management of sustainable energy projects to promote energy efficiency which will mitigate loss and damages from the effects of climate change. This qualification not only supports the organization outcomes of the Tonga 2nd Strategic Development Framework 2015-2025 (TSDF II) but also contributes to developing a larger Pacific Community whose people are educated and healthy and are able to manage their energy resources in a sustainable way.
Rationale	The Pacific Island states including Tonga are particularly vulnerable to the adverse effects of climate change. They are also countries that are leading the world in reducing their fossil fuel consumption and shifting to renewable energy sources of electricity generation. The increasing demand, usage and costs associated with fossil fuels to power the transportation and energy sectors of Pacific Island nations have led to an energy transformation in the region. Investment in clean and affordable energy, with a focus on renewable energy, energy efficiency and conservation is leading diversity in technologies, sources of energy and mitigating the environmental effects of using fossil fuels. In Tonga, the *Tonga Energy Road Map* (TERM) has gained wide recognition in these areas. These efforts highlight the levels of importance Tonga has given to its national energy security as well as the need to reduce national vulnerability to global fluctuations in fossil fuel prices through the use of sustainable energy. Around the Pacific Island region, the price of fuel and electricity tariffs rank among the highest in the world and there are significant inefficiencies in electricity generation and fuel consumption in the transport sector. While there are promising renewable energy opportunities, about 7 million people out of the region's 10 million still do not have access to electricity. Against this backdrop, Tonga and the rest of the Pacific island countries are prioritizing a shift to renewable electricity sources and increased access for all communities. In some cases, whole atolls are now 100 percent renewable, many more people have access to clean and reliable power, the amount of diesel imported for electricity generation has been reduced and some Pacific countries can now better manage the impacts of climate change. As a result of the shift and ongoing changes, there is a need for training in a wide range of skills associated with sustainable energy. The *NCSEL3(H-w)* is aimed at those who may already be working in a field related to Energy/Sustainable Energy or those with relevant work experience who wish to pursue a career, or further studies, in Sustainable Energy. It is part of an attempt to make quality assured training in energy/sustainable energy widely available to training institutions and the people of Tonga.

Outcomes Statement

On completion of a *NCSEL3(HW)*, graduates will be able to:

1. demonstrate some operational and theoretical knowledge not only in hybrid-wind but also *Wind energy conversion systems* (WECS), select from and apply known solutions to familiar problems, apply a range of standard processes relevant to the field of work or study, apply a range of communication skills including appropriate cultural protocols relevant to the role in the field of work or study, apply literacy and numeracy skills relevant to the role in the field of work or study, work under limited supervision, demonstrate major responsibility for own learning and performance, adapt own behaviour when interacting with others, contribute to team performance;
2. contribute to project development proposals and reporting, gathering relevant information and data for monitoring and reporting purposes, providing general communications and services to communities, government and development partners, and developing community awareness on matters related to renewable and non-renewable energy sources, renewable energy technologies, energy efficiency and energy management;
3. Conduct a resource assessment and apply methods and tools for siting hybrid wind energy projects as they relate to the Pacific region;
4. Identify with local communities information on determining the viability of hybrid-wind energy production for local areas;
5. Provide information to local communities and stakeholders (development partners, government agencies, NGO's) on benefits and environmental impact of hybrid wind power systems for a particular location;
6. Provide technical skills to support the operations and maintenance of hybrid wind components such as combustion engine, generators, battery storage and power conditioning equipment;
7. Contribute to strengthening sustainable energy practices through the use of appropriate renewable energy sources and technologies which include hybrid, grid-connected, and standalone power systems.

Qualification Components

This qualification consists of the following units of competency:

	Unit Code	*Unit Title*	*Credit value*
1	NS080-03	Provide quotations for installation or services jobs	4
2	NS081-03	Carry out simple project activities in SE	6
3	NS082-03	Comply with scheduled and preventative maintenance program processes	5
4	NS093-03	Apply tools, equipment and materials in complex tasks in RE & EE for operations and maintenance of hybrid-wind systems	6
5	NS094-03	Apply basic concepts in Hybrid-wind for energy generation and consumption	6

6	NS095-03	Use drawings, diagrams, schedules, standards, codes and specifications for hybrid-wind systems	4
7	NS096-03	Diagnose and rectify faults in hybrid-wind control systems	4
8	NS097-03	Maintain and repair hybrid-wind infrastructure and facilities associated with remote area essential service operations	4
9	NS098-03	Assist in the installation and operation of hybrid-wind systems	6
		TOTAL CREDITS:	45

Note:

a) The above units of competency can be delivered as short courses consisting of one or more units depending on the training needs of a training provider;

b) Approval for short course delivery should be sought from TNQAB prior to delivery;

c) Competency gained through short courses delivered in the past three years, can be considered for cross-credit.

[Refer to section below on cross-credits].

Entry Requirements

EITHER

1. Successful completion of the Tonga *National Certificate in Sustainable Energy Level 2* (or equivalent).

OR

2. Completion of Year 12 (Form 6) with pass marks in:
   i. Mathematics,
   ii. Chemistry (or Physics),
   iii. English (or Tongan Studies);

OR

3. Completion of Year 11 (Form 5) with pass marks in Science, Mathematics, and English (or Tongan Studies), PLUS 2 years of work experience in a field related to Sustainable Energy.

Learning Assumed to be in Place

- Mathematical literacy at TQF Level 1
- Communication literacy at TQF Level 1
- ICT literacy at TQF Level 1 (including computer, internet, mobile technology, and instructional media);
- Tonga cultural literacy and awareness Level 1 (including Tongan language, protocol, etc.)
- Social skills and can work with others to accomplish a task;

- Basic knowledge of the geography of Tonga (and the Pacific Islands) including but not restricted to the location of places on a map, climate and weather.

International Comparability

This Tonga national certificate is equivalent to:

1. *Regional Certificate 3 in Sustainable Energy (SE)* (with specialisation in Hybrid wind) registered by Pacific Community (SPC)'s Educational Quality and Assessment Programme (EQAP);
2. Any other Pacific Island qualification in SE that has been formally recognized as equivalent to the regional qualification mentioned in 1 above.

Further, the following Tongan units of competency (1st column) are comparable to registered Australian units of competency (2nd column) which are, in turn, components of the Australian qualifications shown (in 3rd column):

Unit code in Tonga	Unit code in Australia	Australian qualification the unit is a component
NS080-03	UEEC0015	i. *UEE40420- Certificate IV in Electrical – Instrumentation;* ii. *UEE50722- Diploma of Renewable Energy Engineering;* iii. *UEE40520- Certificate IV in Electrical - Air Conditioning Split Systems* iv. *UEE41020- Certificate IV in Energy Management and Control*
NS082-03	UEECD0011	i. *UEE41920- Certificate IV in Electrical - Renewable Energy;* ii. *UEE53020- Diploma of Electrical Systems Engineering;* iii. *UEE40620- Certificate IV in Electro-technology - Systems Electrician;* iv. *UEE32120- Certificate III in Appliance Service*
NS095-03	UEECD0051	i. *UEE41620- Certificate IV in Renewable Energy;* ii. *UEE62122- Advanced Diploma of Engineering Technology – Electrical;* iii. *UEE32120- Certificate III in Appliance Service;* iv. *UEE30920- Certificate III in Electronics and Communications.*
NS096-03	UEERE0034	i. *UEE41920- Certificate IV in Electrical - Renewable Energy* ii. *UEE41620- Certificate IV in Renewable Energy* iii. *UEE60920- Advanced Diploma of Renewable Energy Engineering* iv. *UEE62020- Advanced Diploma of Engineering Technology - Renewable Energy*
NS097-03	UEEREE0017 or UEENEEK117A or UEENEEK017B	i. *UEP20222- Certificate II in Remote Area Essential Service* ii. *UEE21420 - Certificate II in Remote Area Power Supply Maintenance*

Successful completion of the above Australian units of competency may be considered for cross-credit when studying this Tonga national qualification. Approval of cross-credits is at the discretion of relevant training providers and TNQAB. (See section on *Credit transfer* below).

Recognition of Prior Learning	This qualification may be achieved in whole or in part through *Recognition of Prior Learning* (RPL) that considers skills and knowledge gained in different settings including the community, workplace and educational institutions, and in accordance with relevant national and institutional policies and processes. Learners can achieve competence in ways most suited to their educational, work or cultural needs and aspirations. Assessment for RPL must be undertaken by a qualified assessor. Evidence of skills and knowledge acquired must be shown before recognition can be given. Recognition of prior learning (RPL) acknowledges the skills and knowledge gained from both formal education as well as informal settings such as the workplace, community, and life experiences.
Credit transfer	Both the *Tonga Qualifications Framework* (TQF) and the *Pacific Qualifications Framework* allow for credit recognition and transfer from other regional or national qualifications through a process of mutual recognition. Credit transfer is a process whereby credits already achieved for one qualification are recognized towards a new qualification. An applicant to this Tonga national qualification, may be granted cross credits for unit standards which he/she had successfully completed within the past 3 years, if such unit standards were components of: 1. A qualification which has been identified as equivalent to this Tonga national qualification. Evidence of achievement will be required by relevant authorities before credit transfer is approved; 2. A TNQAB-approved short course. Evidence of achievement will be required by relevant authorities before credit transfer is approved. 3. Australian training programmes listed in the section for international comparability. Approval of cross-credits is at the discretion of relevant training providers and TNQAB.
Learning Pathways	**Pathways in:** 1. Successful graduates of *National Certificate in Sustainable Energy Level 2*; 2. High School leavers who meet entry requirements; 3. Mature students and current employees who meet the entry requirements; 4. Completion of relevant short-courses. **Pathways out:** 1. *National Certificate in Sustainable Energy Level 4* (to be developed after this national qualification) 2. Employment – in the energy industry or environment management in both Tonga and overseas.

Support for Qualification	This national qualification has gained the support of the following organizations: 1. Pacific Community's *EU-PacTVET Project*, Fiji. 2. Ministry of Meteorology, Energy, Information, Disaster Management, Environment, Climate Change and Communications (MEIDECC), Tonga. 3. Ministry of Education and Training, Tonga. 4. Tonga Institute of Science and Technology (TIST), Tonga. 5. Pacific Centre for Renewable Energy and Energy Efficiency (PCREEE), Tonga, 6. Department of Energy, Tonga, 7. Pacific Community's Educational Quality and Assessment Programme (EQAP), Fiji. 8. Sustainable Energy Industry Association of the Pacific Islands (SEIAPI), Fiji.
Accreditation Requirements	Important accreditation requirements include: 1. Teaching staff mush have : a. At least a level 4 qualification in Energy/Sustainable Energy or related field plus 3 years relevant industry experience. b. A relevant qualification as a trainer or assessor in TVET c. A valid first aid certificate 2. Wind energy conversion system (WECS): Small or Large Scale *Horizontal axis wind turbine* (HAWT) systems 3. Hybrid-Solar PV system; 4. Energy Storage Systems: Lithium Ion Batteries, Lead Acid Batteries, etc.; 5. Charge Controllers: Pulse Width Modulation (PWM) or Maximum Power Point Tracking (MPPT); 6. Diesel generator; 7. Electrician's Tool Kit includes a sturdy tool-case containing the following: a) Electric drill and bit sets b) Ratchet handle, universal joint, c) Sockets d) Coupler e) Extension bar f) Insulated screwdrivers (approved for electrical safety) g) Combination spanner (approved for electrical safety) h) Pliers (approved for electrical safety) i) Electric tester j) Hammer k) Measuring 8. Personal protective equipment (PPE) a) Hand gloves for electrical and mechanical lab work b) Safety helmets c) Safety glasses

	d) Ear mask for use in workshop environment e) Dust masks f) Body harness g) Safety tags – e.g., Lock and tag out tags such as out of service, do not operate, live wire) 9. Physical resources (satisfied with standard of computers and internet access, and other class room resources) 10. A computer–aided design software such as AutoCAD installed in all student computers 11. Saving devices such as USB flash drives or external hard drives for Supervisory Control and Data Acquisition (SCADA) 12. General course outline ready for distribution to students with details of Purpose, Learning outcomes, Qualification components, Credit values, Entry requirements, Learning assumed to be in place, and Name(s) of teaching team; 13. Unit descriptors are ready for distribution to students with details of: a) Learning outcomes and performance standards b) Assessment details including assessment tasks and due dates, marking guidelines, moderation information, and other requirements about the completion of each unit c) Recommended readings for students, and d) Names and contact details of teaching staff