REGISTERED
NATIONAL STANDARD

UNIT OF COMPETENCY

Title:	**Apply tools, equipment, materials relevant to tasks in RETs and Energy Efficiency practices**				
TQF Level:	2	**Credits:**	8	**Version:**	1[1]
National standard code:	NS 050-02				
Associated qualification (and code):	National Certificate in Sustainable Energy Level 2 (QR-02-NQ-018-02-0504-20-01)				
Approval date:	30 Nov 2020	**Review date:**	30 Nov 2025		
Purpose:	This unit standard is for a person who work, or may intend to work in the energy sector or energy related sectors. Persons credited with this unit standard are able to: 1. Select and use tools and equipment relevant to each of the different *Renewable energy technologies* (RETs) and *Energy efficiency* (EE) practices and measures; 2. Identify and use relevant materials relevant for each of the different RETs and EE practices and measures; 3. Identify basic faults in RETs and other power tools and perform repairs using correct tool and procedures; 4. Demonstrate ability to write basic reports in regards to tool handling and storage, including wear and tears; 5. Demonstrate ability to work independently under limited supervision with RET.				

[1] This Tonga unit standard, with the unit code *NS050-02*, is adapted from the Pacific regional unit standard *SE2001* which carries the same title mentioned above. Unit standard SE2001 is a component of the Pacific regional qualification *Certificate 2 in Sustainable Energy* which is equivalent to the Tonga *National Certificate of Sustainable Energy Level 2*.

Learning Outcome 1 (LO1)	**Select and use tools, equipment and materials relevant to different RET and EE practices**
Performance standards	1.1 Identify and use tools, equipment and materials used in different RET and EE practices; 1.2 Identify relevant RET testing techniques involved with monitoring activities over different time periods; 1.3 Use safe and appropriate practices for handling and storing tools, equipment and materials used in RET in accordance with specifications and organisational policies and procedures; 1.4 Prepare and update appropriate servicing and maintenance records for tools, equipment and materials used in different RET and EE practices in accordance with specifications and organisational policies and procedures.
Learning Outcome 2 (LO2)	**Identify basic faults in RETs and other power tools and equipment, and perform basic repairs**
Performance Standards	2.1 Identify and describe the basic faults in sustainable energy systems, RETs and associated tools and equipment; 2.2 Identify relevant tools required to repair or rectify basic faults in energy systems and associated power tools and equipment; 2.3 Apply correct procedures in fault-finding and basic repairs of power tools and sustainable energy systems; 2.4 Ensure safety standards are maintained when attending to faults.
Learning Outcome 3 (LO3)	**Conduct workplace activities independently under limited supervision.**
Performance standards	3.1 Use appropriate workplace verbal and non-verbal communication skills to maintain workflow and workplace relationships so that tools, equipment and materials are applied appropriately in work activities; 3.2 Plan and manage workplace tasks, including access and use of tools and equipment sheds and storage, and movements in accordance with organisational policies and procedures under minimum supervision; 3.3 Prepare records and write basic reports on the condition and status of tools, equipment and materials used in RET and EE practices, with minimum guidance;

	3.4 Use a checklist to ensure that workplace activities are conducted as planned.
Pre-requisites	N/A
Co-requisites	N/A
Underpinning skill and knowledge	The following knowledge and skills underpin this unit standard: • Identifying and describing the appropriate uses of common tools, equipment and materials that are commonly used with the renewable energy sources of solar, wind, micro-hydro and biomass; • Selecting and using appropriate tools, equipment and materials specific to each of the following RETs: solar photovoltaics; biomass; micro-hydropower and wind-power; • Using EE practices with tools, equipment and resources for RETs; • Using energy conservation practices with tools, equipment and resources for renewable energy technologies.
Suggested assessment methods	**Context of assessment:** To support student assessment and to ensure they are valid, reliable, flexible, and fair, provider institutions are encouraged to make the necessary arrangements to involve the relevant key industry organisations such as *Tonga Electricity Commission* (TEC), *Tonga Power Limited* (TPL) and other trusted licensed private energy and electricity entrepreneurs in the assessment of the required standards and competencies. Such collaboration between provider institutions and the industry may include but not restricted to the following: • Experts from the industry have input to the design and implementation of the curriculum and assessment activities; • Experts from the industry are engaged as trainers, assessors, or assessment moderators; • Students are placed in relevant industry organisations for workplace attachment; • Industry experts act as supervisors of students on workplace attachment • Etc. To show that students have the required competence they will need to:

	1. Demonstrate knowledge in the workplace (or in an environment that closely resembles the workplace) on: a) Generic tools, equipment/materials that are used for components or power systems for: wind, solar, biomass, micro-hydro; b) The definition of Renewable Energy c) The differences between RE and non-RE using relevant examples; *d)* The types of RETs that are available in both Tonga and other Pacific Islands, including *Solar, Wind, Biomass, Biogas,* and *Wave* etc. e) Types of technologies per RET type: o Type of Solar PV, Type of Battery, o Type of Charge Controller, o Type of Wind Turbine, etc. f) Main components of a Solar PV Home system: o Solar PV, o Battery, o Charge Controller etc. g) Definition of Energy Efficiency; h) Definition of Energy Conservation using relevant examples; i) Identifying and describing; o Basic faults in sustainable energy systems, RETs and associated tools and equipment; o Relevant tools required to repair or rectify basic faults in energy systems and associated power tools and equipment; o Correct procedures in fault-finding and basic repairs of power tools and sustainable energy systems; o Safety standards to be maintained when attending to faults. **2. Apply their knowledge and skills in the workplace (or in an environment that closely resembles the workplace), by:** a) Selecting and using tools, equipment and materials, in terms of: i. Different RET and EE practices; ii. Relevant RET testing techniques involved with monitoring activities over different time periods;

iii. Safe and appropriate practices for handling and storing tools, equipment and materials used in RET in accordance with specifications and organisational policies and procedures;
iv. Preparation and updating appropriate servicing and maintenance records for tools, equipment and materials used in different RET and EE practices in accordance with specifications and organisational policies and procedures.

b) Conducting workplace activities independently under limited supervision, in terms of;
   i. Using appropriate verbal and non-verbal communication skills to maintain relationships and workflow so that tools, equipment and materials are applied appropriately;
   ii. Planning and managing tasks, including access to equipment sheds/storage, the use of tools, and movements, in accordance to organisational policies and procedures;
   iii. Preparation of records and writing of basic reports on the condition and status of tools, equipment and materials used in RET and EE practices
   iv. Using a checklist to ensure that work activities are conducted as planned.

Methods of assessment:

A range of assessment methods should be used to assess students' knowledge and application of skills, include but not restricted to the following:

i. Direct observation of students performing certain tasks as mentioned in context of assessment;
ii. Written or oral questions to test relevant skills and knowledge during observation;
iii. Inspection of storage of tools and equipment;
iv. Checklist of repair and routine maintenance;
v. Identifying basic tools, equipment and RE and EE materials;
vi. Student Portfolio;
vii. Review of workplace attachment reports (e.g. Supervisor/third party reports).

Resource requirements	i. Text Books or printed resources for Applying Tools, Equipment and materials relevant to tasks in RETs and Energy Efficiency Practices at the discretion of the course/unit coordinator or trainer, ii. Computer, Printer, Internet Access, iii. Conventional classroom, classroom furniture and resources: White/blackboard, tables or benches, chairs, student notice boards, A3 coloured cards or wall charts for group discussion. iv. *Personal protective equipment* (PPE) such as: • hard clothing or overall, • grip it gloves, • safety spectacles, • orange waist coat, • valved dust-mask, • first aid kit, • safety boots, • safety helmet and • lightweight ear defenders; v. Basic tools such as: • spanners, • mechanical fixtures (press tools, assembling fixture, brackets, precision fixtures, etc), • wrenches, • circlip-pliers (inside and outside), • vice grip, • Tinman's snips, • socket screws, • Allen hex keys, • Twist auger bits, • wood chisel, • tap & die, • scissors, • crosscut handsaws, • hacksaws • junior saws; vi. Appropriate hand and power tools for RET and EE practices; • Hand power tools and equipment that may include: ○ Angle grinder (handheld and portable),

	○ Test equipment such as gauges, test lamps, multi-meter, battery tester, earth ground tester, insulation tester, ○ Chart recorders, ○ Thermal Imaging Camera, etc. • Winding equipment such as: ○ bearing puller, ○ growler tester, ○ coil winding machine, ○ earth loop impedance tester; • Cable termination equipment that may include: ○ Crimping tool, ○ Air blower, ○ Heat gun, ○ Soldering iron vii. Appropriate RET equipment (or necessary arrangement made so that students have the opportunity to be exposed to these); • Solar PV: Stand-alone, grid-tied, and hybrid Solar PV Systems; • Wind Systems: Small and Large Scale *Horizontal axis wind turbine* (HAWT) systems and Hybrid Wind Systems; • Biogas System; • Hydropower system Prototype: Tube or conduit-like penstock connected to a hydro-power turbine which is coupled to a generator and conductors connecting the generator to a simple electrical load such as a single light. • Energy Storage Systems: Lithium Ion Batteries, Lead Acid Batteries, etc; • Charge Controllers: *Pulse Width Modulation* (PWM) or *Maximum Power Point Tracking* (MPPT) • Measuring devices: Anemometer, Pyranometer, and Multimeter.
Moderation arrangements	Provider Institutions are responsible for moderation arrangements to ensure consistency in assessments. Moderation process must be approved by TNQAB.

Requirements to complete this unit	There are three (3) Learning Outcomes and twelve (12) Performance Standards that measures competence. To demonstrate competence, the person studying this unit is: 1. Required to attain an *Achieved*[2] grade (Competent) to fulfil the requirements of the Unit Standard. 2. Eligible to three (3) attempts to achieve the required competency within 5 days of the first attempt. Failure to achieve the required competency level after three (3) attempts of the exam or specific part of the assessment will require the person studying this Unit to re-enrol for the same Unit.
Important notes and definitions	**Notes**: 1. All activities associated with this unit standard must comply with the requirements of national codes of practice, regulations and legislation for workplace health, safety, and environmental protection and any subsequent amendments. 2. Assessors must comply with Tonga national assessment and moderation requirements. **Definitions:** 1. **Renewable Energy Resources** refers to resources that are available naturally and can be replenished by nature. Examples are sunlight, wind, rain (water), tides, waves, plants and geothermal heat. 2. **Renewable Energy Technology (RET)** refers to a technology that uses naturally available energy resources to produce energy for human consumption to meet its needs. Such energy produced is deemed to be 'clean energy' because there is no emission of greenhouse gases into the atmosphere. 3. **Energy Efficiency** refers to the utilisation of minimal energy to be able to 'do work'. 4. **Energy Conservation** refers to minimizing energy usage by using less energy (input energy) such as electrical energy or liquid fuel (unleaded petrol or diesel). It can be distinguished from energy efficiency. 5. **Specifications** refer manufacturer's specifications on operation, processes, maintenance repairs for tools equipment, resources

[2] This unit is competency-based in which there are only two possible grades: *Achieved* and *Not Achieved*. An 'Achieved' grade is assigned to a candidate who has met the competency requirements of the unit.

	6. **Maintenance activities** refer scheduled maintenance and servicing and restoration of low voltage electrical components, motors, appliances and fittings and maintenance and servicing of tools and equipment used by electrical fitter mechanics, in particular power analysers, cathode ray oscilloscope (CROs), secondary injector set, relay tester, phase sequence testers. 7. **Scheduled maintenance and servicing** refers replacement of consumables; minor adjustments; replacement of faulty components; operational changeovers
Public comments on unit	Please contact TNQAB National Qualifications Unit (email EnquireNQ@tnqab.to or Telephone 28136) if you like to discuss or suggest changes to the details of this unit.