REGISTERED
NATIONAL STANDARD

UNIT OF COMPETENCY

Title:	**Describe and explain basic *Renewable Energy Technologies* and energy saving practices**				
TQF Level:	2	**Credits:**	7	**Version:**	2[1]
National standard code:	NS048-02				
Associated qualification (and code):	National Certificate in Sustainable Energy Level 2 (QR-02-NQ-018-02-0504-26-02)				
Approval date:	25th Mar. 2026	**Review date:**	25th Mar. 2031		
Purpose:	This unit standard is for people who work, or intend to work in the Energy sector. Persons credited with this unit standard are able to: 1. Identify Renewable and Non-Renewable Energy Resources harnessed in a global, regional (Pacific-wide) and local (communities) context; 2. Identify and describe different types of Renewable Energy Technologies (RETs) used globally and those that are used in various Pacific Island communities; 3. Explain and distinguish energy efficiency and energy conservation; 4. Identify energy ratings on different electrical appliances used in households, offices and commercial buildings; 5. Identify the units of "power", "voltage", "electrical current" and "electrical energy" in accordance with the *International System of Units* (SI Units)				

[1] This Tonga unit standard, with the unit code *NS048-02*, is adapted from the Pacific regional unit standard SE2002 which carries the same title mentioned above. Unit standard SE2002 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)	**Identify Renewable and non-Renewable Energy resources available in global, regional, national and local contexts**
Performance standards	1.1 Distinguish between renewable and non-renewable energy resources. 1.2 Identify examples of renewable and non-renewable energy resources that are available globally; 1.3 Describe renewable and non-renewable energy resources that are available in Tonga or anywhere else the Pacific region; 1.4 Explain the advantages and disadvantages of using non-renewable energy resources, globally and, in Tonga and the Pacific region.
Learning Outcome 2 (LO2)	**Identify different types of Renewable Energy Technologies used globally and in the Pacific region**
Performance Standards	2.1 Distinguish between "Renewable Energy Technology" and "Renewable Energy Resources"; 2.2 State reasons for the use of the different Renewable Energy Technologies in different geographical locations and terrains globally and in the Pacific region; 2.3. Explain why it may be difficult to use certain renewable energy technologies in the Pacific region than in other areas of the world; 2.4 Identify renewable energy technologies which are applicable to renewable energy resources that are available in your local area.
Learning Outcome 3 (LO3)	**Explain the benefits of *energy efficiency* and *energy conservation***
Performance standards	3.1 Define the concepts of 'energy efficiency' and 'energy conservation' using examples; 3.2 Differentiate between 'energy efficiency' and 'energy conservation'; 3.3 Describe the benefits of implementing energy conservation practices, using examples from the global context, regional context and local context; 3.4 Describe the benefits of implementing energy efficiency measures in residential, commercial and industrial premises; 3.5 Identify financial and economic benefits of utilising RETs and other energy saving practices in residential, commercial and industrial premises.

Learning Outcome 4 (LO4)	**Explain energy ratings of different electrical appliances and power tools that are used in residential, commercial and industrial buildings.**
Performance standards	4.1 Define the term 'energy rating' with regard to electrical appliances and power tools that are used in residential, commercial and industrial contexts. 4.2 Identify the 'power rating' and the 'amperage' of power tools and appliances that are commonly used in the household and the office; 4.3 Calculate the energy consumed, in watthour (Wh) by an electrical appliance given the length of time the appliance is used, the power rating of the appliance (or its amperage), and the local grid household voltage; 4.4 Define '*Alternate current* (AC)' loads and '*Direct current* (DC)' loads with examples; 4.5 Differentiate between *Alternate current* (AC) *loads* and *Direct current* (DC) loads.
Learning Outcome 5 (LO5)	**Demonstrate understanding of the concepts *power, voltage, current,* and *electrical energy* in accordance with the International System of Units (SI Units)**
Performance standards	5.1 Define 'power', 'voltage', 'electrical current', 'electrical energy' and 'electrical resistance'. 5.2 Identify the SI units (including multiple units) for power, electrical current, electrical energy and voltage. 5.3 Explain the relationship between power, electrical current, voltage, and electrical resistance for an electrical appliance that is in use for a specific length of time. 5.4 Differentiate between electrical power and electrical energy based on their SI units.
Pre-requisites	N/A
Co-requisites	N/A
Underpinning skills and knowledge	The following knowledge and skills underpin this unit standard: • Renewable energy sources and renewable energy technologies • Principles of energy efficiency • Principle of energy conservation

	• Skills in communication (verbal and non-verbal) with groups and individuals; • Basic skills relating the use of a piece of technology as a training tool. • Ohm's law • Power rule
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 Energy Commission* (TEC), *Tonga Power Limited* (TPL) and other trusted licensed private energy and electricity entrepreneurs in the assessment of the required 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 acquired the targeted competencies, they will need to: 1. **Demonstrate their knowledge in the workplace (or in an environment that closely resembles the workplace) on basic Renewable Energy Technology (RET) and energy saving practices by:** a) Identifying and describing Renewable and non-Renewable Energy resources availability in terms of: i. Renewable and non-Renewable energy resources available globally ii. Renewable and non-Renewable energy resources available in the Pacific Region iii. Renewable and non-Renewable energy resources available in the Tonga iv. Advantages and disadvantages of renewable and non-renewable resources v. Determining difference between RE resources and non-RE resources

b) Identifying different types of Renewable Energy Technologies used in terms of:
    i. The reasons for their use in different geographical locations and terrains globally and in the Pacific Region
    ii. The reasons as to why it may be difficulty to employ certain RE Technology in the Pacific including Tonga;
    iii. Their suitability to Tonga based on the availability of RE resources.
    iv. Determining difference between RE Technology and RE Resource
c) Explaining the benefits of energy efficiency and energy conservation in terms of the:
    i. Difference(s) between 'energy efficiency' and 'energy conservation';
    ii. Benefits of implementing energy conservation practices globally, regionally and locally;
    iii. Benefits of implementing energy efficiency measures in residential, commercial and industrial premises;
    iv. Financial and economic benefits of utilising RET and other energy saving practices in residential, commercial and industrial premises.
d) Explaining the energy ratings of different electrical appliances and power tools which are commonly used in residential, commercial and industrial buildings, in terms of:
    i. The different ways they are being used;
    ii. Their 'power rating' and 'amperage';
    iii. The energy they consume (in watthour (Wh)) given the length of time they are being used, their power rating and/or amperage, and the local grid household voltage.
    iv. Whether they are AC loads or DC loads.
e) Defining the electrical terms *power, voltage, electrical current* and *electrical energy* in accordance with the *International System of Units* (SI Units) with reference to:
    i. Their SI units including their multiple units;

ii. The relationship between power, electrical current, voltage, and the electrical resistance for an electrical appliance that is in use for a specific length of time;
iii. Differences between electrical power and electrical energy based on the SI units

2. **Apply their knowledge and skills in the workplace (or in an environment that closely resembles the workplace), by:**
   a) Explaining the principle of operation of common RE technologies available locally;
   b) Selecting appropriate RET for a given situation to conserve and generate energy.
   c) Demonstrate skills in identifying specifications of household, office appliance and power tables
      i. Power Ratings
      ii. Voltage Rating
      iii. Amperage
   d) Differentiating between AC and DC loads and identify residential and household voltages.
   e) Assisting skilled personnel in conducting walk-through audit to determine energy requirements and assist skilled personnel in determining solutions for energy reduction (conservation and/or efficiency) for residential, commercial and industrial premises.
   f) Demonstrating skills in undertaking calculations to determine energy efficiency.

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 such mentioned in context of assessment
ii. Written or oral questions to test relevant skills and knowledge during observation
iii. Written report
iv. Student observation on energy resource availability at a specific location
v. Written description of renewable energy resource and technology

	vi. Oral presentations providing distinction between energy efficiency and energy conservation and identifying electrical specifications of electrical appliances/devices. vii. Student portfolio viii. Review of workplace attachment reports (e.g. Supervisor/third party reports)
Resource requirements	i. Text Books or printed resources for Basic Renewable Energy Technologies and Energy Saving 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 discussions. iv. Multimeter or ammeter and voltmeter v. Charts/Pictures showing Energy Efficiency practices Charts/Pictures showing Renewable Energy resources vi. Charts/Pictures showing Renewable Energy Technologies and Non Renewable Energy Technologies vii. Science lab with appropriate resources for EE and RET viii. *Personal protective equipment* (PPE) such as: • safety boots • gloves (low-voltage)
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 five (5) Learning Outcomes and twenty (20) 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 14 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.

[2] This unit is competency-based in which there are only two possible grades: *Achieved* and *Not Achieved*. An 'Achieved' grade is assigned to candidates who meet the competency requirements of the 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. *Amperage* - refers to the measure of the rate of flow of electric charge in a circuit, expressed in *amperes (A)*. It tells you how many electrons are moving through a conductor per unit of time. 2. *Alternate current (AC)* - refers to the flow of electric charge that periodically reverses direction. 3. *Current* - refers to the flow of electric charge (usually electrons) through a conductor, such as a wire 4. *Direct current (DC)* - refers to the flow of electric charge in only one direction, produced by sources like batteries or solar cells. 5. *Energy Conservation* refers to minimizing energy usage by using less energy (input energy) such as electrical energy or liquid fuel *Energy* 6. *Efficiency* refers to the utilisation of minimal energy to be able to 'do work'. 7. *Energy Rating* refers to the consumption of electrical energy by an electrical appliance. 8. *Power* - refers to the rate at which electrical energy is transferred or used/consumed 9. *Power rating* refers to the amount of power in watts (W) that can flow through a system safely 10. *Renewable Energy Sources* refer to sources of energy that are available naturally and can be replenished by nature. They include sunlight, wind, rain (water), tides and waves, plants, and geothermal heat; 11. *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. 12. *Resistance* - refers to the opposition to the flow of electric current in a material, measured in ohms (Ω). High resistance reduces current flow, while low resistance allows more current to pass. 13. *Specifications* refer to manufacturer's specifications on operation, processes, maintenance repairs for tools equipment, resources 14. *Voltage* - refers to the electric potential difference between two points in a circuit, measured in volts (V). It represents the "pressure" that pushes electrons through a conductor. 15. *Walk-through audit* - is an auditing technique where the auditor traces a transaction or process step-by-step from initiation to completion
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.