



REGISTERED NATIONAL STANDARD

UNIT OF COMPETENCY

Title:	Provide basic sustainable energy solutions for energy reduction in residential, commercial and industrial premises		
TQF Level:	2	Credits:	7
		Version:	1 ¹
National standard code:	NS 049-02		
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:	<p>Persons credited with this unit standard are able to;</p> <ol style="list-style-type: none"> 1. Prepare to monitor energy usage to help in energy reduction in residential, commercial and industrial premises; 2. Identify basic sustainable energy options using renewable energy sources and renewable energy technologies to reduce energy consumptions in residential, commercial and industrial premises; 3. Identify basic sustainable energy options using non-renewable energy sources to conserve and reduce energy consumptions for residential, commercial and industrial premises. 4. Complete monitoring activities and provide reports on alternative sustainable energy options for residential, commercial and industrial premises <p><u>Range Statement:</u> This unit must be demonstrated in relation to providing basic sustainable energy solutions for energy reduction in residential, commercial and industrial premises for any of the following energy utilizing loads:</p>		

¹ This Tonga unit standard, with the unit code *NS049-02*, is adapted from the Pacific regional unit standard *SE2003* which carries the same title mentioned above. Unit standard *SE2003* 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*.

	<ul style="list-style-type: none"> i. Appliances; ii. Business equipment; iii. Computers; iv. Data Communications equipment; v. Electrical Machines; vi. Electronic equipment; vii. Fire protection mechanisms; viii. Instrumentation; ix. Refrigeration; and x. Air Conditioning.
Learning Outcome 1 (LO1)	Plan and prepare to monitor energy usage for energy reduction
Performance standards	<p>1.1 Contribute to planning and preparing for monitoring of energy usage to ensure <i>Work Health and Safety (WHS)</i> or <i>Occupation Health and Safety (OHS)</i> policies and procedures are followed;</p> <p>1.2 Identify appropriate safe locations or worksites in which monitoring of energy usage is to be undertaken;</p> <p>1.3 Identify and obtain materials and resources necessary to undertake the monitoring of energy in accordance with established procedures;</p> <p>1.4 State reasons why monitoring strategies of energy usage must comply with established procedures.</p>
Learning Outcome 2 (LO2)	Identify and describe basic solutions for energy reduction in residential, commercial and industrial premises
Performance Standards	<p>2.1 Explain the needs for employing solutions for energy reductions in residential, commercial and industrial premises, in the context of greenhouse gas emission reduction and economic growth;</p> <p>2.2 Describe how Renewable energy technologies (RETs) are a sustainable solution to reducing energy consumption;</p> <p>2.3 Perform basic inventory of electrical appliances and equipment in residential, commercial and industrial premises, with regards to power rating, amperage, voltage requirement;</p> <p>2.4 Read and explain household or residential electrical metering;</p> <p>2.5 Identify the types of labelling on common electrical appliances in the community;</p>

	<p>2.6 Explain what the energy star labelling means in terms of energy efficiency for common electrical appliances in the community;</p> <p>2.7 Explain the benefits of household appliance labelling and standards;</p> <p>2.8 Identify factors contributing to energy wastage in households, commercial and industrial buildings in a regional and local context.</p>
Learning Outcome 3 (LO3)	Conduct measures to assist energy reduction in residential, commercial and industrial premises
Performance standards	<p>3.1 Collect past electricity costs (bills) from residential, commercial and industrial premises;</p> <p>3.2 Calculate power rating of an electrical appliance, given the amperage and the voltage specification;</p> <p>3.3 Calculate energy consumption of an electrical appliance given its power rating and time of use, showing unit of measurement though out the calculation;</p> <p>3.4 Calculate the total electrical power used by a household over various time periods (e.g.; hour, day, week, month);</p> <p>3.5 Identify and describe measures to reduce energy consumption in residential, commercial and industrial premises;</p> <p>3.6 Explain how building designs and orientation can contribute to reducing energy consumption.</p>
Learning Outcome 4 (LO4)	Report on energy consumption and monitoring activities to meet stakeholder needs
Performance standards	<p>[Stakeholders refer to the community, development partners, and government ministries or agencies]</p> <p>4.1 Identify relevant regulations and stakeholder requirements that informed energy consumption monitoring activities.</p> <p>4.2 Gather and interpret relevant information and data from monitoring activities;</p> <p>4.3 Prepare records and reports on inventories and energy consumption for residential, commercial and industrial premises;</p> <p>4.4 Prepare a written report on energy usage for residential, commercial and industrial premises in accordance with regulations and stakeholder requirements;</p>

	4.5 Prepare a written report on energy reduction interventions or measures for residential, commercial, and industrial premises to meet regulatory requirements and stakeholder needs.
Pre-requisites	N/A
Co-requisites	N/A
Underpinning skill and knowledge	<p>The following knowledge and skills underpin this unit standard;</p> <ul style="list-style-type: none"> • Current issues (economic, social, environmental and political) impacting on utilizing renewable energy technology; • Energy services/demand encompassing: terminology; energy, power, temperature, symbols and units; • Energy conversion and efficiency in domestic dwellings: energy services and energy demand of individuals; appliances, energy efficient appliances, primary energy and end-use energy and embodied energy instruments; • Energy ratings, energy labels, manufacturer’s specifications.
Suggested assessment methods	<p><u>Context of assessment:</u></p> <p>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 <i>Tonga Electricity Commission (TEC)</i>, <i>Tonga Power Limited (TPL)</i> and other trusted licensed private energy and electricity entrepreneurs in the assessment of the required standards and competencies. Possible areas for collaboration between provider institutions and the industry include but not restricted to the following:</p> <ul style="list-style-type: none"> • Experts from the industry are engaged as trainers, assessors, or assessment moderators; • Industry experts have input to the design and implementation of assessment activities; • Students are placed in the relevant industry organisations for workplace attachment; • Industry experts act as supervisors of students on workplace attachment; • Etc. <p>To show that students have the required competence they will</p>

need to:

1. **Demonstrate their knowledge in the workplace (or in an environment that closely resembles the workplace) on basic sustainable energy solutions for energy reduction in residential, commercial and industrial premises in relation to:**
 - a) Planning and preparing to monitor energy usage for energy reduction, in terms of:
 - i. Ensuring WHS or OHS policies and procedures are followed;
 - ii. Identifying appropriate safe locations/worksites in which monitoring of energy usage is to be undertaken;
 - iii. Obtaining materials and resources necessary to undertake the monitoring of energy in accordance with established procedures;
 - iv. Importance of having monitoring strategies of energy usage comply with established procedures;
 - b) Identifying and describing basic solutions for energy reduction, in terms of:
 - i. Employing solutions for energy reductions in residential, commercial and industrial premises, in the context of greenhouse gas emission reduction and economic growth;
 - ii. RETs as a sustainable solution to reducing energy consumption;
 - iii. Performing basic inventory of electrical appliances and equipment, for residential, commercial and industrial premises, with regards to power rating, amperage, voltage requirement;
 - iv. Household or residential electrical metering;
 - v. The types of labelling on electrical appliances which are commonly used in the community;
 - vi. The energy star labelling on electrical appliances which are commonly used in the community;
 - vii. The benefits of household appliance labelling and standards;

viii. The factors that contribute to energy wastage in households, commercial and industrial buildings.

2. Apply their knowledge and skills in the workplace (or in an environment that closely resembles the workplace), by:

- a) Conducting measures to assist energy reduction in residential, commercial and industrial premises through an energy audit by;
- i. Collecting past electricity bills;
 - ii. Calculating power and energy requirement of electrical appliances;
 - iii. Calculating energy consumption of electrical appliances;
 - iv. Calculating total electrical energy requirements over varying time periods (daily, weekly, monthly etc.)
 - v. Recommending measures to reduce energy usage
 - vi. Explaining how building designs and orientation can contribute to reduction in energy consumption
- b) Reporting on energy consumption monitoring activities of residential, commercial and industrial premises to meet stakeholder needs, by means of:
- i. Identifying relevant regulations and stakeholder requirements that inform monitoring activities;
 - ii. Gathering and interpreting information and data from monitoring activities;
 - iii. Preparing a written report on energy usage for premises;
 - iv. Preparing records and reports on inventories and energy consumption;
 - v. Preparing of notes or reports on energy reduction interventions or measures to meet regulatory requirements and stakeholder needs;
- c) Assist skilled personnel in determining solutions for energy reduction (conservation and/or efficiency) for residential, commercial and industrial premises.

Methods of assessment:

	<p>A range of assessment methods should be used to assess students' knowledge and application of skills, include but not restricted to the following:</p> <ol style="list-style-type: none"> 1. Direct observation of students performing certain tasks as mentioned in context of assessment; 2. Written or oral questions to test relevant skills and knowledge during observation; 3. Written report on monitoring activities and provide reports on alternative sustainable energy options for residential, commercial and industrial premises; 4. Student portfolio; 5. Review of workplace attachment reports (e.g. Supervisor or third party reports).
<p style="text-align: center;">Resource requirements</p>	<ol style="list-style-type: none"> i. Text Books or printed resources for Basic Sustainable Energy Solutions for Energy Reduction at Residential, Commercial and Industrial Premises 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. Renewable Energy Technologies (RETs) (or necessary arrangements made to ensure students are exposed to these technologies): <ul style="list-style-type: none"> • Solar PV system • Wind Systems • Hydropower Systems • Biomass Systems • Battery system as Energy storage v. Energy Efficiency (EE) Equipment (also refer to <i>Range</i> statement at the beginning): <ul style="list-style-type: none"> • EE lights • Lighting Controls • EE refrigerators • EE air conditioners • EE stoves, etc.

<p>Moderation arrangements</p>	<p>Provider Institutions are responsible for moderation arrangements to ensure consistency in assessments. Moderation process must be approved by TNQAB.</p>
<p>Requirements to complete this unit</p>	<p>There are four (4) Learning Outcomes and twenty-two (23) Performance Standards that measures competence.</p> <p>To demonstrate competence, the person studying this unit is:</p> <ol style="list-style-type: none"> 1. Required to attain an <i>Achieved</i>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. <p>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.</p>
<p>Important notes and definitions</p>	<p><u>Notes:</u></p> <ol style="list-style-type: none"> 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. 3. To introduce students to energy reduction measures, training providers may need to make the necessary arrangements for field trips to Energy Reduction initiatives available in Residential, Commercial and Industrial Premises; 4. Energy usage is the same as energy consumption and refers to the amount of energy use in a particular system or in a household. <p><u>Definitions:</u></p> <ol style="list-style-type: none"> 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 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.

	<ol style="list-style-type: none"> 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 Rating refers to the consumption of electrical energy by an electrical appliance. 4. Power rating refers to the amount of power in watts (W) that can flow through a system safely 5. Energy Efficiency refers to the utilisation minimal energy to be able to ‘do work’. 6. 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. 7. Energy reduction refers to the measure taken to reduce the amount of energy usage in a system or a household
<p>Public comments on unit</p>	<p>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.</p>