

Domain

**SOLAR INSTALLATION**

Title:

**Demonstrate knowledge of energy storage technologies**

Level:3

Credits: 4

**Purpose**

This unit standard specifies the competencies required to demonstrate knowledge of energy storage technologies. It includes the following elements: demonstrate knowledge of forms of conversion of energy; demonstrate of electro chemical batteries chemical batteries and demonstrate design and operational principles of other energy storage technologies. This unit is intended for those working as solar technicians.

**Special Notes**

## 1. Entry information:

Prerequisite:

- 1641: *Apply safety rules and regulations in chemical and electrical work environment or demonstrated equivalent knowledge and skills.*

## 2. Tools, equipment, accessories and materials may include but are not limited to removing/fixing tools, protecting devices (e.g. gloves, glasses etc.), electrical meter, hydrometer, calculators, manufacturers' manuals, operational manuals, maintenance manuals, user manuals, and guides, schedules and spare components.

## 3. Assessment evidence may be collected from a real workplace and/or an appropriate simulated realistic environment in which system operations are carried out.

## 4. Performance of all elements in this unit standard must comply with all relevant workplace requirements and manufacturers' specifications.

## 5. Glossary of terms:

- *'Battery' refers to energy storage device storing energy in an appropriate form.*
- *'Ampere-hour (Ah)' refers to energy storage device storing energy in an appropriate form.*
- *'Specifications' refers to any, or all of the following: manufacturers' specifications and recommendations, workplace specific requirements, national and international standards and legislations.*
- *'ISO' refers to International Organization for Standards.*
- *'SANS' refers to South African National Standards.*
- *'PVP' refers to Solar Water Heater.*
- *'INSOLATION' refers to Incoming Solar Radiation.*

## 6. Regulations and legislation relevant to this unit standard include the following:

- Labour Act No. 11 of 2007.
- National Energy Fund Act of 2000.

- Occupational Health and Safety Regulations No. 18, 1997 and all subsequent amendments.
- ISO 14001 (Environmental Management Standard) and all subsequent amendments to any of the above.

### **Quality Assurance Requirements**

This unit standard and others within this subfield may be awarded by institutions which meet the accreditation requirements set by the Namibia Qualifications Authority and the Namibia Training Authority and which comply with the national assessment and moderation requirements. Details of specific accreditation requirements and the national assessment arrangements are available from the Namibia Qualifications Authority on [www.namqa.org](http://www.namqa.org) and the Namibia Training Authority on [www.nta.com.na](http://www.nta.com.na).

### **Elements and Performance Criteria**

#### **Element 1: Demonstrate knowledge of forms of energy and principle of conversion of energy**

##### **Range**

Demonstration of knowledge of forms of energy and principles of energy conservation may include but not limited to technical definition of energy, units of energy (e.g. joule, kWh, BTU etc.), explanation and use of the principle of energy conversion in storage, basic calculations including energy conversion and efficiency.

##### **Performance criteria**

- 1.1 Definition of energy and units of energy discussed.
- 1.2 Forms of energy explained and discussed.
- 1.3 Energy conversion principle explained.
- 1.4 Basic calculation about energy conversion and efficiency explained and discussed.

#### **Element 2: Demonstrate knowledge of electro chemical batteries**

##### **Range**

Demonstration of knowledge of forms of electro-chemical batteries may include but not limited to principles of electro-chemical energy conversion, differentiate between a cell and battery, primary and secondary batteries, types of commercial batteries, design and operational principles of batteries, care, handling and maintenance of batteries. Also to include rating and standard units of batteries i.e. ampere-hours as a measure of charge, basic calculations related to sizing, efficiency etc.

##### **Performance criteria**

- 2.1 Primary Cell is explained.

- 2.2 Secondary cell is explained.
- 2.3 Electrolyte is defined.
- 2.4 Construction of cell plates is explained.
- 2.5 Separators are explained.
- 2.6 Charging and discharging is demonstrated.
- 2.7 Testing of relative density is performed.
- 2.8 Efficiency of a cell is described.
- 2.9 Ampere-Hour efficiency calculations are performed.
- 2.10 Maintenance of a battery is explained.

**Element 3: Demonstrate design and operational principles of other energy storage technologies**

**Range**

In relation to forms of energy, the design and operational principles energy storage technologies may include but not limited to mechanical, direct electrical, thermal, hydrogen and flow cell technologies, and any other emerging technologies.

**Performance criteria**

- 3.1 Mechanical energy storage (compressed air, fly-wheel and pumped hydro) are explained.
- 3.2 Electrical storage (Super Capacitor, and super conductors and magnetic storage) are explained.
- 3.3 Thermo (passive and Active Storage) is discussed and explained.
- 3.4 Hydrogen as energy carrier, flow cell technology and Flow-Cell are explained

**Registration Data**

<b>Subfield:</b>	Electrical Engineering
<b>Date first registered:</b>	28 March 2018
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<b>Body responsible for review:</b>	Namibia Training Authority