

<b>Title</b>	<b>Demonstrate knowledge of renewable energy concepts and technologies</b>		
<b>Level</b>	<b>4</b>	<b>Credits</b>	<b>10</b>

<b>Purpose</b>	<p>This unit standard is for people who work with renewable energy systems and covers knowledge of the design and mounting procedures for photovoltaic arrays.</p> <p>People credited with this unit standard are able to demonstrate knowledge of:</p> <ul style="list-style-type: none"> <li>– non-technical issues and their impact on the application of a renewable energy technology;</li> <li>– renewable energy systems and resources for residential applications;</li> <li>– the configuration and function of components in a typical SPS; and</li> <li>– the configuration and function of components in a typical grid connected power system.</li> </ul>
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<b>Classification</b>	Renewable Energy Systems > Renewable Energy Systems - Installation and Maintenance
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<b>Available grade</b>	Achieved
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### Guidance information

- 1 This unit standard has been developed for learning and assessment off-job.
- 2 References
 

All Australian Standards (AS) may be found at [www.standards.org.au](http://www.standards.org.au);

All Australian/New Zealand Standards (AS/NZS) may be found at <http://www.standards.org.nz/>;

AS 4086.2:1997, *Secondary batteries for use with stand-alone power systems - Installation and maintenance*;

AS 4777.1:2005, *Grid connection of energy systems via inverters – Part 1: Installation requirements*;

AS 4777.2:2005, *Grid connection of energy systems via inverters – Part 2: Inverter requirements*;

AS 4777.3:2005, *Grid connection of energy systems via inverters – Part 3: Grid protections requirements*;

AS/NZS 3000:2007, *Electrical Installations (known as the Australian/New Zealand Wiring Rules)*;

AS/NZS 3010:2005, *Electrical installations – Generating sets*;

AS/NZS 4509.1:2009, *Stand-alone power systems - Part 1: Safety and installation*;

AS/NZS 4509.2:2010, *Stand-alone power systems - Part 2: System design*;

AS/NZS 5033:2012: *Installation and safety requirements for photovoltaic (PV) arrays*; and all subsequent amendments and replacements.

### 3 Definitions

*a.c.* – alternating current.

*Current regulations and standards* – in this unit standard this term is used to refer to the requirements of the above references.

*d.c.* – direct current.

*Enterprise policies and procedures* – those practices and procedures that have been promulgated by the company or enterprise for use by their employees.

*Industry practice* – those practices that competent practitioners within the industry recognise as current industry best practice.

*OSH* – occupational safety and health.

*PV* – photovoltaic.

*SPS* – stand-alone power system – may include but is not limited to – PV, solar thermal, wind, micro-hydro, biomass.

*WECS* – wind energy conversion system.

### 4 Range

a All measurements are to be expressed in Système Internationale (SI) units, and where required, converted from Imperial units into SI units.

b Candidates shall be supplied by the assessor with formulae involving more than three quantities.

c Use of a calculator during assessment is permitted.

d All activities must comply with any policies, procedures, and requirements of the organisations involved.

e All activities and evidence presented for all outcomes and performance criteria in this unit standard must be in accordance with legislation, enterprise policies and procedures, ethical code, current regulations and standards, industry practice; and where appropriate, manufacturer's instructions, specifications, and data sheets.

5 It is recommended that candidates have been assessed against Unit 27439, *Demonstrate knowledge of photovoltaic technology* prior to assessment to this unit standard.

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## Outcomes and performance criteria

### Outcome 1

Demonstrate knowledge of non-technical issues and their impact on the application of a renewable energy technology.

### Performance criteria

1.1 Explain the main non-technical issues impacting on the use of renewable energy technologies.

Range	may include but is not limited to – economic, social, environmental, contractual, political, non-renewable energy sources.
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- 1.2 Describe the method of calculating the annual reduction in greenhouse gas emissions achieved by a renewable energy system at a given location.

Range PV, solar thermal, wind, micro-hydro, biomass.

## Outcome 2

Demonstrate knowledge of renewable energy systems and resources for residential applications.

### Performance criteria

- 2.1 Describe major components of a photovoltaic system, their purpose, and interconnection arrangements.

Range PV modules, arrays, controllers, batteries, inverters.

- 2.2 Describe factors affecting the performance of photovoltaic systems.

Range solar resource availability, orientation, shading, seasonality, automated controls.

- 2.3 Describe major components of a solar thermal system, their purpose, and interconnection arrangements.

Range solar collector, storage, reticulation, flow control.

- 2.4 Describe attributes of different types of thermal collectors.

Range flat plate, evacuated tube, closed loop, open loop.

- 2.5 Describe factors affecting the performance of solar thermal systems.

Range may include but not limited to – solar resource availability, orientation, shading, seasonality, climate, automated controls.

- 2.6 Describe major components of a WECS, their purpose, and interconnection arrangements.

Range wind turbine, mounting, controllers, batteries.

- 2.7 Describe factors affecting the performance of wind energy conversion systems.

Range wind resource availability, location, wind speed, type of wind turbine.

- 2.8 Describe major components of a micro-hydro system, their purpose, and interconnection arrangements.

Range weir, reticulation, turbine, batteries, controllers.

2.9 Describe factors affecting the performance of micro-hydro systems.

Range water availability, head, flow rate, pipe resistance.

2.10 Define terms associated with biomass resource.

Range may include but is not limited to – biogas, producer gas, biofuels, feedstock, gross and net calorific values; evidence of three is required.

2.11 Describe applications for biofuels.

Range two applications.

**Outcome 3**

Demonstrate knowledge of the configuration and function of components in a typical SPS.

**Performance criteria**

3.1 Describe the configuration of a typical SPS.

3.2 Describe the function of each SPS system component.

3.3 Outline SPS system efficiencies.

**Outcome 4**

Demonstrate knowledge of the configuration and function of components in a typical grid connected power system.

**Performance criteria**

4.1 Describe the configuration of a typical grid connected power system.

4.2 Describe the function of each grid connected power system component.

Planned review date	31 December 2024
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**Status information and last date for assessment for superseded versions**

Process	Version	Date	Last Date for Assessment
Registration	1	21 July 2011	31 December 2020
Review	2	24 October 2019	N/A

<b>Consent and Moderation Requirements (CMR) reference</b>	0003
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This CMR can be accessed at <http://www.nzqa.govt.nz/framework/search/index.do>.

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**Comments on this unit standard**

Please contact The Skills Organisation at [reviewcomments@skills.org.nz](mailto:reviewcomments@skills.org.nz) if you wish to suggest changes to the content of this unit standard.