



**Australian Government**

**Department of Education, Employment and Workplace Relations**

# **UEENEEK155A Assess energy loads and uses for energy efficiency in industrial properties and enterprises**

Release: 1

## **UEENEEK155A Assess energy loads and uses for energy efficiency in industrial properties and enterprises**

### **Modification History**

Not applicable.

### **Unit Descriptor**

#### **Unit Descriptor**

#### **1) Scope:**

##### **1.1) Descriptor**

This unit covers the undertaking of energy audits of industrial properties and enterprises to evaluate the energy efficiency of the facilities and to make recommendation on design implementations. It encompasses working safely, apply extensive knowledge of industrial electrical installations and components and their operating parameters, gathering and analysing data, applying problem solving techniques, developing and documenting engineering solutions.

### **Application of the Unit**

#### **Application of the Unit 2)**

This unit is intended to apply to any recognised development program that leads to the acquisition of a formal award at AQF level 4 or higher.

### **Licensing/Regulatory Information**

#### **License to practice 3)**

The skills and knowledge described in this unit require a license to practice in the workplace subject to regulations for undertaking of electrical work. Practice in workplace and during training is also subject to regulations directly related to occupational health and safety and where applicable contracts of training such as apprenticeships.  
Note:

**License to practice**

**3)**

1. Compliance with permits may be required in various jurisdictions and typically relates to the operation of plant, machinery and equipment such as elevating work platforms, powder operated fixing tools, power operated tools, vehicles, road signage and traffic control and lifting equipment. Permits may also be required for some work environments such as confined spaces, working aloft, near live electrical apparatus and site rehabilitation.
2. Compliance may be required in various jurisdictions relating to currency in First Aid, confined space, lifting and risk safety measures.

**Pre-Requisites**

**Prerequisite Unit(s)**

**4)**

**Competencies**

**4.1)**

Granting competency in this unit shall be made only after competency in the following unit(s) has/have been confirmed.

UEENEEK1 53A Assessment of energy loads and uses for energy efficiency in residential, office and retail dwellings.

**Literacy and numeracy skills**

**4.2)**

Participants are best equipped to achieve competency in this unit if they have reading, writing and numeracy skills indicated by the following scales. Description of each scale is given in Volume 2, Part 3 'Literacy and Numeracy'

Reading 4      Writing 4      Numeracy 4

## Employability Skills Information

### Employability Skills 5)

The required outcomes described in this unit of competency contain applicable facets of Employability Skills. The Employability Skills Summary of the qualification in which this unit of competency is packaged will assist in identifying Employability Skill requirements.

## Elements and Performance Criteria Pre-Content

6) Elements describe the essential outcomes of a competency standard unit  
Performance Criteria describe the required performance needed to demonstrate achievement of the element.  
Assessment of performance is to be consistent with the Evidence Guide.

## Elements and Performance Criteria

### ELEMENT

### PERFORMANCE CRITERIA

1 Prepare to assess industrial properties and enterprises for energy efficiency evaluation.	1.1	OHS processes and procedures for a given work area are identified, obtained and understood
	1.2	Established OHS risk control measures and procedures are followed in preparation for the work
	1.3	The extent of the energy assessment are determined from facilities orientation, facilities floor plans, building structure plans, energy accounts, and situation reports and in consultation with relevant persons
	1.4	Activities are planned to meet scheduled timelines in consultation with others involved in the work
	1.5	Effective strategies are determined to ensure solution development and implementation is carried out efficiently

<b>ELEMENT</b>	<b>PERFORMANCE CRITERIA</b>
2 Assess industrial properties and enterprises for energy efficiency evaluation.	2.1 OHS risk control measures and procedures for carrying out the work are followed
	2.2 Knowledge of energy loads is applied to developing energy efficient strategies to address energy use.
	2.3 Parameters, specifications and performance requirements in relation to energy use are set in accordance with established procedures
	2.4 Approaches to resolving energy uses are analysed to provide most effective solutions
	2.5 Unplanned events are dealt with safely and effectively consistent with regulatory requirements and enterprise policy
	2.6 Quality of work is monitored against personal performance agreement and/or established organisational or professional standards
3 Document assessment of industrial properties and enterprises for energy efficiency.	3.1 Solutions to energy use are tested to determine their effectiveness and modified where necessary
	3.2 Adopted solutions are documented, including instructions for implementation that incorporates risk control measures to be followed
	3.3 Appropriately competent and qualified persons required to implement solutions to energy use are coordinated in accordance with regulatory requirements and enterprise policy (See Note)
	3.4 Justification for strategies used to solve energy use is documented for inclusion in work/project development records in accordance with professional standards

**Note:**

A licence or permit to practise in the workplace is required for specified work on building and facilities

## Required Skills and Knowledge

### REQUIRED SKILLS AND KNOWLEDGE

8) This describes the essential skills and knowledge and their level, required for this unit.

Evidence must show that knowledge has been acquired of safe working practices and assessment of energy loads in industrial properties and enterprises.

All knowledge and skills detailed in this unit should be contextualised to current industry practices and technologies.

#### **KS01- Industrial properties and enterprises energy efficiency assessment** **EK155A**

Evidence shall show an understanding of industrial properties and enterprises energy efficiency assessment to an extent indicated by the following aspects:

T1 Energy management, legislation and regulation relevant to industrial properties and enterprises encompassing:

- National Building Code of Australia
- Standards Australia for Energy Auditing
- State based legislation for energy management in business
- Energy Efficiency Opportunities Act
- State energy reporting schemes
- Minimum Renewable Energy
- Renewable Energy Credits
- Small Technology Credits

T2 Water supply and use encompassing:

- collecting and analysis of information for industrial facilities water use and methods to improve water efficiency in the industrial facilities
- ability to analyse the water consumption index for different Industrial sectors.
- ability to analyse Industrial facilities water use and ways to minimize the use of water.
- understanding on the methodology applied to water savings
- calculate water star rating

T3 Environmental context – greenhouse gas emission, ecological impacts and resource use encompassing:

- concept of greenhouse gas emissions and global warming
- fossil fuel resource depletion and how mining impacts the environment

## REQUIRED SKILLS AND KNOWLEDGE

- breakdown of energy consumption in the Australian Industrial sector
- breakdown of water consumption in the Australian Industrial sector

### T4 Energy efficiency methodologies encompassing:

- Energy services approach and relationship to energy auditing
- End user focus and relationship to energy auditing
- Opportunistic approach and relationship to energy auditing
- Energy management strategy in relationship to energy efficiency, energy management, demand management, fuel switching and renewable energy
- Financially viable best practice solutions; including net present value and internal rate of return
- Water management strategy in relationship to water efficiency, water management, source switching and water reuse/recycling
- Opportunistic best practice solutions in relationship to water and the differences to the financially viable best practice solutions
- Benchmarking with reference to statistical benchmarks, technology benchmarks and best practice financially viable benchmark methodologies
- Calculate best practice energy and water star ratings
- Property cost and environmental impact tables in relationship to reporting energy audit outcomes
- Sustainable initiative investment tables in relationship to reporting energy audit outcomes

### T5 Energy and society encompassing:

- understanding of electricity charges
- drivers of the predicted electricity price increases in Australia
- Network charge and retail charge increases and how they relate to electricity price
- The Carbon tax or similar and impact on electricity prices
- Renewable Energy Target and impact on electricity prices
- Impact of electricity prices to Industrial facilities

### T6 Energy auditing and practice encompassing:

- scope of Australian Standards for energy auditing
- Energy audit process in relationship to data collection, analysis and the communication of results
- Accounts, bills and data, tariff structures and the identification

## REQUIRED SKILLS AND KNOWLEDGE

of Industrial tariff types

- Calculate energy and energy balance including power calculations, usage time calculations, power factor calculations and energy conversions from kWh to MJ
- process involved in onsite assessment in a Industrial facilities energy audit.
- gathering information on Industrial facilities energy use and costs
- Risks and hazards associated in a Industrial facilities energy audit.
- Calculate energy and power
- Power rating of equipment and metering and measurement in a Industrial facilities energy audit.
- Calculate energy balance for Industrial facilities
- Advice on ways to improve energy efficiency
- Calculate greenhouse emission, emissions factors, carbon intensity of electricity vs. natural gas and LPG and global warming potential and CO2 equivalents
- Financial analysis in terms of simple payback and simple payback period and return on investment or rate of return
- Reporting and communication of energy audit results

T7 Energy management encompassing:

- energy management strategies.
- practice based energy management.
- technology based energy management.
- Interaction between human resources and practice based control.
- Application of technology based energy management.
- Identify potential energy savings from application of energy management

T8 Power and energy data recording encompassing:

- Identify the structure and purpose of power and energy data recording for whole systems and equipment.
- Review or develop single line schematic of electrical system of a Industrial facility
- Establish the power and energy data gap from the energy audit in T7 to achieve Australian Standard compliant energy audits.
- Identify electrical loads that need contribute more than 5% of energy use
- Understand and explain the operation seven different power



## REQUIRED SKILLS AND KNOWLEDGE

and energy monitoring equipment available

- Understand the implications of data recording intervals for monitoring equipment
- Develop a power and energy monitoring strategy for a Industrial facility
- Deploy Industrial facility power and energy monitoring strategy
- Draw conclusions and report on power and energy data collection in a Industrial facility

T9 Water auditing services and design encompassing:

- Water flow rates of taps, showers and irrigation, toilets, washing machines, dishwashers and filtration and top up water use for cooling towers and pool systems
- Industrial facility water meter reading
- Trends of water use and charges for Industrial facilities
- Water Efficiency Labelling (WELS) Scheme as it relates to water auditing
- Identification of water efficiency opportunities in Industrial facility assessments.
- Operation of a rain water and grey water systems
- Factors that impact on landscape water demand

T10 Lighting services and efficient design encompassing:

- Fundamental illumination design for Industrial facilities
- Illumination terms: light output, light level and brightness
- Determining target light levels for differing tasks
- Characteristics of light sources including efficacy, colour temperature and colour rendering index
- Ballast types, their efficiency and benefits
- Incandescent lamps, LED, Induction Lamps, halogen lighting, Industrial fluorescent lighting, metal halide, mercury vapour and comparisons between these and applications for the Industrial facilities
- Application of lighting methodology for best practice energy efficiency design
- Energy saving lighting opportunities in the Industrial facilities

T11 Thermal performance and climate control encompassing:

- Thermal performance of a building impacts on heating, ventilation and air conditioning energy use including orientation, thermal mass, insulation, glazing, shading and

## REQUIRED SKILLS AND KNOWLEDGE

ventilation

- Air conditioning designs including central, ducted systems, split-system air conditioners, multi-headed split systems, individual room air conditioners (RAC), through wall / window and portable units
- Improvement to air movement systems in Industrial facilities including diffusers
- Improvement to ventilation systems in Industrial facilities
- improvement of thermal performance of a Industrial building envelop elements
- ability to apply the knowledge of Australian climate zones
- Air conditioning technologies including refrigerated type air conditioning, inverter type air conditioning, reverse cycle air conditioning, evaporative air conditioners, breeze power systems and digital scroll compressors
- application of Energy Efficiency Ratio (EER) and Coefficient of Performance (COP) and show proficiency in EER and COP calculations
- application of the Air Conditioning Star Ratings to Industrial facilities
- Gas and electric heating options and air (ducted) heating
- operation of an air conditioning system and describe each components including the compressor, evaporator, condenser, expansion valve and fan coil
- ceiling and pedestal fans and ventilation climate control
- factors that impact on climate control energy consumption
- best practice climate control methodology as applied to the Industrial facilities
- Industrial facilities climate control saving opportunities
- conducting thermal performance assessment of a Industrial facilities

T12 Product storage services and efficient design encompassing:

- Industrial refrigeration system basic operation
- different industrial refrigeration chilling methods and system elements
- Industrial refrigeration characteristics including operation, cooling and heat loads calculations, operational performance,
- factors that impact on industrial refrigeration energy use including size, configuration temperature setting, heat load, cooling time, seals, insulation, compressor efficiency and age
- Industrial cold rooms and freezer rooms energy saving

## REQUIRED SKILLS AND KNOWLEDGE

opportunities

- Product storage saving opportunities

T13 Food preparation services and efficient design encompassing:

- different food preparation appliances
- different operation of gas and electric hot plates and ovens and the advantages and disadvantages of each
- EMI food preparation methodology
- Food preparation saving opportunities
- Food preparation services and efficient design

T14 Water heating services and efficient design encompassing:

- different water heaters including electric and gas storage, gas instantaneous (continuous flow), electric heat pump and solar hot water heaters
- solar water heater configurations and characteristics including passive (or thermo siphon) systems and active (or pumped) systems solar collector types, one shot booster
- RECs and STCs and how these relate to solar water heater STCs
- factors that influence water heater energy use including pipework and fitting insulation, atmospheric conditions, water efficiency, temperature setting and maintenance & operation
- Water heating / cooling calculations
- EMI water heating methodology
- Industrial water heating saving opportunities
- types of entertainment and administration appliances found in Industrial residences

T15 Entertainment and administration services and efficient design encompassing:

- appliance standby power including the different mode; passive and active standby
- appliance energy star ratings
- MEPS and labelling requirements for televisions
- Network standby management strategies
- Computers energy consumption including computer power management
- Entertainment and administration saving opportunities

T16 Industrial services and efficient design encompassing:

- Compressed air, hydraulic and steam systems

## **REQUIRED SKILLS AND KNOWLEDGE**

- Overview of industrial services in relation to Industrial sector
- Compressed air, hydraulic and steam system selection and design
- Compressed air, hydraulic and steam system theory, energy balance for a typical systems in industrial processes
- Energy efficiency pumping compressed air, hydraulic and steam systems design methodology
- Energy efficiency compressed air, hydraulic and steam systems
- Industrial pumping compressed air, hydraulic and steam systems saving opportunities

T17 Industrial cogeneration services and efficient design encompassing:

- Cogeneration systems
- Overview of industrial cogeneration systems in relation to Industrial sector
- Cogeneration system selection and design
- Cogeneration system theory, energy balance for a typical systems in industrial processes
- Energy efficiency cogeneration systems design methodology
- Energy efficiency cogeneration systems
- Industrial cogeneration systems saving opportunities

T18 Pumping systems (and pools) and efficient design encompassing:

- Pumping services in relation to Industrial sector
- Pumping types including centrifugal and positive displacement and pump selection and design
- Pumping theory including pressure head, pressure pumping vs. transfer pumping, pump curves, pump best efficiency (operating) point bep, variable speed drive, energy balance for a typical pumping system and electric motors
- operating of water pumps in industrial processes
- Energy efficiency pumping systems design methodology
- Energy efficiency pumping systems
- Industrial pumping systems saving opportunities

T19 Smart metering solutions encompassing:

- benefits of the different metering available to the Industrial sector
- metering opportunities relation to Industrial sector

T20 Renewable energy (solar PV) encompassing:

## REQUIRED SKILLS AND KNOWLEDGE

- design of solar PV systems and different panel types including mono-crystalline, poly-crystalline and amorphous
- solar panel characteristics and choice of selection
- solar power system utility approval process
- Balance of systems, rules of thumb, shading, orientation and shading of strings in an on grid solar power system
- Solar PV energy calculations and calculate REC entitlement for a small solar PV system
- different feed-in tariff schemes and how they apply to solar PV

T21 Energy audit system encompassing:

- Industrial facilities energy audit forms and legend
- Conducting energy and water audit for the Industrial sector
- Industrial facilities sector energy audit report

## Evidence Guide

### EVIDENCE GUIDE

9) This provides essential advice for assessment of the unit and must be read in conjunction with the performance criteria and the range statement of the unit and the Training Package Assessment Guidelines.

The Evidence Guide forms an integral part of this unit. It must be used in conjunction with all parts of this unit and performed in accordance with the Assessment Guidelines of this Training Package.

### Overview of Assessment 9.1)

Longitudinal competency development approaches to assessment, such as Profiling, require data to be reliably gathered in a form that can be consistently interpreted over time. This approach is best utilised in Apprenticeship programs and reduces assessment intervention. It is the industry-preferred model for apprenticeships. However, where summative (or final) assessment is used it is to include the application of the competency in the normal work environment or, at a minimum, the application of the competency in a realistically simulated work environment. In some circumstances, assessment in part or full can occur outside the workplace. However, it must be in accordance with industry and regulatory policy.

Methods chosen for a particular assessment will be influenced by

various factors. These include the extent of the assessment, the most effective locations for the assessment activities to take place, access to physical resources, additional safety measures that may be required and the critical nature of the competencies being assessed.

The critical safety issues inherent in working with electricity, electrical equipment, gas or any other hazardous substance/material present a challenge for those determining competence. Sources of evidence need to be 'rich' in nature to minimise error in judgment.

Activities associated with normal everyday work have a bearing on the decision as to how much and how detailed the data gathered will contribute to its 'richness'. Some skills are more critical to safety and operational requirements while the same skills may be more or less frequently practised. These points are raised for the assessors to consider when choosing an assessment method and developing assessment instruments. Sample assessment instruments are included for Assessors in the Assessment Guidelines of this Training Package.

**Critical aspects  
of evidence  
required to  
demonstrate  
competency in  
this unit** 9.2)

Before the critical aspects of evidence are considered all prerequisites must be met.

Evidence for competence in this unit must be considered holistically. Each element and associated performance criteria must be demonstrated on at least two occasions in accordance with the 'Assessment Guidelines – UEE11'. Evidence must also comprise:

- A representative body of performance criteria demonstrated within the timeframes typically expected of the discipline, work function and industrial environment. In particular this must incorporate evidence that shows a candidate is able to:
  - Implement Occupational Health and Safety workplace procedures and practices including the use of risk control measures as specified in the performance criteria and range statement
  - Apply sustainable energy principles and practices as specified in the performance criteria and range statement
  - Demonstrate an understanding of the essential knowledge and associated skills as described in this unit. It may be

required by some jurisdictions that RTOs provide a percentile graded result for the purpose of regulatory or licensing requirements.

- Demonstrate an appropriate level of skills enabling employment
- Conduct work observing the relevant Anti Discrimination legislation, regulations, policies and workplace procedures
- Demonstrated consistent performance across a representative range of contexts from the prescribed items below:
  - Carryout energy assessments to address energy efficiency issues as described in 8) and including:

- A Identifying and quantifying the extent of the energy use, loads and patterns of usage for electrical and energy installation energy problem/s.
- B Identifying and quantifying the extent of the energy use, loads and patterns of usage for electrical and energy installation energy problem/s.
- C Identifying the operational patterns in control of the user that impact on energy use and the energy services supplied by the energy technology that allow the quantifying energy use.
- D Perform an energy balance to model the current energy use to the existing energy bills.
- E Identifying effective energy saving opportunities to reduce energy use from
- F Understand the extent of the scope of the electrical and energy installation design problems, constraints and likely cost of installation.
- G Obtain energy system/component parameters, specifications and performance requirements appropriate to each problem.
- H Test and commission energy saving opportunity solutions to energy problems.
- I Documenting instruction for implementation of solutions that incorporate risk control measure to be followed.

- J Document and report financial and technical justification of solutions implemented in accordance with professional standards
- K Deal with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions incorporated in a holistic assessment with the above listed items.

Note:

Successful completion of relevant vendor training may be used to contribute to evidence on which competency is deemed. In these cases the alignment of outcomes of vendor training with performance criteria and critical aspects of evidence must be clearly identified.

**Context of and specific resources for assessment** 9.3)

This unit should be assessed as it relates to normal work practice using procedures, information and resources typical of a workplace. This should include:

- OHS policy and work procedures and instructions.
- Suitable work environment, facilities, equipment and materials to undertake actual work as prescribed by this unit.

These should be part of the formal learning/assessment environment.

Note:

Where simulation is considered a suitable strategy for assessment, conditions must be authentic and as far as possible reproduce and replicate the workplace and be consistent with the approved industry simulation policy.

The resources used for assessment should reflect current industry practices in relation to assessment of energy loads found in industrial properties and enterprises.

**Method of assessment** 9.4)

This unit shall be assessed by methods given in Volume 1, Part 3 'Assessment Guidelines'.

Note:



Competent performance with inherent safe working practices is expected in the Industry to which this unit applies. This requires assessment in a structured environment which is intended primarily for learning/assessment and incorporates all necessary equipment and facilities for learners to develop and demonstrate the essential knowledge and skills described in this unit.

**Concurrent  
assessment and  
relationship with  
other units** 9.5)

There are no concurrent assessment recommendations for this unit.

The critical aspects of occupational health and safety covered in Unit UEENEEE101A and other discipline specific occupational health and safety unit(s) must be incorporated in relation to this unit.

## **Range Statement**

### **RANGE STATEMENT**

**10)** This relates to the unit as a whole providing the range of contexts and conditions to which the performance criteria apply. It allows for different work environments and situations that will affect performance.

This unit must be demonstrated in relation to carrying out energy assessments and documenting energy efficiency strategies on at least two industrial properties/enterprises.

Generic terms used throughout this Vocational Standard shall be regarded as part of the Range Statement in which competency is demonstrated. The definition of these and other terms that apply are given in Volume 2, Part 2.1.

## **Unit Sector(s)**

Not applicable.

## **Competency Field**

**Competency Field** 11)

Renewable and Sustainable Energy

