Government of Western Australia
North Metropolitan TAFE

UEE 11 Training Package Support Material

(Non-Endorsed Component)

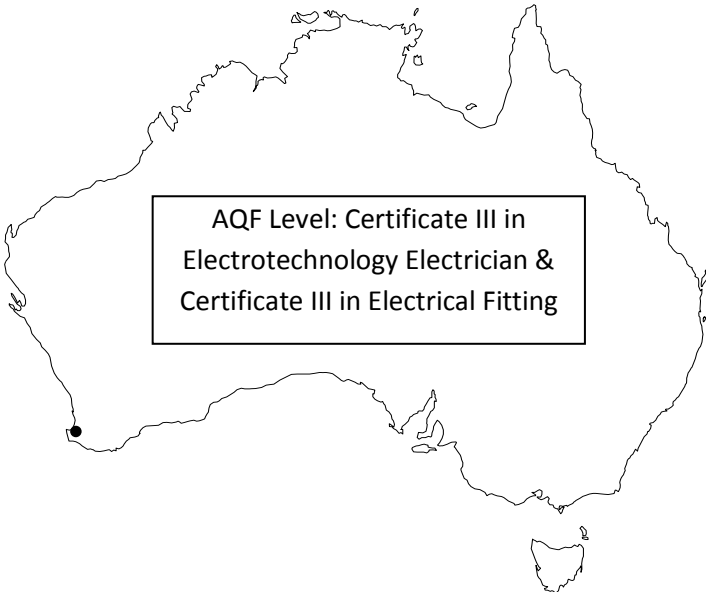
Based on:

National Electrotechnology Industry Standards

Resource Book

UEENEEK142A

Apply Environmentally and Sustainable Procedures in the Energy Sector



North Metropolitan TAFE

Edited by J. Waswo. T. Rowcroft.

August 2018.

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Version 4 – 08/2018

Acknowledgements

This Unit Guide has been prepared by NMTAFE Lecturers.

It is intended for NMTAFE students only.

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C O N T E N T S

UEENEEK142A Training Achievement Record

Name:	Student No:	Apprenticeship No
Employer:		College:

Activity	Topic	Date	Lecturer	
Section 1	Environmental Risk Management			
Section 2	Greenhouse Effect			
Section 3	Environmental Legislation			
Section 4	Sustainable work practices			
Section 5	Sustainable Energy			
Activity 1	Luminaire energy consumption			
Activity 2	Sustainable Energy report			
Assessment	Assessment of Underpinning Knowledge (Theory)			
Assessment	Assessment of Underpinning Knowledge (Practical)			

References

- Electrical Wiring Practice – Volume 1&2 (7th ed.) Pethebridge, K & Neeson, I
- Various websites as listed in workbook

Competency Standard Units

UEENEEK142A – Apply environmentally and sustainable procedures in the energy sector.

Prerequisite Units

There are no pre-requisite competencies for this unit.

Elements and Performance Criteria

ELEMENT		PERFORMANCE CRITERIA	
1	Plan and prepare to apply sustainable work practice	1.1	Activities are planned and prepared for to ensure OHS policies and procedures are followed with the work appropriately sequenced in accordance with requirements
		1.2	Appropriate personnel are consulted to ensure the work is co-ordinated effectively with others involved
		1.3	Materials are obtained and checked in accordance with established procedures and to comply with requirements
		1.4	Location in which activities are to be undertaken is determined from requirements
		1.5	Materials necessary to complete the work are obtained in accordance with established procedures and checked against job requirements
		1.6	Workplace environmental risks and resource efficiency issues are identified
2	Apply sustainable work practice	2.1	OHS policies and procedures for undertaking administrative functions are followed
		2.2	Activities are undertaken in accordance with requirements to implement techniques which produce energy reduction directly or indirectly
		2.3	Unplanned events or conditions are responded to in accordance with established procedures
		2.4	Approval is obtained in accordance with established procedures from appropriate personnel before any contingencies are implemented
		2.5	On-going checks of the quality of the work are undertaken in accordance with established procedures
		2.6	Work is carried out efficiently without unnecessary waste of materials or damage to the surrounding environment, while using sustainable work practices which minimise wastage of energy and materials either directly or indirectly

ELEMENT		PERFORMANCE CRITERIA	
3	Complete the application of sustainable work practice	3.1	Documentation/reports are completed to ensure detailed promotional activities requirements are met
		3.2	Suggestions are made for improvements to workplace practices to minimise energy and materials wastage
		3.3	Completion is notified in accordance with established procedures

Required Skills and Knowledge

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

KS01-EK142A **Environmentally and sustainable work practice**

Evidence shall show an understanding of environmentally and sustainable work practices to an extent indicated by the following aspects:

T1 Sustainable work practices encompassing:

- Notion of sustainable work practice
- Effects of neglecting sustainable work practice
- The greenhouse effect - causes, consequences.
- International and national greenhouse imperatives.
- The role of regulators and similar bodies
- Legislative requirements
- Economic benefits of sustainable initiatives.

T2 Techniques for reducing carbon produced energy and hence greenhouse gases encompassing:

- domestic, commercial and industrial strategies
- trade related technologies and methods
- energy efficient retrofits (overview).
- renewable energy technologies (overview)

E142A Work Performance Tasks – (Q Tracker tasks):

UEENEEK142A – Apply environmentally and sustainable procedures in the energy sector
1. Performance requirements: 1a. Related to the following elements: 1. Prepare to terminate cables, cords and conductors. 2. Terminate cables cords and conductors. 3. Test terminated cables and cords. 1b. For each element demonstrate performance: – across a representative body of performance criteria, – on at least 2 occasions, – autonomously and to requirements, – within the timeframes typically expected of the discipline, work function and industrial environment. **2. Representative range** includes the following: All listed tasks related to performance across a representative range of contexts from the prescribed items below: **The minimum number of items on which skill is to be demonstrated Group No** **Item List** A. At least one of the following: **Using sustainable energy technologies** • Using energy-efficiency building design • Selecting energy-reduction control systems

Workplace Rules:

Rule 1	Follow the instructions
Rule 2	Tolerate ambiguity
Rule 3	Meet your obligations

Note: This information and current details of critical aspects for each competency standard unit (CSU) in this qualification can be found at the EE-Oz Training Standards website www.ee-oz.com.au.

UEENEEK142A – Apply environmentally and sustainable procedures in the energy sector
Learning and Assessment Plan

Name of Lecturer: _____

Contact Details: _____

Delivery Mode/s: □ Face to Face □ On-Line □ Blended Delivery □ Other

Using: UEENEEE142A – Apply environmentally and sustainable procedures in the energy Sector Resource Book

Session	Nominal Duration	Program of Work (Topics to be covered)	Primary Reference
1	0.5h	Introduction to CSU, assessment methods, duration, resources, RPL Applications	K142A Resource Notes
2	2.0h +	Environmental Risk Management	Various Websites both Government and Private
3	2.0h +	Greenhouse Effect	Various Websites both Government and Private
4	2.0h +	Environmental Legislation	Various Websites both Government and Private
5	2.0h +	Sustainable work practices	Various Websites both Government and Private
6	2.0h	Sustainable energy practices	Various Websites both Government and Private
6	3.5h	Activity – Luminaire energy consumption	K142A Resource Notes
7	2.0h +	Activity - Sustainable Energy report	Various Websites both Government and Private
8	1.0h	Assessment of Underpinning Knowledge (Written) Closed book – Nil references	KS01 – EK142A
9	1.0h	Assessment of Skills (Observed Practical)	K142A Performance Criteria

I acknowledge that I have received and read this Learning and Assessment Plan

Student Name:_____ Signature: _____ Date: _____

Lecturer Name	Lecturer Signature	Date

Assessment Strategy

Conditions of Assessment:

Normally learning and assessment will take place in an integrated classroom/ laboratory environment.

It is essential to work through the worksheets and activities in this workbook and follow the guidance of your lecturer. The worksheets and practical activities will provide the required skills and knowledge outlined in this Unit and assist you in achieving competency.

Assessment Methods:

Resource Book - The satisfactory completion of all worksheets and practical activities is required.

Written Theory Assessment – based on the **REQUIRED SKILLS AND KNOWLEDGE**. You must achieve a mark of 75% or more in this assessment.

Observed Practical Assessment – based on the Elements and Performance Criteria of this Competency Unit UEENEEK142A. You must achieve a mark of 100% in this assessment.

On-Job-Training:

It is expected that the off-job component of this competency unit will be complemented by appropriate on-job development involving exposure to re-occurring workplace events and supervised experiences. (See Work Performance Tasks). You are required to log your on-the-job training in your on line 'Q-Tracker' account.

Sufficiency of Evidence:

In all instances competency is to be attributed on evidence sufficient to show that a person has the necessary skills required for the scope of work. These include:

- Task skills - performing individual tasks
- Task management skills - managing a number of different tasks
- Contingency management skills - responding to irregularities and breakdowns in routines
- Job/role environment skills - dealing with the responsibilities and expectations of the work environment including working with others.

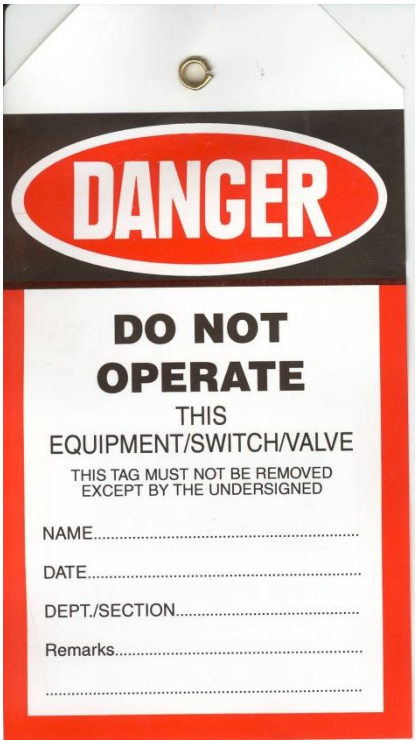
Evidence must demonstrate that an individual can perform competently across the specified range of activities and has the essential knowledge, understanding and associated skills underpinning the competency.

DANGER TAG PROCEDURES

FOR ELECTRICAL TRADES LABORATORIES

Government of Western Australia
North Metropolitan TAFE

The following procedures are to be adopted for all electrical trade classes at North Metropolitan TAFE.



GENERAL REQUIREMENTS:

1. DANGER TAGS (Danger - Do Not Operate) are to be issued to ALL Electrical Trades students. The student's name is to be indelibly printed, and the date is to be entered daily in pencil.

2. The danger tag is to be retained by the student and becomes his or her personal property. It is the student's responsibility to bring the danger tag to all laboratory classes. If the tag is lost it may be replaced at the student's expense.

3. Each student is to use the tag at the appropriate time in the prescribed manner and under the guidance of the lecturer.

4. The danger tag is to be used on all electrical projects and equipment that are connected to, or are to be connected to, a voltage source (including those connected to EXTRA LOW VOLTAGE).

5. No other student may remove or interfere with any DANGER TAG that is not his or her own property.

6. Progress to the next stage is conditional on the student having satisfactorily completed the preceding stage. Each stage of training will be treated with the appropriate degree of supervision. Pre-apprentices, Stage 1 and Stage 2 apprentices being under direct supervision, Stage 3 apprentices and most post trade students being under general supervision.

7. The lecturer is to exercise direct supervision for Pre-apprentices, Stage 1 Apprentices, and Stage 2 Apprentices. For Stage 3 Apprentices and Post Trade Students the lecturer is to exercise general supervision.

8. The purpose of using Danger Tags is to prevent electrical accidents from happening.

9. Failure to follow Danger Tag Procedures when working on practical activities and practical assessments will result in a **Not Yet competent** comment recorded for this Unit of Competency – UEENEEK142A

Student's Signature _____ Date: _____

STAGE 1 and PRE-APPRENTICES
THE FOLLOWING PROCEDURE IS COMPULSORY

PROCEDURE

1. The student is to attach a DANGER TAG on to the plug top of the project lead before proceeding with the allocated project. A danger tag must be attached to the plug top at all times, when the lead is NOT plugged into the supply outlet. Plug tops or leads are not to be connected to the supply outlet WHILE A DANGER TAG is attached.

2. The student is to assemble the project (according to the lecturer's directions) in its isolated and de-energised state and report to the lecturer as necessary and on completion.

3. The lecturer is to:-
   a. Check the project for safety and
   b. Ensure that the student has performed a safety check using the recommended procedure.

4. When the lecturer is satisfied that the project is safe to connect and energise the lecturer is to instruct the student to REMOVE the DANGER TAG from the plug top.

5. With the danger tag removed the lecturer is to plug in the project and switch on. (i.e. the lecturer is to connect and energise)

6. The lecturer is to determine whether or not the project is operating satisfactorily.

7. If the project operates satisfactorily the student may take measurements and or operate as required under general supervision. The student is NOT to modify, disassemble or carry out ANY unsafe act.

8. If the circuit is to be modified the student must:
   a. Switch the circuit off,
   b. Disconnect the project from the supply,
   c. Attach the DANGER TAG to the plug top,
   d. Report to the lecturer for instructions,

   In the lecturer's presence the student is to:-
   e. TEST and VERIFY for ZERO VOLTAGE.
   f. Restart the DANGER TAG procedure from step 2 above.

9. When the student is satisfied that the project has been completed the student is to:-
   a. Switch the project off,
   b. Remove the plug,
   c. Replace the DANGER TAG on the plug top,
   d. Report to the lecturer for instructions,

   In the lecturer's presence the student is to:-
   e. TEST and VERIFY for ZERO VOLTAGE.

The lecturer is then to instruct the student to:-

f. Disassemble the project

g. Remove the DANGER TAG and store it in a designated place.

10. The student can then prepare for the next project.

LABORATORY and WORKSHOP SAFETY INSTRUCTIONS

Students working in laboratories, workshops and installation skills areas at this college do so on the condition that they agree to abide by the following safety instructions. Failure to observe the safety instructions may result in immediate suspension.

1. Personally owned eye protection must be worn AT ALL TIMES where eye protection signs are displayed. Other safety equipment including hearing protection must be worn when applicable to a particular task.

2. Loose clothing must not be worn when working on fixed or portable machines. Hairnets must be worn where applicable. Clothing must cover the upper arms and body.

3. **Safety boots or safety shoes** must be worn at all times on this campus. Thongs or sandals are not permitted.

4. Tools and safety equipment are issued from the tool store on request. It is your responsibility to ask for the correct item (Size, Type and Tool). Check to see that you have been given the correct item before using it. If in doubt ask your LECTURER, not the store person.

5. Report any broken, damaged or unserviceable equipment to your Lecturer. Do not use damaged tools or machines.

6. Clean down the machines immediately after use. All tools must be cleaned before returning them to the store.

7. Skylarking is not permitted at any time.

8. Always use protective vice jaws when cutting off material in a bench vice.

9. Accidents resulting in cuts, abrasions or other personal injury must be reported to your Lecturer immediately - no matter how minor they may seem. A first-aid kit is available in the tool store.

10. Never leave a machine unattended when it is running. Do not allow yourself to be distracted when operating a machine.

11. Read all safety signs and notices and follow the instructions.

12. Do not use a fixed or portable machine unless you have been instructed in its proper use.

13. Read all risk assessment documentation provided (JSAs) and conduct a relevant risk assessment process before performing any task.

Student's Signature _____ Date: _____

K142A – Workbook

- This unit requires the learner to research various aspects of environmental and sustainable procedures in the energy sector.

- The learner will be required to complete the tasks outlined in the following worksheets. These tasks may require a simple one line answer, a descriptive list or a more detailed explanation. However, no response need be any longer than a paragraph or two.

- The worksheets need to be completed on separate paper, either by word processor or handwritten on ruled paper. If hand written the text must be legible, if your lecturer cannot read your writing he/she will require you to re-write the material.

  The satisfactory completion of the worksheets is necessary for a 'CO' result, along with the Practical task and the written Report.

- The written report will require more content and research than the worksheets. Your report topic will be nominated by your lecturer.

  Aside from the standard texts the learner will need to access and research various websites. Each section lists websites which may be accessed to complete the worksheet questions for that section. Other websites may be accessed if required.

- Reference Texts:

  Electrical Wiring Practice – Volume 1&2 (7th ed.) Pethebridge, K & Neeson,

  NOTE: The student ***must*** make a list of websites and texts accessed for each worksheet, at the end of the worksheet.

Notes

SECTION 1 – Environmental risk management

This section covers the following topics

- Environmental sustainability
- Environmental management
- Environmental risks
- Environmental Management Systems (EMS)
- International Standard ISO 14001

References for this section-

Various websites as indicated below.

Websites for this section include but are not limited to-

www.google.com (Search engine)
www.epa.gov/ems
www.environment.nsw.gov.au/sustainability
www.environment.gov.au
http://www.environment.gov.au/aggregation/education-centre
http://australia.gov.au/topics/environment-and-natural-resources
http://en.wikipedia.org/wiki/sustainability
http://education.qld.gov.au/curriculum/learning/sustainability.html
http://www.dse.vic.gov.au
http://www.iso14000-iso14001-environmental-management.com
www.iso14001.com.au

Topic Technical Summary

Code: KS01-EK142A	**Title: Apply environmentally and sustainable procedures in the energy sector**
Topic: 1. Environmental risk management	
➢ Environmental sustainability refers to the environmental action and impacts of what we do. In moving towards sustainability we are attempting to reduce our ecological footprint; that is to reduce our impact on the environment and provide the best outcomes for human and the natural environments both now and into the future. ➢ "Living sustainably means adopting a lifestyle which enables us to meet our present needs while maintaining a healthy environment for future generations." ➢ The need for sustainability in everything humans do has become increasingly important as we understand the effects we are having on the environment. One of these is global warming due to greenhouse gases such as carbon dioxide. This gas is emitted by coal-fired power stations, and by any machine that operates from a carbon based fuel, such as petrol. ➢ Energy sector companies often operate in an environment that includes land, water, air, flora and fauna, natural resources, humans and their interactions. ➢ Environmental management is therefore important for the company's operations. There is considerable pressure on all organisations to operate in an environmentally friendly way, for reasons such as the following: • Legislation and enforcement • Stakeholder pressure – from shareholders, employees, environmental interest groups, consumers, general public • Reputation and corporate image ➢ Because of the nature of its business, potential risks to the environment are regularly encountered by energy sector staff in their day-to-day activities. These are in addition to other risk factors. ➢ Environmental risks can be described as elements of an organisation's activities, products or services that can interact adversely with the environment.	➢ Some of the environmental impacts and risks faced by energy sector companies are: • Oil management and spills • Generation of waste and appropriate disposal of waste • Greenhouse gas emissions • Historical contamination (such as oil or chemical contamination caused by past industrial activities) • Asbestos (handling and removal) • Air emissions (toxic and greenhouse gases) • Noise and vibration • Dust generation • PCB (polychlorinated biphenyls) management • Radiation (electric and magnetic fields – EMF) ➢ To manage these risks, companies usually have an *Environmental Management System* (EMS) which integrates environmental management into daily operations, long term planning and other systems within the organisation. A typical EMS is designed and maintained in compliance with international standard ISO 14001. (ISO 14000 is a family of voluntary standards in which ISO 14001 covers the EMS used by many organisations.) ➢ There are a number of components in an EMS, including: • environmental impact identification • objectives and targets which are consistent with the environment policy • operational and emergency procedures • responsibilities and reporting structure • continual improvement. ➢ Basic principles and methodology of an EMS: • Plan – establish the objectives and processes required • Do – implement the processes • Check – measure and monitor the processes and report results • Act – take action to improve performance of EMS based on results (PDCA–a continual improvement process)

Worksheet Questions Section 1

1. Define the term ‘environmental sustainability’
2. Explain the difference between ‘sustainable energy’ and ‘renewable energy’
3. Why are sustainable work practices so important?
4. Give reasons why it is important that energy sector organisations give consideration to environmental management.
5. What are the typical environmental risks faced by Australian energy companies?
6. What is an EMS (Environmental Management System)?
7. Why is it important that energy companies maintain an EMS?
8. What is the Scope of ISO-14001?
9. Describe the relationship between ISO14001 and a typical energy sector EMS.

Websites accessed for this worksheet - (*Mandatory*)

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Satisfactory	

Not Yet Satisfactory	

Lecturer:_____ Date_____

SECTION 2 – Greenhouse effect

This section covers the following topics

- The Greenhouse Effect
- Causes of the Greenhouse Effect
- Potential consequences of increased greenhouse effect
- Climate change
- Greenhouse imperatives, national and international

Websites for this section include but are not limited to-

www.google.com (Search engine)
www.environment.gov.au
http://en.wikipedia.org/wiki/greenhouse_effect
www.environment.nsw.gov.au
www.ipcc.ch
www.climatechange.gov.au/climate-change.aspx
www.science.org.au/policy/climatechange.html
http://www.bom.gov.au/climate/change
www.un.org/wcm/content/site/climatechange/pages/gateway
http://www.climatecouncil.org.au/about-us/
www.csiro.au

Topic Technical Summary	
Code: KS01-EK142A	**Title: Apply environmentally and sustainable procedures in the energy sector**
Topic: 2. Greenhouse effect	
➢ The term 'greenhouse effect' refers to the process in which the heat radiated from the Earth's surface is partially reflected back by certain gases in the atmosphere, as a result causing the Earth's temperature to rise. This effect is essential for life on Earth, as without it, the temperature of the Earth would be below freezing. ➢ The main greenhouse gases are water vapour, carbon dioxide, methane, nitrous oxide and ozone. ➢ Global warming refers to the measured increase in the Earth's temperature over the last 100 years, and the projected increase in coming years. It is concluded by many scientific societies and academies that this increase is caused by certain human activities that are creating an enhanced greenhouse effect. This includes burning carbon-based fuels (eg, coal, petrol, diesel), as these increase the concentration of carbon dioxide in the atmosphere. ➢ Climate change can be defined as a significant and long lasting change in the Earth's weather patterns. Climate change is a natural phenomenon, and is caused by factors such as slight variations in the Earth's orbit, large volcanic eruptions, and variations in the heat output from the sun (solar output). ➢ Climate change is also related to global warming, and in scientific journals the term 'climate change' includes global warming and everything else that increased greenhouse gas levels will affect. ➢ The significance of climate change is recognized internationally, and is sometimes referred to as 'man-made climate change'. There are differing views on the role humans have in causing climate change. To provide scientific clarity on the topic, an internationally based organisation called *The Intergovernmental Panel on Climate Change* (IPCC) was created in 1988.	➢ The IPCC is a scientific body. It reviews and assesses the most recent scientific, technical and socio-economic information produced worldwide relevant to the understanding of climate change. It does not conduct any research nor does it monitor climate related data or parameters. ➢ The IPCC is an intergovernmental body that is open to all member countries of the United Nations (UN) and World Meteorological Organization (WMO). Currently 195 countries are members of the IPCC. ➢ It is generally concluded by scientific bodies that most of the increase in the Earth's temperature is very likely due to the increase in greenhouse gas concentrations caused by man's activities. These include burning carbon-based fuels, deforestation and other activities. ➢ On a national level, the Australian Government has legislation in force to cut pollution that leads to greenhouse gases. Introducing a price on carbon is part of this action. Other initiatives include investing in renewable energy sources to reduce the nation's dependency on 'dirty' energy sources such as brown coal. ➢ In Australia, there are a number of bodies providing information on climate change, including the *Australian Academy of Science*. Others include the *Bureau of Meteorology* (BOM), the CSIRO, the *Climate Commission* and *ClimateWorks Australia*, a non-profit collaboration hosted by Monash University in partnership with The Myer Foundation.

Worksheet Questions Section 2

1. Explain the meaning of the term ‘greenhouse effect’.
2. List five greenhouse gasses in order of their greenhouse effect.
3. What is the gas that all other gasses are measured against for their greenhouse effect.
4. List six human activities which are increasing greenhouse gas concentrations.
5. What is the role of the Intergovernmental Panel on Climate Change (IPCC) in assessing climate change.
6. Outline actions which have been and are currently being taken in Australia to reduce greenhouse gas emissions.

Websites accessed for this worksheet - (*Mandatory*)

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Satisfactory	

Not Yet Satisfactory	

Lecturer:_____ Date_____

SECTION 3 – Environmental legislation

This section covers the following topics

- Australian Government legislation
- State & Territory legislation
- Environmental issues covered by state & territory legislation
- Responsibilities of corporations and individuals imposed by environmental legislation
- Role of local Councils in administering environmental legislation
- Typical energy sector company environmental policies and procedures

References for this section-

Various websites as indicated below.

Websites for this section include but are not limited to-

www.google.com (Search engine)
www.environment.gov.au
http://www.environment.gov.au/topics/about-us/legislation
www.ntepa.nt.gov.au
www.environment.nsw.gov.au
www.derm.qld.gov.au
www.epa.sa.gov.au
www.epa.vic.gov.au
www.environment.act.gov.au
www.epa.wa.gov.au
http://epa.tas.gov.au/epa

Topic Technical Summary	
Code: KS01-EK142A	**Title: Apply environmentally and sustainable procedures in the energy sector**
Topic: 3. Environmental legislation	
➢ The Australian Government's key piece of environmental legislation is called *The Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) which commenced 16 July 2000. It is constantly under review and amendment. ➢ The EPBC Act provides a legal framework to protect and manage environmental aspects that are nationally and internationally important. These include flora, fauna, ecological communities and heritage places—defined in the EPBC Act as matters of national environmental significance. ➢ The EPBC Act is accompanied with a set of regulations (*Environment Protection and Biodiversity Conservation Regulations 2000*), which provide greater detail and are more frequently amended. ➢ All Australian states and territories have their own environmental legislation. Essentially, this legislation empowers a regulating body, usually called the Environmental Protection Authority or EPA (except in Queensland) to administer the Environmental Protection Act in that state/territory. Some states have a number of regulating bodies. ➢ Typically, state/territory legislation covers all relevant aspects of environmental protection. This includes waste disposal, noise, assessing the environmental impact of a proposed project, pollution (water and air), and anything that can affect the environment. ➢ As well as an Environmental Protection Act, each state/territory has a range Acts that cover certain aspects of environmental protection. These might include soil conservation, waste, National Parks, weeds, fishing management, hazardous chemicals, planning and assessment etc. ➢ A common factor in all environmental legislation is the provision of penalties. These vary, depending on the state/territory, and the nature of the offence. Penalties apply to corporations and individuals and can exceed $5 million (for corporations) and $1 million plus imprisonment for individuals.	➢ In general terms, environmental legislation means a company or individual must: • Not cause water pollution (unless a licence is obtained) • Not cause air pollution (without a licence) • Keep noise levels below certain limits • Dump waste only at a licensed facility • Not cause land pollution as a result of spills or illegal dumping • Protect animals and plants in danger of extinction • Manage dangerous chemicals responsibly • Not start major construction works without appropriate approval. ➢ Local councils have an important role in ensuring compliance with environmental regulations. In some cases, local councils are empowered to act on the behalf of the EPA (or other regulating authority). The issues faced by a local council depend on the area, but often include: • Illegal clearing and tree removal • Illegal filling and earthworks • Illegal dumping on public reserves • Water pollution from residential areas and industry • Sediment and erosion control • Waste management practices on construction sites. ➢ Energy sector companies often have environmental policies and procedures that employees are required to follow. Policies might include: • Overall environmental policy • Methods of preventing contamination • General requirements concerning operations that create noise • Waste management and recycling ➢Procedures might include: • Pesticide use • Contaminated land management • De-watering worksites procedure • Addressing environmental risks • Disposal of scrap metal • Disposal of surplus goods and equipment

Worksheet Questions Section 3 - (*Mandatory*)

1. Give a brief outline of the role of Australian Government environmental legislation.
2. What is the environmental legislation that applies to W.A.
3. List eight environmental issues covered in state & territory environmental legislation.
4. What are the responsibilities that environmental legislation imposes on individuals and corporations?
5. What is the role of local Councils in administering environmental protection legislation & regulations?
6. List the types of environmental policies and procedures that apply to an energy sector company.

Websites accessed for this worksheet

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Satisfactory	

Not Yet Satisfactory	

Lecturer:_____ Date_____

SECTION 4 – Sustainable work practices

This section covers the following topics

- Sustainable work practice
- Environmental Impact Assessment
- Sustainable work practices when working outdoors
- Sustainable work practices when working indoors
- Waste disposal and recycling
- Waste classifications
- Recycling and recyclable materials

Websites for this section include but are not limited to-

www.google.com (Search engine)
www.ntepa.nt.gov.au
www.environment.nsw.gov.au
www.derm.qld.gov.au
www.epa.sa.gov.au
www.epa.vic.gov.au
www.environment.act.gov.au
www.epa.wa.gov.au
http://epa.tas.gov.au/epa

Topic Technical Summary	
Code: KS01-EK142A	**Title: Apply environmentally and sustainable procedures in the energy sector**
Topic: 4. Sustainable work practices	
➢ An environmentally sustainable work practice is one that: identifies sustainable issues and has procedures to deal with the issues implements the identified procedures monitors the effectiveness of the procedures reviews the procedures with a view to improving them ➢ Sustainable work practices ensure that all works carried out by an energy company or its contractors use energy efficiently and avoid or minimise any likely impact on the environment. The environmental policies and procedures that apply will depend on the nature of the work and the legislative requirements. Typically, for a small job, those carrying out the work are required to identify environmental risks and how to minimise these. ➢ For a larger job, eg construction, an *Environmental Impact Assessment* (EIA) is typically required. Its purpose is to ensure the best possible outcome for the environment is achieved, while taking into account the needs of the organisation. ➢ In the case of a typical outdoors worksite, sustainable work practices would include: • Erosion and sediment control, in which measures are put in place to prevent soil eroding from the site into stormwater drains, roadways or waterways. • Air pollution suppression, such as ensuring no dust leaves the site, motorised machinery is well maintained and used efficiently (not left idling unnecessarily). • Preventing water flow from the site, including water pumped from open trenches, from entering the stormwater system or waterways. • Dealing correctly with vegetation, including appropriate use of pesticides. • Disposing of and/or recycling waste products.	➢ In a general workplace, such as an electrotechnology workshop, the main sustainability issues to consider are: Energy usage and where efficiencies in usage can be made. Waste disposal and recycling. Disposing of chemicals and toxic materials. ➢ Waste disposal and recycling are generally a part of all sustainable work practices Three ways to minimise the problems caused by waste products are: Avoidance – reducing the amount of waste generated Resource recovery – reuse, recycling, reprocessing and energy recovery Disposal – management of all disposal options in the most environmentally responsible manner. This is the least desirable option. ➢ Waste is classified in certain ways, although classifications might vary between state/territory legislation. For example, in NSW, there are six classes of waste: special waste (eg, clinical, asbestos, tyres) liquid waste hazardous waste (eg, lead acid or nickel cadmium batteries, lead paint, coal tar) restricted solid waste (as announced by EPA from time to time) general solid waste – putrescible. (Eg, household waste, food, night soil) general solid waste – non-putrescible. (eg, waste that does not break down biologically) ➢ Waste recycling is practiced in most energy sector organisations. Recycling processes used materials into new products, which is usually more energy efficient and less polluting compared to manufacturing the product from raw materials. Examples of recyclable waste materials/products typically produced by an energy sector organisation include: paper and cardboard timber transformer and motor oil metals (copper cables, aluminium etc)

	▯ some types of light globes ▯ building and construction materials ▯ vegetation ▯ plastics ➢ Waste products that have economically salvageable or hazardous metals, and are therefore considered recyclable, include: ▯ electronic/computer circuit boards (rare metals, including gold) ▯ lead-acid batteries (lead) ▯ items such as some types of lamps, that contain hazardous metals, (eg, mercury) which can be removed for reuse

Worksheet Questions Section 4 - (*Mandatory*)

1. Define the term ‘sustainable work practice’
2. Describe environmental and resource saving issues associated with an outdoors worksite.
3. Describe environmental and resource saving issues associated with an electrotechnology workshop.
4. List methods to reduce waste products
5. Describe ways of reducing, where possible, on-the-job energy usage.
6. Use relevant state & territory government information to classify waste products and describe their disposal methods.
7. Describe recyclable waste products produced by energy sector organisations.

Websites accessed for this worksheet

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Satisfactory	

Not Yet Satisfactory	

Lecturer:_____ Date_____

SECTION 5 – Sustainable energy

This section covers the following topics

- Sustainable energy
- Minimum Energy Performance Standards (MEPS) program
- Reducing energy usage
  - Domestic, commercial and industrial strategies
  - Trade related technologies and methods
  - Energy efficient retrofits
- Energy efficiency of new buildings
- State & Territory sustainable building regulations
- Government energy saving initiatives
- Renewable energy sources

References for this section-

Various websites as indicated below.

Websites for this section include but are not limited to-

www.google.com (Search engine)
http://en.wikipedia.org/wiki/efficient_energy_use
www.sustainableenergy.com.au/
www.energyrating.com.au/
www.basix.nsw.gov.au
www.abcb.gov.au
www.ret.gov.au
http://en.wikipedia.org/wiki/renewable_energy
http://sa.gov.au
www.ntepa.nt.gov.au
www.derm.qld.gov.au/
www.environment.act.gov.au/
www.epa.wa.gov.au
http://epa.tas.gov.au/epa
http://en.wikipedia.org/wiki/national_electricity_market

Topic Technical Summary	
Code: KS01-EK142A	**Title: Apply environmentally and sustainable procedures in the energy sector**
Topic: 5. Sustainable energy	
➢ Energy efficiency and renewable energy are the two main ways towards a sustainable energy policy. A sustainable energy policy requires that energy sources used to produce electricity do not cause greenhouse gases or other effects that are unsustainable. ➢ Energy efficiency means less energy is used to achieve a particular outcome. This ranges from using efficient lights, motors and equipment, to developing a lifestyle and work practices that use less energy. Renewable energy means electricity is generated from renewable sources. ➢ Many items of electrical equipment are required by law to display an Energy Rating Label (ERL). The regulations also require a wide range of equipment to conform to minimum efficiency standards set out in Australian and New Zealand Standards. This is part of the Minimum Energy Performance Standards (MEPS) program. ➢ Increased efficiency means an electrical appliance or component (eg motor, lamp) uses less energy to do its job. For example, an 11 watt compact fluorescent lamp produces the same light output as a 60 watt incandescent lamp. ➢ Energy usage can also be reduced by switching off appliances or lights when they are not in use. Energy reduction programs developed by industry and commercial enterprises typically include this as part of the program. ➢ All states/territories have regulations requiring new buildings to comply with certain energy efficiency requirements. From May 2011, the Australian Building Codes Board began publishing a National Construction Code, which as well as numerous technical codes (plumbing etc), includes codes concerning energy efficiency. The minimum energy rating permitted is referred to as a 6-Star rating, and this is usually specified by state/territory regulations (except NSW). What differs is how	➢ Methods used to increase the energy efficiency of a building include: □ selecting a suitable building fabric (the outer covering of the building) □ double glazing windows to prevent heat loss or transfer □ sealing doors, windows and the like to prevent drafts □ using efficient lighting (LED, fluorescent, induction etc) □ using an efficient heating/cooling system along with installing insulation in ceilings, walls and under some types of floors. ➢ Energy efficiency is important for industry. Many types of industrial motors and transformers must meet MEPS efficiency requirements. Federal government strategies include programs to coordinate and encourage high energy users to improve their efficiency. The programs are delivered through the National Framework for Energy Efficiency. ➢ Renewable energy is another path to sustainable energy. Methods used to power an alternator to produce electricity include: □ Geothermal energy – heat contained within the Earth is used to heat water to produce the steam required to power a turbine driving an alternator. □ Solar energy, in which the heat of the sun is focused onto specially shaped pipes, thereby heating the water flowing through the pipes and producing high pressure steam to power a turbine. □ Hydro-electric power stations, in which flowing water from a dam or river turns the alternators. □ Wind power, in which an alternator is rotated by wind passing over blades of 80 or more metres in diameter. ➢ Solar panels, in which light is converted to electricity, are now being widely installed on homes and commercial buildings. The electricity from a solar panel installation is fed into the electrical supply lines, the owner

the required rating can be achieved, which depends on the location and other factors.	receiving payment for the energy produced at a rate set by state/territory governments. Electrical energy is supplied to homes and industry by electrical energy distributors and retailers. A distributor purchases electrical energy from a generating source at a particular rate (or tariff) that varies from time to time. Consumers purchase electrical energy from a retailer at a tariff that is regulated by state/territory governments. The wholesale electricity market (National Electricity Market or NEM) is regulated by a number of key bodies, including the Australian Energy Market Commission (AEMC), the Australian Energy Regulator (AER) and the Australian Energy Market Operator (AEMO). ➢ Every energy distributor needs to ensure their network can meet a peak load, which might only occur a few times each year. A network peak load typically occurs during extremely hot or cold weather. If the available generating sources are unable to meet the peak load, load shedding or power outages need to occur. ➢ An electrical installation, domestic or industrial, is designed to handle the maximum power the installation draws when all appliances, machines, lights etc are switched on. This is called the installation's 'maximum demand'. ➢ Load profiling is a way of gaining information about energy use. By looking at (profiling) energy use in a home or factory, a usage trend can often be identified leading to developing strategies to shift high energy demands to a period of low demand. Eg, by operating hot water heaters at night, when demand is low. Energy companies usually have a range of tariffs, such as off-peak rate which offers a lower cost per kilowatt hour of electricity. ➢ Electrical energy usage is measured with a kilowatt hour meter, where one kilowatt hour (kWh) is the energy used over one hour by an appliance rated at one thousand watts. Electricity retailers are now fitting 'smart power meters' to measure the power taken by an installation, as this allows varying tariffs to be applied, depending on the time of day. Smart meters enable two-way communication between the meter and the retailer's central system.

Worksheet Questions Section 5

1. Define the term ‘sustainable energy’
2. Explain why some electrical equipment items are required to display an energy rating label.
3. Explain the overall role of Minimum Energy Performance Standards in reducing energy consumption.
4. Outline two main ways in which the use of electrical energy can be reduced.
5. Outline the role the Australian Building Codes Board has in determining the energy efficiency of homes and commercial buildings.
6. How are state & territory energy efficiency and sustainability regulations applied to new developments?
7. Outline the role of Australian Government programs aimed at increasing energy efficiency in industry?
8. Write a simple description of how the following technologies produce energy.
    - Wind
    - Tidal
    - Photovoltaic
    - Solar Thermal
    - Geothermal
    - Wave
    - Biomass
    - Gas Thermal
9. Define the term baseload with respect to electrical energy.
10. Which of the technologies listed in question eight meet the requirements of ‘baseload’ supply?
11. Define the following terms as applied to electrical energy-
    - ‘Network demand’.
    - ‘Maximum demand’.
    - ‘Peak demand’.
    - ‘Tariff’.

Websites accessed for this worksheet - (*Mandatory*)

Satisfactory	

Not Yet Satisfactory	

Lecturer:_____ Date_____

Activity 1 – **Energy use activity**

Objective

To measure and log the light output of various types of luminaires compared to their electrical power input.

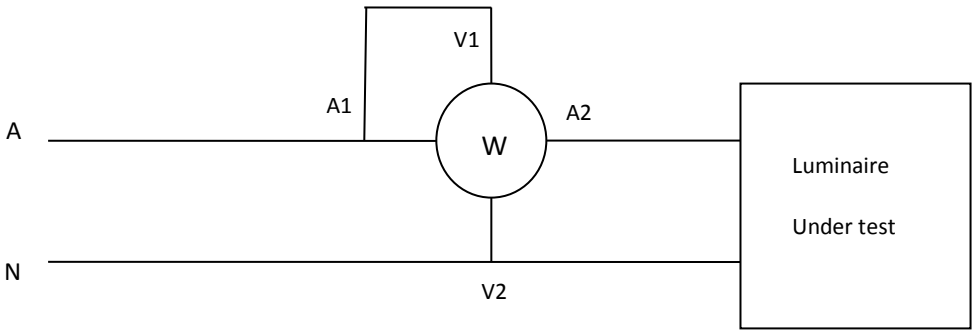
Equipment

Your lecturer will set up a number of test beds as illustrated. The student(s) will then connect the different luminaires in turn to the test bed.

The luminaires will include the following types –

- Incandescent
- Compact fluorescent
- Halogen incandescent
- LED (Light Emitting Diode)
- 12 Volt dichroic (MR16)
- 240 Volt dichroic (GU10)

Circuit Diagram



Procedure

1. There are spaces for seven different types of luminaire, as decided by the lecturer.

2. The first two are for example only and the values are not necessarily true readings.

3. All measurements are to be taken at a distance of 500mm directly above the luminaire under test. Be careful not to cast any shadows over the luminaire. Set the lux meter on the best range (needle near mid-scale) and record the lux value for the luminaire.

4. De-energise the luminaire and measure the lux level in the same manner. This will give you the background lux level.

   NOTE- this value may vary (e.g. cloud movement) so do it for each luminaire with as little time delay as possible.

5. Select one of the nominated luminaires and record it's nominal power rating (printed on it). Connect the luminaire into the circuit, **following isolation and danger tag procedures,** and record the Watt meter reading.

   Next take the lux readings as described in steps 3 and 4 and record the values in the correct space.

   NOTE- Fluorescent luminaires will require a warm-up time.

6. Take the readings for all of the luminaires that have been made available, **and be patient it is not a race.**

7. Do the calculations for the lux per watt. The main aim of this exercise is to determine which type of luminaire is the most efficient as far as light output per electrical watt is concerned.
   Electrical watts relates directly to carbon emissions.

8. De-energise the luminaire and measure the lux level in the same manner. This will give you the background lux level.

   NOTE- this value may vary (e.g. cloud movement) so do it for each luminaire with as little time delay as possible.

9. Select another one of the nominated luminaires and record it's nominal power rating (printed on it). Connect the luminaire into the circuit, **following isolation and danger tag procedures,** and record the Watt meter reading.

   Next take the lux readings as described in steps 3 and 4 and record the values in the correct space.

   NOTE- Fluorescent luminaires will require a warm-up time.

10. Take the readings for all of the luminaires that have been made available, **and be patient it is not a race.**

11. Do the calculations for the lux per watt. The main aim of this exercise is to determine which type of luminaire is the most efficient as far as light output per electrical watt is concerned.
    Electrical watts relates directly to carbon emissions.

Results

- To calculate lux/watt, you will need to do the following **for each luminaire's readings.**

'lux level minus background lux level' ÷ 'input power as read on wattmeter'

Ie. Lux/watt = value in column 5/value in column 2

Column 5 value = Column 4 value – Column 3 value

Column	1	2	3	4	5	6
Luminaire Type	Rated input power as on luminaire	Input power as read on wattmeter	Background Lux level with luminaire off	Lux level with luminaire on	Lux level minus background lux level (4 – 3)	lux/watt calculate, See below (5÷2)
Incandescent 240V 40W	*40W*	*35W*	*150*	*850*	*700*	*20*
LED 12V 10W	*10W*	*8W*	*160*	*400*	*240*	*30*

Questions

From your observations-

1. Which luminaire is the MOST light efficient?

   _____

2. Which luminaire is the LEAST light efficient?

   _____

3. Which type of luminaire would you use in the following situations?

   Explain the reasoning behind your choice, *we are not considering the dollar outlay for this.*

Kitchen

_____

Activity/TV Room

_____

Home Office

_____

Satisfactory	

Not Yet Satisfactory	

Lecturer:_____ Date_____

Activity 2 – **Sustainable Energy Report**

Note: **Do Not** copy and paste text out of websites or documents. There is software available to lecturers to check for plagiarism.

Objective:

The objective is to research a Sustainable Energy Technology as directed by your lecturer, from the following list. You will then write a report on the topic given, with diagrams, following the headings described in the Procedure.

Topic List:

- Wind
- Tidal
- Photovoltaic
- Solar Thermal
- Geothermal
- Wave
- Biomass
- Gas Thermal

Procedure:

1. Research the topic you have been allocated. The internet has a wealth of information available. Access both private and government sites if possible in your research.

2. Your report needs to be at least two pages long including diagrams.

   You will need to have a cover sheet in addition to the report content which contains the title, your name, class and your lecturer's name.

3. Your report **must** address the following headings

- Name and basic description of the technology
- How it is used
- Where in general it is used
- Cost of resulting energy. (compared to coal if possible)
- Advantages of the technology
- Disadvantages of the technology
- Future prospects of the technology (worldwide)
- Australian usage (both now and in the future)
- Government and Private investment (now and future)

4. Your completed report **must** be either handed or emailed to your lecturer by the given date.

Satisfactory	

Not Yet Satisfactory	

Lecturer:_____ Date_____

Reference:

- National Curriculum - EE-Oz Training Standards Australia
- Electrical Wiring Practice – Volume 1&2 (7th ed.) Pethebridge, K & Neeson, I
- Various websites as listed in workbook