NTC

Your planet, Your future

AN ENERGY CONSERVATION HANDBOOK FOR STUDENTS AND PARENTS

This handbook has useful information for young adults about:

- Being aware of energy use
- What a carbon footprint is
- How choices effect change
- Power Down Fridays
- Green jobs

Your planet, Your future

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Introduction

The world is changing quickly. That has become more evident in the past year. As we adapt to living in this changing world, it is important to become aware of how the things we do affect the planet. It is, after all, your future.

Some of these habits and behaviours are positive and constructive, but some have negative effects on the environment. We take showers that are too long. We leave lights on when we are not using them. We keep our homes too cool in the summer and too warm in the winter. All of these wasteful behaviours may seem inconsequential and are usually done without malicious intent, but they do carry consequences. Wasting energy also means wasting the natural resources that are used to make the energy and electricity we often take for granted.

So how do we begin to develop new habits and behaviours that can help prevent waste? Self-awareness is the first step, followed by education and action. It's easier said than done, however. This handbook is intended to help shed light on the importance of energy conservation and ways you can make your voice heard and help make a difference.

In addition to some information on energy conservation, you will also find information on jobs and careers in the renewable energy industry field as well as areas of study to pursue post high school.

BE AWARE OF ENERGY USE

Simply becoming aware of your energy use can begin to mitigate climate change effects in the future, but there are psychological barriers that hinder people from engaging in sustainable behaviours. Climate change can be a daunting problem, in part because people have a hard time putting distant events in context.

Compounding this problem, people tend to perceive that the acts of any single individual seem too small to make a difference. Recognizing how these two factors can hinder environmental action can also suggest some possible solutions.

When discussing the seemingly far-off effects and implications of climate change, it can be useful to frame the events as short-term in actuality. This can be done by putting the next century within the context of the next thousand years. This has the effect of making the impacts of climate change more urgent and immediate, thus having a positive influence on behaviour change.

In addition, the more we can agree that enacting positive actions that benefit the environment is normal and that "everybody is doing it," the more we can amplify the likelihood of making positive behaviour changes regarding energy use and conservation.

BE AWARE OF ENERGY USE

Another reason changing household energy habits is hard is because we can't see energy. It's invisible. And it can be difficult to change behaviours around something that is largely unseen. Households account for a significant proportion of Australia's energy consumption - approximately 30% (Source ABS Energy Account).

Given that cost-effective measures are available to improve home energy efficiency, there lies a challenge in raising homeowners' awareness of inefficiencies and motivating them to act. This challenge may partly be because energy is invisible. A householder may know terms associated with energy use but may have difficulty relating that to specific behaviours. Knowledge of energy use is predicated on what is experienced: light, heat and convenience rather than the amount of energy required to provide these benefits.

Visual images can be powerful. **Smoke sticks** can be used to make drafts visible. A smoke stick is a device that emits a small stream of smoke that is susceptible to drafts and wind. It can be used to make invisible drafts visible in a house. Telling people that they are losing a percentage of heat through the cracks around the windows is one thing, but showing smoke pour out under doors and over window sills is far more compelling.

Source: journals.sagepub.com/doi/pdf/10.1177/0013916514546218

BE AWARE OF ENERGY USE

There are many psychological theories about how humans deal with change. One of the most influential psychologists in the discipline is James Prochaska, who developed the Transtheoretical Model of Behavior Change. It states that humans usually move through six different stages when dealing with change. The different stages are:

PRECONTEMPLATION

People do not intend to take action in the foreseeable future (six months).

CONTEMPLATION

People are intending to start the new behaviour in the foreseeable future (within six months).

PREPARATION

People are ready to take action within the next 30 days.

ACTION

People have recently changed their behaviour and intend to keep moving forward with that behaviour change.

MAINTENANCE

People have sustained their behaviour change for a while and intend to maintain the behaviour change going forward.

TERMINATION

People have no desire to return to their old behaviours and are sure they will not relapse.

People rarely move through these stages in a straightforward fashion. Rather, they bounce back and forth or loop around repeatedly, sometimes slowly making progress, sometimes not. The theory is revolutionary because it gives a framework for dealing with change that can be used across psychological areas of discipline. This has helped psychiatrists, psychologists and therapists assist their patients in their progress.

WHAT A CARBON FOOTPRINT IS

Many of our daily activities cause emissions of **greenhouse gases**. For example, we produce greenhouse gas emissions by burning petrol when we drive, burning oil or gas for home heating, or using electricity generated from coal, natural gas and oil. Adding together all the activities you do that result in the release of carbon dioxide into the atmosphere is called your **carbon footprint**. Greenhouse gas emissions vary among individuals depending on a person's location, habits and personal choices. Just like real footprints, your carbon footprint is probably a different size than someone else's.

For example:

- The greenhouse gas emissions from your home's electricity use depend on the **types of fuel** your power plant uses to generate the electricity and the amount you use.
- The greenhouse gases emitted from your heating and cooling applicances depend on the **efficiency** of these appliances, the size and insulation of your house, and the amount and type of fuel used.
- The emissions from your car depend on **how you drive** (e.g., the amount of time spent idling in traffic).
- In addition, the more you **recycle**, the more you reduce the amount of waste sent to **landfills**, as well as the greenhouse gas emissions that result from processing raw materials.

Source: www.epa.gov/ghgemissions/household-carbon-footprint-calculator

WHAT A CARBON FOOTPRINT IS

Where do greenhouse gases come from?

Primary sources of greenhouse gas emissions in Australia:

- *Electricity* production generates the largest share (33.6%) of greenhouse gas emissions in Australia. These emissions come from the combustion of fuel to generate electricity for public use.

- *Stationary energy excluding electricity* produces 20.4% of the greenhouse gas emissions in Australia. This type of energy includes emissions created from direct combustion of fuels, predominantly from the manufacturing, mining and residential sectors. This does not include the emissions created from generating electricity.

- *Transport* is responsible for about 17.6% of Australia's household greenhouse gas emissions. These primarily come from burning fossil fuels for our cars, trucks, buses, airoplanes, trains and ships.

- *Industrial processes and product use* account for 6.2% of Australia's emissions. These emissions are created from the production of chemical, metals and mineral products for the industrial sector.

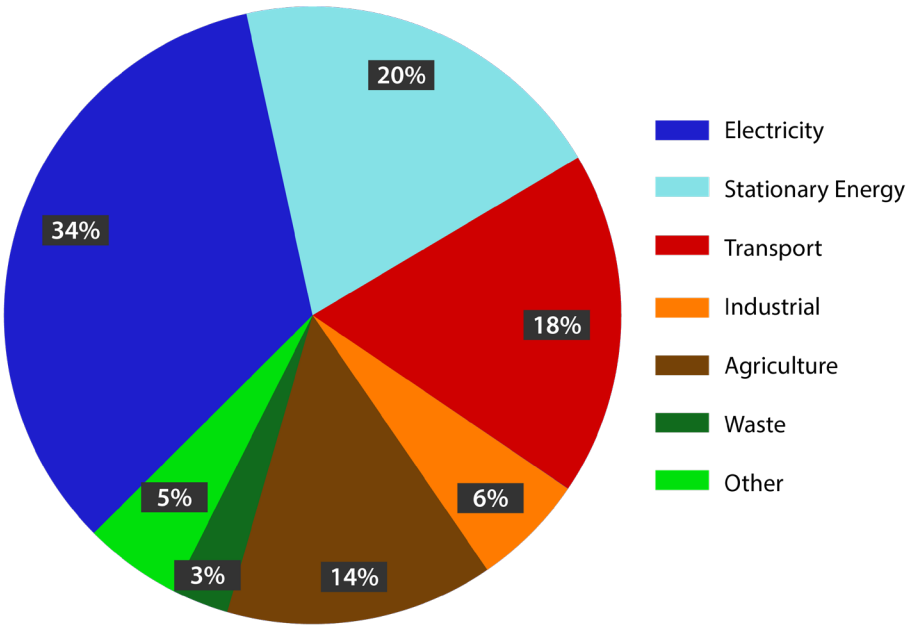
- Greenhouse gas emissions from *agriculture* include methane, nitrous oxide and carbon dioxide. These are created through the management of livestock such as cows, agricultural soils and rice production. Agriculture accounts for 14.6% of the emissions in Australia.

- The *waste sector* creates emissions from landfill, wastewater treatment and disposal of solid waste. Emissions from landfill largely consist of methane, which is generated from the decay of organic matter. Waste accounts for 2.7% of emissions in Australia.

Source: https://particle.scitech.org.au/people/reducing-your-carbon-footprint/
https://www.wwf.org.au/get-involved/change-the-way-you-live#gs.7j615e
https://www.climatecouncil.org.au/wp-content/uploads/2018/06/CC_MVSA0143-Briefing-Paper-Australias-Rising-Emissions_V8-FA_Low-Res_Single-Pages3.pdf
https://www.industry.gov.au/data-and-publications/national-greenhouse-gas-inventory-quarterly-update-december-2020
https://www.industry.gov.au/sites/default/files/2021-05/nggi-quarterly-update-december-2020.pdf
https://www.abc.net.au/news/science/2020-08-12/easy-ways-to-lower-carbon-emissions/12545906

Where do greenhouse gases come from?

Primary sources of greenhouse gas emissions in Australia:



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https://particle.scitech.org.au/people/reducing-your-carbon-footprint/
https://www.wwf.org.au/get-involved/change-the-way-you-live#gs.7j615e
https://www.climatecouncil.org.au/wp-content/uploads/2018/06/CC_MVSA0143-Briefing-Paper-Australias-Rising-Emissions_V8-FA_Low-Res_Single-Pages3.pdf
https://www.industry.gov.au/data-and-publications/national-greenhouse-gas-inventory-quarterly-update-december-2020
https://www.industry.gov.au/sites/default/files/2021-05/nggi-quarterly-update-december-2020.pdf

What You Can Do to Reduce Your Emissions

There are simple things you and your family can do to reduce the size of your carbon footprint.

SHOWER LESS!

Cutting your daily shower from eight minutes to four minutes saves up to 350 kilograms of CO2 a year! If everyone in Australia did this, we would cut emissions from household energy use by 8 per cent.

TWEAK YOUR ENERGY USE AT HOME!

Changing your air conditioner's thermostat by 1 degree can cut your energy use by about 10 per cent! So dial it up a degree in summer and down a degree in winter! This difference could save over 200kg of CO2 a year, and if everyone did this it would be equivalent to a 5 per cent reduction in household electricity emissions.

DON'T WASTE FOOD!

On average, Australians throw out about 118kg of food at home each year. When it breaks down in landfill, that food waste creates about 250kg of greenhouse gasses!
Anything you can do to put less food in the bin will cut your emissions, and there are plenty of options you can try to be more efficient:

- Planning meals
- Checking the pantry before shopping
- Making a shopping list
- Using the freezer to manager leftovers before they go off

WALK MORE AND DRIVE LESS!

If all car owners walked just five times a week, instead of driving one kilometre to the local shops, we'd save over 2 million tonnes of C02 a year! If everyone car owner in Australia made this change, we would reduce our emissions from transport by 44 per cent.

Two ways to make change happen are to **make your voice heard** and **get involved**. High school students have both a unique perspective on the world and the most at stake in its future. By choosing to take advantage of opportunities to communicate the importance of natural resources and energy conservation, students can begin to effect change. Starting at the most **local level**, home and school, students become aware of the prevalence of the problem and create innovative solutions unique to their communities. Starting a **green club** or other student-run organisation dedicated to environmental awareness is a great way to get started on both goals.

Extending beyond the confines of the local community, students can begin preparing for post-high school life by exploring **university degrees in environmental science** or seeking out jobs and careers in the expanding **renewable energy workforce**. Some of the fastest-growing and best-paying jobs in the world centre on our need to make a more sustainable planet. There is a demand for careers in renewable energy now and for the foreseeable future.

Using your voice to effect change can be nerve-wracking for some, but once one person begins to create change, others will follow. Young adults have an opportunity and a responsibility to help shape our world in a way few generations have had in the past. The time is now to speak up and act.

Starting locally in your own school and finding ways to make it more energy efficient can have many benefits. Some of the benefits are:

REDUCED ENERGY COSTS

It is estimated that up to 40% of all energy going into schools is non-productive and could be saved. The savings from improved energy behaviours can result in financial savings of up to 20% of a school's electricity costs.

IMPROVED STUDENT PERFORMANCE

Energy-efficient school building designs often use natural daylight to reduce the energy needed to light a building. Natural light has also been proven to have a positive effect on student performance and reduce lighting costs by 20%.

INCREASED ATTENDANCE

An indirect benefit of energy efficiency measures in school buildings is an increase in school attendance rates. A global study found incorporating green building measures in school designs improves indoor air quality and can reduce absenteeism rates by as much as 15%.

ENHANCED EDUCATIONAL OPPORTUNITIES

Several K-12 schools have used energy efficiency improvements as opportunities to adapt academic curricula to promote awareness of energy and environmental issues. Some schools around Australia have implemented energy awareness campaigns and energy audits so students can monitor their school's energy consumption.

INCREASED SECURITY AND SAFETY

Improving energy efficiency in K-12 school buildings can have positive effects on school security and student safety. For example, energy-efficient exterior lighting can enhance security while reducing energy costs by providing effective and even light distribution.

Source: https://www.abc.net.au/news/science/2020-08-12/easy-ways-to-lower-carbon-emissions/12545906
www.epa.gov/sites/production/files/2015-08/documents/k-12_guide.pdf

Power Down Fridays

Power Down Fridays are a way to **reduce energy use in buildings** (like schools) that are mostly unoccupied over the weekend. The practice has been in use at many businesses and some schools for years. It is a great way for interested students, or members of a school's green team, to work with staff to make sure lights, computers and other electricity-hogging devices are powered down for the duration of the weekend.

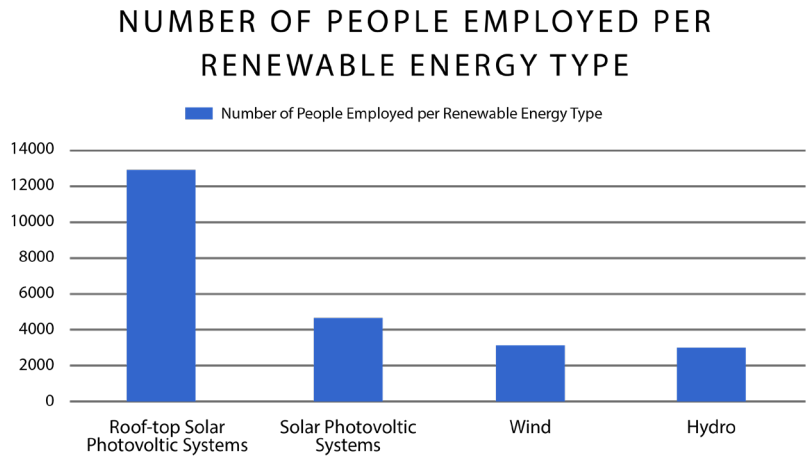
Here's how it works: The **staff**, along with **interested students**, sweep the school, going classroom by classroom to make sure the lights are turned off, computers are shut down and any power strips are clicked off. With an average high school having over **50 rooms**, the energy-saving potential of a Power Down Friday is enormous. This can not only **save the school money** on its utility bill, it also helps reduce our **reliance on the natural resources** it takes to make electricity.

Some things to consider if you are interested in starting a Power Down Friday action at your school:

- Coordinate with both the administration and the staff at your school.
- Plan for how your team will progress through the school and what items will be turned off, powered down or put in "sleep" mode.
- Make sure you communicate your plan to all the students, staff and teachers at the school.
- Some people may have appliances or devices that are exempt from being shut off.
- Assign students and staff to begin the sweep after school every Friday.
- Some schools choose to put a sign on the door that reminds people that the room has been powered down.

Australia's renewable energy industry is rapidly growing and estimated to create thousands of jobs over the next decade. In 2019, over 26,000 people were employed across renewable energy supply chains and almost 10,000 of those were in rooftop solar.

The Australian Bureau of Statistics presents the following data for each type of renewable energy:



**Roof-top solar includes solar hot water systems and small-scale batteries. Table does not include all renewable energy types.*

Wind

Many workers, like electrical engineers, turbine technicians and construction workers, are found on wind farms. Wind turbine technicians include electrical and mechanical technicians who provide servicing and preventive maintenance, breakdown response and inspections on wind farms. Wind turbine blade technicians perform blade inspections and major structural repairs. The wind industry has an even spread of occupations and a higher proportion of professionals and managers, reflecting a complex and diverse workplace. There are wind farms in all states of Australia. At the end of 2018, there were 94 wind farms in Australia, with an additional 21 wind farms built by the end of 2020. Collectively, the wind farms around Australia help to avoid over 1.1 billion tonnes of CO_2 globally.

Sources: www.thesolarfoundation.org/wp-content/uploads/2020/02/SolarJobsCensus2019-2.pdf
www.bls.gov/green/wind_energy
www.bls.gov/green/solar_power

Solar

The solar industry includes workers in science, engineering, manufacturing, construction and installation. Scientists, for example, are involved in the research and development of new and more efficient materials, and engineers design new systems and improve existing technologies. Manufacturing workers make the equipment used in solar power generation, such as mirrors and panels. Construction workers build solar power plants. Electricians, plumbers and solar photovoltaic technicians install residential and commercial solar projects. The UTS Institute for Sustainable Futures and Clean Energy Council Australia report job growth is strongest in rooftop solar and wind. Most jobs are in construction and installation but over time an increasing proportion of jobs would be on-going operations and maintenance roles.

Hydro

Hydro energy has a higher proportion of construction labour than any other renewable energy technology. A very high proportion of hydro jobs are in regional areas, with more than 80% of construction work and more than 90% of operations and maintenance work expected to be local to the hydro scheme. Hydro energy has a higher proportion of labourers and trades and technicians, reflecting the scale of construction required. Other occupations involved in hydro energy include engineers (civil, mechanical, electrical and scada), civil and general labourers and drivers.

Sources: https://www.uts.edu.au/research-and-teaching/our-research/institute-sustainable-futures/our-research/energy-futures/renewable-energy-employment-australia
https://www.uts.edu.au/sites/default/files/2020-06/Renewable-Jobs-Australia-ISF%20F.pdf
https://www.cleanenergycouncil.org.au/resources/technologies/wind
https://gwec.net/global-wind-report-2021/
https://www.australianwind.com.au/our-people/wind-turbine-technicians/

Solar Panel Installers

Solar photovoltaic (PV) installers assemble, install and maintain solar panel systems on rooftops or other structures.

PV installers typically do the following:

- Plan PV system configurations based on customer needs and site conditions
- Measure, cut and assemble the support structure for solar PV panels
- Install solar modules, panels and support structures in accordance with building codes and standards
- Connect PV panels to the electrical system
- Apply weather sealant to equipment being installed
- Activate and test PV systems
- Perform routine PV system maintenance

To become a qualified solar installer in Australia, most people complete a solar PV qualification at trade school or a solar training centre, and then go on to apply for provisional installer accreditation with the Clean Energy Council of Australia.

The average annual wage for solar photovoltaic installers was $82,524 in 2019.

Sources: https://www.nationalskillscommission.gov.au/solar-installers
https://solarrto.com.au/
www.onetonline.org

Wind Turbine Technicians

Wind turbine service technicians, also known as wind-techs, install, maintain and repair wind turbines.

Wind turbine service technicians typically do the following:

- Inspect the exterior and physical integrity of wind turbine towers
- Climb wind turbine towers to inspect or repair wind turbine equipment
- Perform routine maintenance on wind turbines
- Test and troubleshoot electrical, mechanical and hydraulic components and systems
- Replace worn or malfunctioning components
- Collect turbine data for testing or research and analysis
- Service underground transmission systems, wind field substations or fiber optic sensing and control systems

Most wind technicians learn their trade by gaining an apprenticeship or attending a trade school where they typically complete certificates in electrical, mechanical, or renewable energy. Some workers, however, choose to earn an associate degree or higher in these fields.

The median annual wage for wind turbine technicians was $102, 076 in 2019.

Sources: https://www.nationalskillscommission.gov.au/wind-turbine-technicians

Environmental Scientists

Environmental scientists and specialists use their knowledge of the natural sciences to protect the environment and human health. They may clean up polluted areas, advise policymakers or work with industries to reduce waste.

Environmental scientists and specialists typically do the following:

- Determine data collection methods for research projects, investigations and surveys
- Collect and compile environmental data from samples of air, soil, water, food and other materials for scientific analysis
- Analyse samples, surveys and other information to identify and assess threats to the environment
- Develop plans to prevent, control or fix environmental problems, such as land or water pollution
- Provide information and guidance to government officials, businesses and the general public on possible environmental hazards and health risks
- Prepare technical reports and presentations that explain their research and findings

For most entry-level jobs, environmental scientist's usually have to complete a degree in science or applied science. Most graduates major in environmental science, natural resource management, geography, marine science, or a related field. To get into these courses you usually need to gain your Year 12 Certificate. Prerequisite subjects, or assumed knowledge, in one or more of English, mathematics, biology, chemistry, physics, and earth and environmental science are normally required. Universities have different prerequisites and some have flexible entry requirements or offer external study.

The avergae annual wage for environmental scientists is $92, 508.

Sources: https://www.gooduniversitiesguide.com.au/careers-guide/environmental-scientist#the-facts www.oneton-line.org

Renewable Energy Engineers

Renewable energy engineers work on the production of energy from renewable or sustainable sources, including wind, solar and hydro or marine power. They research and develop new machinery and equipment, production processes and ways to minimise impact on the environment.

Renewable energy engineers typically do the following:

- Prepare, review and update environmental investigation reports
- Obtain, update and maintain plans, permits and standard operating procedures
- Analyse scientific data and do quality-control checks
- Monitor the progress of environmental improvement programs
- Contribute to the development and implementation of clean energy policy
- Understand traditional and alternate renewable power sources and their generation, in-order to assess available energy options and optimise the outcome
- Provide recommendation and solutions regarding conversions to renewable energy sources
- Manage the process of developing, maintaining and optimising alternative energy assets, and maximising energy usage efficiency.

Renewable energy engineers must have a bachelor's degree in renewable energy engineering or a related field such as civil, electrical, mechanical, or environmental engineering.

The median annual wage for renewable energy engineers was $113,412 in 2019.

Sources: https://www.planitplus.net/JobProfiles/View/780/53
https://www.nationalskillscommission.gov.au/energy-efficiency-engineers

Energy Auditors

Energy auditors conduct checks of buildings, building systems or process systems to determine efficient energy use.

Energy auditors typically do the following:

- Identify opportunities to improve the operation, maintenance or energy efficiency of building or process systems
- Identify and prioritise energy-saving measures
- Analyse technical feasibility of energy-saving measures, using knowledge of engineering, energy production, energy use, construction, maintenance, system operation or process systems
- Inspect or evaluate building envelopes, mechanical systems and electrical systems
- Identify any health or safety issues related to planned weatherisation projects
- Use testing equipment to identify the potential for energy conservation
- Educate users on energy use habits and the potential for consumption and cost reduction

To become an energy auditor, workers must complete a degree in an area such as civil engineering, environmental engineering, environmental science or a related field. To get into these courses you usually need to gain your Year 12 Certificate. English, mathematics, biology, chemistry, physics, and earth and environmental science would be appropriate subjects to study prior to univeristy. Universities have different prerequisites and some have flexible entry requirements or offer external study.

The average annual wage for energy auditors is $79, 788.

Sources:https://careerhq.com.au/careers-database/job_details/898/energy-auditor
https://www.erieri.com/salary/job/energy-auditor/australia/melbourne

Hydrogeologist

Hydrogeologists monitor, measure, analyse and describe the earth's surface and groundwater resources and many aspects of the water cycle, including human use of water resources.

Hydrogeoligists typically do the following:

- Conduct preliminary surveys of mineral, petroleum and natural gas deposits with prospectors, mining engineers, metallurgists, and other mineral scientists and engineers.
- Prepare and supervise the production of laboratory reports and scientific papers.
- Study the effects of natural events such as erosion, sedimentation, earthquakes, and volcanic activity on the formation of the earth's surface and sea beds.
- Carry out exploration to determine the resources present by sampling, examining and analysing geological specimens, rock cores, cuttings and samples using optical, chemical, electronic and mechanical techniques.
- Investigate the propagation of seismic waves to determine the structure and stability of the earth's mantle and crust.
- Perform laboratory and field studies as well as aerial, ground and drill hole surveys.

Most people complete a bachelor degree in science majoring in environmental science or a related field (such as geology or hydrology) to work as a hydrogeologist. It is also highly common to complete postgraduate studies. The average annual wage for a hydrogeoligist is $80, 000.

Sources: https://joboutlook.gov.au/occupations/hydrogeologists?occupationCode=234413

ADDITIONAL RESOURCES

The information in this handbook was collected from a number of useful sources. If you would like more information, visit these websites:

AUSTRALIAN RENEWABLE ENERGY AGENCY
www.arena.gov.au

NATIONAL SKILLS COMMISSION
www.nationalskillscommission.gov.au

CLEAN ENERGY COUNCIL
www.cleanenergycouncil.org.au

SUSTAINABILITY VICTORIA
www.sustainability.vic.gov.au

YOUR PLANET, YOUR FUTURE!

What career in renewable energy interests you?

Chat with your classmates, teacher, or career counsellor if your school has one, about the possible pathways you could take to make a positive impact on the environment in the future.

Stockland

stockland.com.au/sustainability