 Guide to conducting a school energy audit – Stages 2 to 5

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Why do an energy audit

Most of the energy used in schools comes from electricity and gas. An energy audit tells us how much, where and why energy is used in your school. This can lead to developing energy reducing strategies.

Environmental impacts

The use of energy from the burning of fossil fuels results in more of the gases (mostly carbon dioxide) that cause climate change, rising sea levels and ocean acidification.

Causes and effects

* One kilowatt hour (kWh) of electricity from burning coal results in about one kilogram (kg) of carbon dioxide (CO2).
* Burning one megajoule (MJ) of gas results in about 0.07 kilograms of carbon dioxide (CO2).
* The installation of air conditioning units in schools has already resulted in an additional 20,000 tonnes of greenhouse gas annually.

Benefits of reducing energy consumption

Reducing energy consumption:

* saves money
* reduces greenhouse gas emissions
* conserves the Earth’s non-renewable energy reserves.

How to do an energy audit

There are three methods of conducting an energy audit. A combination of all three provides the most comprehensive analysis. The energy audit methods are:

* Analyse the school’s electricity and gas bills and describe past energy use.
* Analyse energy use using an audit of appliances, [WebGraphs tool](https://www.webgraphs.com.au/Pages/Default.aspx) and the ERM energy online calculator. Note: ERM Business Energy is the department’s energy supplier, as at April 2018.
* Survey energy use in rooms and the school community about energy use.

Analyse the school’s energy bills

Obtain a copy of your school’s electricity and gas bills for the past 12 months and analyse them using the following procedures.

Electricity bill

1. From the front page of the bill find:
   * total cost (dollars – $)
   * greenhouse gas emissions (tonnes)
   * average daily usage (kilowatt hours – kWh).
2. Examine the other pages of the bill to find:
   * retail charges. The cost of electricity is different depending on the time of day power is used. For the department, as at April 2018, pricing times are as follows:
   1. peak 2pm–8pm
   2. shoulder 7am–2pm and 8pm–10pm. On weekends and public holidays the shoulder is extended to 10pm.
   3. off peak 10pm–7am
   * percentage of green power. Green energy is electricity from purchased from renewable energy sources. The department has ensured all schools pay at least 6% but a school can elect to pay more. At home a household can elect to pay 100% green energy.
3. Transfer information from the electricity bills to table 1. For the previous 12 months, add each column to calculate the school’s:
   * total number of billing days
   * total electricity cost
   * total greenhouse gas emissions
   * total average daily use (to be divided to find average daily use over the year).
4. Calculate the:
   * cost per day by dividing the total yearly cost by the total number of billed days
   * greenhouse gas emissions per person by dividing the total greenhouse gas emissions by the number of people at the school. Include staff and students.
   * average daily usage across the year by dividing the total of average daily usage by the number of billing periods. Note that the average daily use on the account includes school holidays and weekends.

Resource – [How to read your electricity bill](https://www.energymadeeasy.gov.au/help/electricity-bill), Australian Government

Table 1 – analysis of electricity use

| Billing period (which months?) | Number of days | Total cost ($) | Greenhouse gas emissions (tonnes) | Average daily usage (kWh) |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Total | Total | Total | Total |

Gas bill

1. From the front and other pages of the bill find:
   * total cost (dollars – $)
   * greenhouse gas emissions, if available, (kilograms – kgs). This may be presented in a graph.
   * average daily usage (megajoules – MJ)
   * gas usage for the billing period (megajoules – MJ).
2. Transfer information from the gas bills to table 2. For the previous 12 months add each column to calculate the:
   * number of billing days
   * total gas cost
   * total megajoules (MJ) used
   * total average daily use (to be divided to find average daily use over the year).
3. Calculate the:
   * cost per day by dividing the total yearly cost by the total number of billed days
   * greenhouse gas emissions per person by dividing the total greenhouse gas emissions by the number of people at the school. Include staff and students.
   * average daily usage across the year by dividing the total of average daily usage by the number of billing periods. Note that the average daily use on the account includes school holidays and weekends.

Resource – [How to read your gas bill](https://www.energymadeeasy.gov.au/help/gas-bill), Australian Government

Table 2 – Analysis of gas use

| Billing period (which months?) | Number of days | Total cost ($) | Megajoules used (MJ) | Average daily usage (MJ) |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Total | Total | Total | Total |

Analyse how the school uses energy

The three biggest energy users in a typical school are:

* heating and cooling (15%)
* lighting (55%)
* classroom and office equipment (8%).

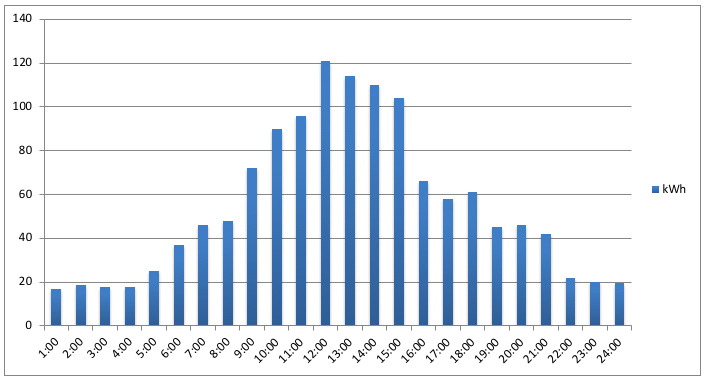
(Usage statistics sourced from [Energy management](https://education.nsw.gov.au/school-infrastructure-nsw/school-design-and-property-services/environment-sustainability/energy-management), School Infrastructure NSW.)

WebGraphs

[WebGraphs](http://www.webgraphs.com.au) enables easy analysis of the school’s energy consumption over various time scales from months to hours. The graph in figure 1 shows consumption over a 24 hour period. Over the night between 11.00pm and 4.00am the graph shows consumption of 18–20 kilowatt hours. This could be used as a springboard for students to investigate power consumption and power saving strategies when the school is empty, for example, turn off instantaneous hot water heaters overnight and compare to the next day’s consumption graph.

[WebGraphs](http://www.webgraphs.com.au) can also monitor the output of solar cells. To access [WebGraphs](http://www.webgraphs.com.au) email [datamgt@pluses.com.au](mailto:datamgt@pluses.com.au) for school username and login.

Figure 1 – Graph showing electricity usage in a school over a 24 hour period (01:00–24:00)



Energy using equipment

Although a time consuming procedure, an audit of all the energy using equipment in the school can reveal where most energy is being used. The department’s [Energy audit tool](https://cms.det.nsw.edu.au/amd/school-design-and-property-services/media/documents/Energy-audit-tool.xls) (XLS 114KB) provides estimates for various items and automatically calculates energy consumption based on number of items and hours in use.

Estimating the hours in use for thermostat-controlled devices is problematic but can be achieved with a power meter. Your local environmental education centre may be able to loan power meters.

ERM business energy

As at April 2018 the department’s energy supplier is [ERM Business Energy](https://www.ermpower.com.au/). This supplier enables a school to monitor its energy usage online. To gain access, phone the helpline on 1300 337676 and provide the school’s account number, which is found on the energy bill. A password can be created enabling access to usage reports. Ensure the dates in of the billing period are entered.

School survey

Surveying the school’s rooms and spaces, and the school community, will assist in finding where energy savings can be made through changes to appliances, attitudes and practices.

Students should work in teams, for example, a thermal team will have a interviewer/recorder and ‘scientist’ who measures temperature; the lighting and appliances team will have an interviewer/recorder and ‘scientist’ who measures light and power. There should be enough teams to sample a wide range of buildings and staff, for example, classrooms, canteen, office, staffroom, principal, teachers, office staff and cleaners.

Each team will need to be briefed on energy efficient practices. They will also need to be briefed on the use of equipment. Note that students will need special instruction and supervision when using power meters as appliances have to be plugged into them.

Students can use the suggested questions below or formulate their own questions. Following the survey, students analyse responses and investigations to identify problems and determine solutions. Finally, they develop a school energy plan to present to the school community.

Equipment list

* Thermometers and hygrometers for thermal survey
* Light meters for lighting survey
* Power meters, for example, Power-Mate or Power-Mate Lite, for plug-in appliances survey ([Power-Mate Light user manual](https://shop.ata.org.au/wp-content/uploads/2017/08/HYPERTEC_PML-Operators-Manual-V3-3302-200-10020.pdf) PDF 128KB)

Equipment may be able to be borrowed from your local environmental education centre.

Thermal comfort

Use these questions to assess and record the thermal comfort of each room or space. On each survey recording sheet, note the room number or name, the date and time and the name of the interviewer and ‘scientist’.

1. What is the inside temperature and humidity?
2. What is the outside temperature and humidity?
3. Is the air conditioner or heater on or off?
4. Are the windows and doors open or closed?
5. Are ceiling fans on or off?
6. What is the current temperature setting on the air conditioner or heater thermostat?
7. How do you ensure that air conditioners and heaters are not left on when the room is vacated for lengthy periods, for example, at lunch time and during sport?
8. Are blinds or curtains used to assist temperature control in the room?
9. Are air conditioner filters cleaned regularly?
10. Is the ceiling insulated?
11. Are roof ventilators installed? If so, are they on or off?
12. Is the room difficult to keep at a comfortable temperature in winter or summer?
13. Is there any shading of the room in summer, for example, external awnings, window blinds or trees?
14. Is the building heated by adjacent hard surfaces, for example, bitumen, concrete or a brick wall?
15. Can you suggest ways to reduce the energy used to maintain thermal comfort in this room or in other parts of the school?

Lighting

Use these questions to assess and record the lighting of each room or space. On each survey recording sheet, write the room number or name, the date and time and the name of the interviewer and ‘scientist’.

1. How do you ensure that lights are turned off when the room is vacated?
2. Are energy efficient light sources being used?
3. Are the light lenses or covers clean?
4. What are the room lighting levels? Measure the lighting range with a light meter. Note if the blinds are up or down when taking light readings.
5. Are the light readings above or below the recommended levels listed in table 3? Note: The room should be within 20 Lux of the standard. If a reading is 50 Lux above the standard, the room can be considered over-illuminated and wasting energy.
6. Can you suggest ways to reduce the school’s light energy use?

Table 3 – Required lighting level for secondary schools, in accordance with Schools facilities standards, Version 1.14, 01/03/2008

| Room or space | Recommended light (Lux) |
| --- | --- |
| Corridors, passage ways, storerooms | 80 |
| Libraries, laboratories, classrooms, kitchens, administration areas, canteen, toilets | 160 |
| Visual arts and performance studios | 240 |

Plug-in appliances

Use these questions to assess and record the power consumption and usage of plug-in appliances in each room or space. The power consumption of appliances can be checked using power meters, which may be available for loan from your local environmental education centre.

On each survey recording sheet, write the room number, date, time and name of the interviewer and ‘scientist’.

Plug-in appliances survey questions:

1. When not in use are computers on stand-by, turned off or on screen saver?
2. What is the power consumption of computers in use and on stand-by?
3. Do the school photocopiers, printers and fax have an energy saver mode? Is it being used?
4. What other appliances are left on when they can be switched off or put on a timer, for example, instant boiling water heaters and appliances in the canteen?

School energy management analysis

Use tables and graphs to organise and represent the data collected in the usage analysis and school surveys. Compare your school’s electricity use with that of similar sized schools. Table 4 shows the average electricity use per student per year in 2010. Use the [School energy stars calculator tool](https://www.sustainableschoolsnsw.org.au/sites/sustainableschoolsnsw.org.au/files/files/schools-calculator-energy.xls) to rate your school in energy use.

Table 4 – Average electricity use per student in schools, 2010

| School classification | P1 | P2 | P3 | P4 | P5 | P6 | S8 | S9 | C |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 2010 NSW average kWhr per student per year | 225 | 249 | 262 | 305 | 431 | 897 | 387 | 490 | 481 |

Energy management checklist

The following checklist can assist in analyzing the survey information and may also identify other questions that need to be asked about energy management in the school.

Heating and cooling

* Air conditioners are thermostatically controlled to 260C–280C in summer and 170C–190C in winter.
* Timers are used to ensure that air conditioning is turned off outside operating hours.
* Blinds, windows and fans are used to maintain thermal comfort before using air conditioners.
* External louvres or awnings are used to regulate winter sun and summer shade.
* Landscaping is used to enable winter sun and summer shade and provide non-reflective surfaces.
* Roof turbo extractor vents are open in winter and closed in summer.
* Buildings are well insulated.
* Air conditioner systems are regularly serviced to achieve maximum working efficiency.
* Filters in reverse cycle air conditioning systems are regularly cleaned.

Lighting

* Lighting is adequate but not excessive.
* Energy efficient lights such as LEDs are used wherever possible.
* Lighting lens covers are kept clean.
* Systems, such as motion sensors, are in place to ensure that lights are not left on unnecessarily.

Equipment and appliances

* Systems are in place to ensure that computers and other plug-in energy appliances are turned off, put into standby or energy saving mode at appropriate times.
* Timers are used on plug-in appliances.
* Electric kettles are used instead of instant hot water heaters in small staff areas.
* Instant hot water heaters are turned off outside school hours.
* Electrical appliances have a five or six star energy rating.
* Refrigerators and freezers are properly serviced to maintain operating efficiency.
* The school has solar thermal water heaters.

Green energy and carbon offsets

* The school produces green energy from solar panels and or wind turbines.
* The school has opted to purchase green energy.
* The school recognises the value of planting trees to absorb carbon dioxide.
* People are encouraged to travel to and from school in the most energy efficient way.

Growing trees to absorb carbon dioxide

Through photosynthesis, trees absorb carbon dioxide from the atmosphere and convert it into structural materials such as cellulose. About half a tree’s mass is the carbon in these structural chemicals that make the woody roots, branches and leaves. This natural process is part of the carbon cycle and is known as bio-sequestration. In most ecosystems, the majority of the carbon is stored below ground, either as roots and decaying biomass, or as organic carbon in the soil. The carbon is released back into the atmosphere when the wood decomposes or is burnt.

With a tree [carbon calculator](https://www.northsydney.nsw.gov.au/Waste_Environment/Trees/Measuring_Carbon_in_a_Tree) students can make a simple measurement of trees in the school and be given an estimate of just how much carbon they store. Measurements in successive years can be used to find out how much carbon was absorbed, noting that individual trees would need to be identified.

The carbon dioxide absorbed by trees in the school can be subtracted from the carbon dioxide produced by the school’s energy consumption, that is, a carbon offset. Trees can also improve the biodiversity of the school grounds and provide shading from summer sun.

Table 5 – Carbon stored in trees at school

| Tree identification code | Tree girth (cm) at 1.3m | Carbon dioxide equivalent (Kgs) |
| --- | --- | --- |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

School energy management plan

Discuss the results of the energy audit, identify problems and use brainstorming and research to come up with agreed solutions and energy efficiency targets. Energy saving ideas are listed in the resources and energy saving tips pages.

Use the following format to develop a school energy management plan. Present the plan to the school using a multimedia format such as Powerpoint or Keynote slides or creatively through the arts.

Energy plan contents

Energy consumption

* State how many tonnes of greenhouse gas your school produced in the last 12 months.
* Translate this to tonnes per person at the school.
* State the total cost of the school’s electricity usage over the last 12 months.
* Include a graph generated from the energy audit calculator to show cost in dollars or carbon dioxide (CO2)production. The example provided in figure 2 and table 6 shows that air conditioners were the biggest users of electricity in the school.

Figure 2 – Graph showing cost per year of energy using equipment in a school

Column graph representing cost per year of energy use in a school. The data represented is listed in Table 6. 

Source: [Energy ppt, reporting template](http://www.rumbalara-e.schools.nsw.edu.au/documents/230888/231169/energy_action_plan_1323141477575.ppt), Rumbalara Environmental Education Centre

Table 6 – Cost per year of energy using equipment in a school

|  | Other | Fans | Computers | Freezer | Fridge | Lights | Water heater | Air conditioner |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Cost per year | 114 | 249 | 262 | 305 | 431 | 897 | 387 | 4,000 |

Energy survey results

* List the key findings of the thermal energy survey.
* List the key findings of the light energy survey.
* List the key findings of the plug-in appliances survey.

Our energy action plan

* List the main problems. For example:
  + In some rooms there are more lights on than needed
  + Heaters are left on longer than required
  + Air conditioners are left on all day and sometimes while doors and windows are open.
* List the agreed solutions. For example:
  + Remove fluorescent tubes where they are not needed
  + Keep a thermometer in the room to monitor temperature. Turn off heaters at a designated temperature, for instance, when everyone is comfortable wearing a jumper.
  + Educate the school community about the efficient use of air conditioners.
* State the annual target. For example:
  + Reduce energy use from fossil fuels to 0.16 tonnes of greenhouse gases per person – 35.2 tonnes in the next 12 months, a saving of 9.2 tonnes of greenhouse emissions.

Resources and energy saving tips

On average, lighting, heating and cooling account for 70% of electricity use in NSW public schools.

The following information can be used when considering ways to reduce electricity use and become more energy efficient in the school. The department’s [energy management](https://education.nsw.gov.au/school-infrastructure-nsw/school-design-and-property-services/environment-sustainability/energy-management) and [thermal management](https://education.nsw.gov.au/school-infrastructure-nsw/school-design-and-property-services/environment-sustainability/thermal-management) pages provide further energy saving and school contract information.

Use the energy saving ideas when discussing solutions to identified problems in the development of your school energy management plan.

Heating and cooling

Avoid using heaters and cooling systems by:

* encouraging students to dress for the climate and then heat and cool only the areas that are necessary
* setting the thermostat to 260C–280C in summer and 170C–190C in winter. A change of one degree can reduce heating and cooling greenhouse gas emissions by 10-20%.
* minimising the use of electric fan heaters
* engaging students in physical activity regularly throughout the day in winter, for example, walk ten minutes around the school oval and surrounding areas.

Switch off:

* gas heaters and boiler pilot lights over summer and on holidays
* fans when leaving the room, even if only for a few minutes.

Manage the building by:

* insulating ceilings and walls where possible. Insulation reduces heat flow by around 80%. Ceiling insulation can reduce heating and cooling costs by 20–30%.
* installing roof ventilators to extract hot air
* avoiding direct sun through windows in summer through external shading, window blinds or solar film. External shading is more effective than internal blinds for keeping the heat out.
* planting trees to provide summer shading of classrooms. Refer to the department’s landscaping for thermal management advice on the [thermal management](https://education.nsw.gov.au/school-infrastructure-nsw/school-design-and-property-services/environment-sustainability/thermal-management) page.
* opening windows on opposite sides of the room to provide cross ventilation
* reducing hot and cold draughts through doors by weather stripping
* sealing off exhaust fans and science room fume cupboards when not in use in winter to reduce hidden leaks
* experimenting to see what allows more light in – covering the top of the windows or the bottom
* using ceiling fans on low settings to recirculate warm air from the ceiling in winter in rooms with high ceilings
* considering other thermal comfort design solutions listed on the department’s [thermal management](https://education.nsw.gov.au/school-infrastructure-nsw/school-design-and-property-services/environment-sustainability/thermal-management) page.

Air conditioners are big users of energy. Save energy when using an air conditioner by:

* closing doors and windows whenever heaters or air conditioners are running to keep winter heat in, and summer heat out
* setting the thermostat to 260C–280C in summer and 170C–190C in winter
* checking the temperature after the air conditioner has been operating for 30 minutes
* adjusting the louvres to point them towards the ceiling when cooling and towards the floor when heating (as cool air falls, hot air rises)
* following the manufacturer's instructions for filter cleaning
* ensuring heaters and air conditioners are switched off when not required. Timers can be programmed to automatically switch them off towards the end of the school day.
* installing air conditioners and split systems on the shady side of the building, or shade the air conditioner itself, making sure the air flow around it isn't obstructed.

Lighting

Encourage staff and students to switch off lights:

* at recess, lunch time and at the end of the day. Classes could nominate lights monitors.
* that are not in use. Place reminder stickers or posters near doors.

Remove or upgrade lights by:

* taking out unnecessary fluorescent tubes, especially where there are more than two lights in a fitting or next to windows
* replacing incandescent globes with LEDs. LEDs have greater lifespans, give off less heat and enable electricity savings of 40% to 90%. Information on school LED upgrades is on the department’s [energy management](https://education.nsw.gov.au/school-infrastructure-nsw/school-design-and-property-services/environment-sustainability/energy-management) page.

Install lighting controls by:

* installing motion detectors to turn on and switch off lights after a pre-set time of no movement
* installing timers or controls that turn on and off lights across the school outside of school hours.

Maintain lights by:

* having them cleaned regularly. Lights perform more efficiently when they are clean.
* ensuring faulty lights are replaced promptly
* replacing older style 40 watt fluorescent tubes (40 millimetres diameter) with thinner (26 millimetres) 36 watt tubes.

Energy using equipment

Reduce greenhouse gas emissions by:

* activating the energy saving modes on computers, photocopiers and printers
* putting a timer on boiling water units and switching them off overnight and over school holidays. These units are usually left on for 24 hours a day for 365 days of the year producing between 2,000–3,000 kilograms of greenhouse gas per year.
* using an electric kettle instead of the boiling water unit in smaller staff areas
* using ceiling fans instead of air conditioners
* minimising the use of electric heaters such as bar radiators, oil column heaters or fan heaters. Gas heaters or reverse cycle air conditioners are more efficient.
* turning off gas heaters and boiler pilot lights over school holiday periods
* making energy smart choices when purchasing new appliances and equipment.

Carbon offsets

Removing and storing carbon dioxide can offset the carbon dioxide produced through the use of energy from coal-fired power stations. Plants have evolved an ingenious way of doing this called photosynthesis where sunlight energy is used to turn carbon dioxide into carbon compounds. Some of these compounds, for example, cellulose are used in building the plant as it grows and are therefore locked away until the plant is eaten, decomposes or burns. At this point the carbon compounds in the tree are turned back into carbon dioxide and the cycle is complete. The amount of carbon stored in a tree can be calculated using an [online carbon calculator](https://www.northsydney.nsw.gov.au/Waste_Environment/Trees/Measuring_Carbon_in_a_Tree) from a measure of the girth of the tree.

Renewable energy

Australia is the highest per capita emitter of greenhouse gases in the world. Only a mere 13% of Australia’s electricity is generated from renewable energy – clean, non-polluting energy. Over 70% of Australia’s greenhouse gases come from electricity generated by burning coal, making electricity the biggest single contributor to Australia’s greenhouse emissions.

Switching to [GreenPower](https://www.greenpower.gov.au/) is an investment in the renewable energy sector, helping it to compete with coal on price and stimulating the development of renewable energy in Australia. Schools can elect to increase the contribution made from GreenPower with the department’s supplier, ERM Energy (as at April 2018), currently the minimum is 6%.

Sustainability action process

Use the [sustainability action process](https://education.nsw.gov.au/teaching-and-learning/curriculum/learning-across-the-curriculum/sustainability/sustainability-action-process) as a scaffold for students’ energy investigations and energy efficiency planning.

Teaching and learning resources

Further resources, activities and case studies are available on the department’s learning across the curriculum sustainability [energy teaching and learning resources](https://education.nsw.gov.au/teaching-and-learning/curriculum/learning-across-the-curriculum/sustainability/teaching-and-learning-resources/energy) page.

Resource portals managed by environmental and sustainability education providers are listed on the department’s [sustainability further information](https://education.nsw.gov.au/teaching-and-learning/curriculum/learning-across-the-curriculum/sustainability/further-information) page. [Sustainable Schools NSW](https://www.sustainableschoolsnsw.org.au/about) is now managed by the Australian Association for Environmental Education NSW and has a rich resource portal.

Syllabus links

Energy audits provide opportunities for learning across several subject areas as listed below.

Mathematics

Students work mathematically in collecting, analysing and representing data.

English

Students use literacy skills in interviewing, collaborating and communicating proposed energy efficiency strategies.

Science and technology

Investigations into energy forms and sources uses working scientifically skills in support of the Science and Technology K–6 Syllabus and Science 7–10 Syllabus in:

* Stage 1 Earth and space – conservation of Earth’s resources
* Stage 2 Physical world – energy makes things happen
* Stage 3 Physical world – transfer and transformation of energy, forces of energy in products and systems
* Stage 4 Physical world – efficiency of energy conversions
* Stage 4 Earth and space – how scientific understanding influences choices
* Stage 5 Earth and space – use of scientific knowledge.

The design and production of energy efficient solutions can support the technology context of engineered systems in the Technology Mandatory 7–8 Syllabus.

Geography

Investigations into environmental changes relating to energy production can be undertaken as part of investigations in the Geography K–10 Syllabus in:

* Stage 2 The Earth’s environment – significance of environments; protection of environments
* Stage 3 Factors that shape places – factors that change environments
* Stage 5 Environmental change and management – environmental change.

Syllabus links per activity

Conducting an energy audit as project based learning enables the development knowledge and skills content across several KLAs as shown in table 6. Note: Listed outcomes may apply to more than one activity.

Table 6 – Suggested syllabus links per activity

| Activities | Knowledge and understandings outcomes | Skills outcomes |
| --- | --- | --- |
| Explore sources and uses of energy.  Investigate energy transformations.  Research the effects of energy use on the environment.  Research the causes of climate change and the predicted changes.  Discuss ways to reduce energy use in the school. | Science and technology K–6  ST1-8PW-S describes common forms of energy and explores some characteristics of sound energy  ST3-8PW-ST explains how energy is transformed from one form to another  Science 7–10  SC4-13ES explains how advances in scientific understanding of processes that occur within and on the Earth, influence the choices people make about resource use and management  SC5-13ES explains how scientific knowledge about global patterns of geological activity and interactions involving global systems can be used to inform decisions related to contemporary issues  SC4-11PW discusses how scientific understanding and technological developments have contributed to finding solutions to problems involving energy transfers and transformations  SC5-11PW explains how scientific understanding about energy conservation, transfers and transformations is applied in systems | Science and technology K–6  ST2-1WS-S questions, plans and conducts scientific investigations, collects and summarises data and communicates using scientific representations  ST3-1WS-S plans and conducts scientific investigations to answer testable questions, and collects and summarises data to communicate conclusions  Science 7–10  SC4-6WS follows a sequence of instructions to safely undertake a range of investigation types, collaboratively and individually  SC5-6WS undertakes first-hand investigations to collect valid and reliable data and information, individually and collaboratively |
| Examine past electricity and gas bills to assess past energy usage in the school.  Calculate the amount of greenhouse gases produced by the school.  Graph energy usage over a one year period.  Analyse data. | Mathematics K–6  MA2-18SP selects appropriate methods to collect data, and constructs, compares, interprets and evaluates data displays, including tables, picture graphs and column graphs  MA3-18SP uses appropriate methods to collect data and constructs, interprets and evaluates data displays, including dot plots, line graphs and two-way tables | Mathematics K–6  MA2-1WM uses appropriate terminology to describe, and symbols to represent, mathematical ideas  MA3-1WM uses appropriate methods to collect data and constructs, interprets and evaluates data displays, including dot plots, line graphs and two-way tables  Science 7–10  SC4-7WS processes and analyses data from a first-hand investigation and secondary sources to identify trends, patterns and relationships, and draw conclusions  SC5-7WS processes, analyses and evaluates data from first-hand investigations and secondary sources to develop evidence-based arguments and conclusions |
| Survey the school community to ascertain knowledge and attitudes to energy use. | Geography K–10  GE2-3 examines differing perceptions about the management of places and environments  GE3-4 compares and contrasts influences on the management of places and environments  GE-5-5 assesses management strategies for places and environments for their sustainability | Geography K–10  GE2-4 acquires and communicates geographical information using geographical tools for inquiry  GE3-4 acquires, processes and communicates geographical information using geographical tools for inquiry  GE5-7 acquires and processes geographical information by selecting and using appropriate and relevant geographical tools for inquiry |
| Develop a school energy management plan.  Communicate school energy management plan to the school community.  Implement energy plan. | Technology mandatory 7–8  TE4-10TS explains how people in technology related professions contribute to society now and into the future | Technology mandatory 7–8  TE4-1DP designs, communicates and evaluates innovative ideas and creative solutions to authentic problems or opportunities  English K–10  EN2-1A communicates in a range of informal and formal contexts by adopting a range of roles in group, classroom, school and community contexts  EN3-1A communicates effectively for a variety of audiences and purposes using increasingly challenging topics, ideas, issues and language forms and features  EN4-3B uses and describes language forms, features and structures of texts appropriate to a range of purposes, audiences and contexts  EN5-3B selects and uses language forms, features and structures of texts appropriate to a range of purposes, audiences and contexts, describing and explaining their effects on meaning |

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[Science and Technology K-6 Syllabus](https://educationstandards.nsw.edu.au/wps/wcm/connect/5ab69646-f1d4-404b-9c16-b39dfb0986d3/science-and-technology-k-6-syllabus-2017.pdf?MOD=AJPERES&CVID=) © NSW Education Standards Authority (NESA) for and on behalf of the Crown in right of the State of New South Wales, 2017

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