



The vital force, the spark that makes things happen in our world

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Foreword

Why An Energy Resource?

The resource helps teachers

- enable students to increase their knowledge of energy sources and the impact these have on the environment
- facilitate students in making positive changes to their energy behaviours

What Is The Resource?

This resource is a combination of several peoples' work. (Where Enviroschools activities have been used the Enviroschools Foundation font has been kept). We hope that it will provide more options and information for teachers for learning around the energy theme.

It has been designed mainly in the inquiry learning style. The resource also includes activities that range from those suitable for Year 1 to Year 8. Most activities are able to be adapted.

This resource includes information and activities on:

- power generation
- electricity
- energy use
- energy efficiency
- electrical safety

Included is a teaching resource with:

- suggested unit plan
- background teacher information
- student activities
- relevant websites

Also available are:

- an Energy Kit or 'box of goodies' with monitoring and hands-on equipment for students
- a large model energy efficient 'house'

Acknowledgements

The development of this resource has been a joint effort with Eastern Bay Energy Trust, GreenGauge, The Enviroschools Foundation and Bay of Plenty Regional Council. The compilation of the energy kit and creation of the 'house' have been thanks to Eastern Bay Energy Trust.

Thanks to the working group of Louise Maple, Esther Mae, and Kerry Gosling. Thanks also to

Environment Waikato for the use of Investigating Energy in Schools. The resource would not have looked the same without the many illustrations from Nikki Slade-Robinson, The Enviroschools Foundation, and the graphic designing skills of Adria Harper – many thanks.

How To Use This Resource

This resource has been designed in line with the Enviroschools Action Learning Cycle which uses inquiry learning as the base. It is student learning leading to decision making and action. The activities within the resource are a mixture of learning styles reflecting the variety of the people involved in writing for it.

www.tki.org.nz – science online

Section 5 'Energy sources' could be done by working through some of the activities as a class or with individual students choosing their direction.

The resource has been designed as a 'pick and mix' with clear curriculum links. This is to assist you with ensuring you have covered the areas that you want, in whichever way best suits the needs of your students.

Although the resource has been aimed at L2 - 4 many of the activities are easily adaptable for other levels.

Eastern Bay Schools – for a great learning experience start to your unit contact Green Gauge.
Email: greengauge@xtra.co.nz or phone 07 315 4623 or Eastern Bay Energy Trust 07 307 0893.

There is an Energy Kit or 'box of goodies' with monitoring and hands-on equipment for students from Bay of Plenty Regional Council's Education Officers.

All areas also have the "Energy House" for use. This is a coreflute 'house' with pictures of people using energy and saving energy in a variety of ways. It is a great starter activity.

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Energy Learning Guide

Outcomes

- To compile a map that shows the location and use of energy in the school including where it comes from, where it goes, and areas for improvement
- To develop “a pool of knowledge” about energy, its sources and forms, any issues with its use and potential solutions
- To discuss and identify ways in which students can contribute to ongoing energy efficiency action
- To put into action those feasible solutions

Key Concepts

- Energy is a natural resource
- Energy takes many forms and can change forms
- Some energy sources are better for the environment than others
- Using energy wisely

Objectives

Students will develop an understanding of:

- energy in the environment and our connection to it where our energy comes from and how we use it how our use of energy affects the environment
- observe, question, monitor and make sustainable decisions about energy individual and collective responsibility for efficiently using energy guardianship of our natural resources
- the efficient and sustainable use of energy; and safety around energy

Background Text

Energy is the vital force, the spark that makes things happen in our world. So looking at how we use energy is an essential part of creating more sustainable schools and communities.

We use energy in our homes and schools to make our machines work and to light and heat our rooms. When we see a car driving down the road, we are watching the stored energy from millions of years ago being burnt up to create movement. However, as we use energy to make our lives more convenient and comfortable, we also create an environment that is increasingly polluted, noisy and expensive to maintain. Finding a balance between these benefits and impacts is a challenge that creates many learning possibilities. Solutions lie not only in technological advances, but also in the choices we make in our everyday lives.

Energy is important to everyone and it is all around us in our school and surrounding environment. Energy is needed for plants, animals and people to grow and be active. It is the force behind waves, tides, winds, waterfalls and the flow of rivers to the sea. When we see water evaporating, or we feel the warmth of the sun on our skin, that is the heat of the sun's energy. When we hear leaves rustling in the trees, we are hearing the movement caused by the energy of the wind.

Forms of energy are experienced in the breath of Tawhirimatea, the warmth of the mighty Tamanuitera and the restless rumblings of Ruaumoko - the youngest child of Rangi and Papa, still beneath the ground. While many of these forces of nature can seem like huge and inexhaustible sources of power, our everyday energy use is depleting some non-renewable forms of energy like coal, oil and gas. Harvesting renewable sources also creates impacts. Burning wood contributes to climate change and hydro-dams result in dramatic habitat disruptions.

However, we can use our own energy to take actions and create change. In Maori terms this is the concept of hiringa, that drives us on to overcome the challenges and barriers which appear before us. We can achieve even more by working as a team (mahi ngatahi) and combining our energies, than if we were all working individually (the synergy effect).

We can use our combined energies to address the problems with our energy-intensive lifestyles. We can look at how to cut down on our use of electricity and fuel (at school, at home and in our transport) and maybe even generate our own power from clean, renewable, local sources.

Overview of the Learning Guide

1 What do you know now?

Purpose: To determine your understanding of energy and begin building your collective knowledge

Key question

- What do you know and feel about energy?

2 What can you observe?

Purpose: To build on your current knowledge through observation in your surroundings

Key questions

- How and where can you observe energy?
- What can you measure?

3 What can you measure?

Purpose: To conduct a detailed survey of energy use in your school

Key questions

- How much energy do you use and waste?
- What can you learn?

4 What can you learn?

Purpose: To explore key concepts in greater depth and relate them to your school situation

Key concepts

- 4a There was a time before electricity
- 4b Energy is a natural resource
- 4c Energy takes many forms and can change forms
- 4d Some energy sources are better for the environment than others
- 4e Using energy wisely

5 What can you learn about the different energy sources?

Purpose: To explore key concepts in greater depth and relate them to your school situation

Key concepts

- 5a Energy from the sun
- 5b Energy from the wind
- 5c Energy from water and geothermal energy

6 What are some extra activities?

7 What would you change if you could? What action will you take?

Purpose: To recap, summarise and reflect on your learning. To encourage positive actions being taken.

Key questions

- What do your Map and Pool of Knowledge tell you about your school's energy use?
- Is this how you want it to be?
- What actions can you take?

Energy- Action Learning Cycle



Energy links

NZ Curriculum

Vision - Young people who are confident, connected and actively involved in lifelong learning and action for efficient energy use and the changing technologies of it.

Values

- caring and respect for the environment
- a belief in the importance of renewable energy
- an awareness of the need for individual and group action in conserving non-renewable energy resources
- a respect for the beliefs and values of others

Key competencies

- thinking managing self relating to others
- participating and contributing

Principles

future focus learning to learn community engagement

It is hoped that students will:

Know and understand that

- energy is a natural resource
- energy takes many forms and can change form
- some energy sources are better for the environment than others
- energy resources need to be used wisely

Further develop the following skills

- collecting information from a range of sources expressing own views and ideas
- organising, planning, and implementing an environmental project
- comparing, contrasting and evaluating information to make connections and generalisations
- working co-operatively and collaboratively with others in a project and demonstrating ability to compromise, negotiate and collaborate
- estimating, calculating, interpreting information using tools and materials safely

and

- develop a sense of responsibility through participation and action as individuals (and small groups) to address energy issues
- make a choice about possible action and justify this choice

Guidelines To Environmental Education In New Zealand

Key concepts

- sustainability
- personal and social responsibility and action

Key dimensions

IN, ABOUT, FOR

Enviroschools

Kaupapa

- sense of place participatory
- sense of purpose

Key areas

- programme (living curriculum)
- people (organisational practices)
- practice (operational practices)
- place (physical surroundings)

Principles

- environmental education
- sustainable communities
- empowered students
- Māori perspectives
- respect for the diversity of people and cultures

Through this broad base it is hoped that students will be able to

- recognise, suggest and display energy efficient behaviours discuss energy and its impact on people and the environment
- explain different sources of energy and their impact on the environment
- identify issues, investigate, problem solve and report regarding environmental issues
- have a sense of responsibility through having participated and taken action as an individual or part of a group in addressing an energy issue

Links to Learning Areas

Science

Students will

- Nature of Science
 - understand and apply the scientific process of investigation
 - explore and act on issues and questions that link their science learning to their daily lives
 - use their growing science knowledge when considering issues of concern to them
 - explore various aspects of an issue and make decisions about possible actions
- Planet Earth and Beyond - Earth Systems
 - develop an understanding of the earth's energy related resources
- Physical World
 - explore every day examples of physical phenomena e.g. electricity

Social Sciences

Students will understand

- that people have social, cultural, and economic roles, rights, and responsibilities
- how people make choices to meet their needs and wants
- how time and change affect people's lives
- how places influence people and people influence places
- how people make significant contributions to NZ's society
- how people make decisions about access to, and use of resources

Technology

Students will

Nature of technology

- understand that technology both reflects and changes society and the environment, and increases people's capability

Math

Students will

Statistics

conduct investigations using the statistical enquiry cycle:

- gathering, sorting, and displaying multivariate category and whole-number data and simple time-series data to answer questions
- accurately measuring and recording data
- identifying patterns and trends in context, within and between
- data sets communicating findings, using data displays

English

All aspects of this curriculum area are relevant

Health & Physical Education

Students will

Healthy Communities and Environments

- explore how people's attitudes, values, and actions contribute to a healthy environment identify and use local community resources and explain how these contribute to a healthy community
- contribute to and use simple guidelines and practices that promote physically and socially healthy classrooms, schools and local environments
- plan and implement a programme to enhance an identified social or physical aspect of the classroom or school environment

Safety management

- identify risk and use safe practices in a range of contexts e.g. electrical safety

The Arts

Students will

Communicating and Interpreting in the Arts

- share the ideas, feelings and stories communicated by their own and others' objects and images

Energy Learning Planner

Activities

MAC - Mac Millan Publishers Energy in our Lives

Week 1

1 What do you know?

- 1.1 Brainstorm
 - 1.2 Magazine mindmap
 - 1.3 Blackout
 - 1.4 Use your initiative
 - 1.5 What do we know now?
- Little Green Reader – I Use Energy (MAC) - in Energy kit

2 What can you observe?

- 2.1 Energy treasure hunt
- 2.2 Wind and sun
- 2.3 Personal energy log
- 2.4 Be an energy saving detective
- 2.5 Where is it all going?

Week 2

3 What can you measure?

- Energy Kit - powermate
Background text - Data collection - what will I need?
Background text - What wattage?
- 3.1 Weather and energy usage
 - 3.2 Reading an energy account
 - 3.3 Energy use profile
 - 3.4 Data collection sheets
 - 3.5 Energy annual summary
 - 3.6 Energy walk through audit
 - 3.7 School energy audit – in-depth
 - 3.8 How much does it use?
 - 3.9 Home and transport energy audit

Week 3

4a What can you learn? – What was it like?

- 4a.1 Time before electricity
- 4a.2 Times change

Weeks 4 – 7

4b What can you learn? – Energy is a natural resource

Background text - Energy is a natural resource

- 4b.1 Introducing electricity
- 4b.2 Energy in the natural world
- 4b.3 Maui gets fire from Mahuika
- 4b.4 What makes them go?
- 4b.5 Play the Energy Game
- 4b.6 Lemon Power

4c What can you learn? – Energy takes many forms and can change forms

Background text - Energy what is it?

Background text - The Electricity Industry

- 4c.1 Types of energy
- 4c.2 Exploring energy
- 4c.3 Balloon Rocket Experiments
- 4c.4 Energy Transfer
- 4c.5 Renewable and Non Renewable Energy Sources
- 4c.6 Let's Talk About It
- 4c.7 Where does it come from? How does it change?
- 4c.8 Electricity to our home
- 4c.9 Where do we get our power from?
- 4c.10 Switch on – Switch off
- 4c.11 Connect it
- Teacher information - Scientific Inquiry
- 4c.12 Conductor or insulator

4d What can you learn? – Some energy sources are better for the environment than others

Background text - Our atmosphere is changing

- 4d.1 Energy options
- 4d.2 Impacts
- 4d.3 Energy and electricity: sources and uses
- 4d.4 Electricity Generation Sources
- 4d.5 Electricity Supply

4e What can you learn? – Using energy wisely

Background text - Using energy wisely

- 4e.1 Various Values
- 4e.2 Energy Alternatives
- 4e.3 Try this out
- 4e.4 See the light
- 4e.5 The lighthouse
- 4e.6 Energy Efficient Kitchen
- 4e.7 Electricity Use at Home
- 4e.8 What a Waste of Energy
- 4e.9 B.E.S.T - Brilliant energy saving trail

- 4e.10 Energy efficiency at home
- 4e.11 Keep it or lose it
- 4e.12 Safe and Smart
- 4e.13 Stay safe
- 4e.14 Safety sleuth search

5a Energy sources – Energy from the sun

Background text - Energy from the sun

- 5a.1 Make a solar cooker
- 5a.2 Solar Energy – almost all our energy comes from the sun

Little Green Readers (MAC)

- Making Use of Solar Energy
- Making a Solar Water Heater
- Solar Cooker
- Power from the Sun

Schoolgen - www.schoolgen.co.nz

- Benefits of solar panels
- What's cooking with solar?
- Harnessing solar energy
- Warming it up using solar energy

5b Energy sources – Energy from wind

Background text - Energy

- 5b.1 How to make a windmill
- 5b.2 Wind generation

Little Green Readers (MAC) in Energy Kit

- Blow wind blow
- The big wind race

5c Energy sources – Energy from water and geothermal

Background text - Energy from water

Background text – Energy from geothermal

- 5c.1 Make a turbine (1)
- 5c.2 Make a turbine (2)
- 5c.3 Using geothermal energy

Little Green Readers (MAC) in Energy Kit

- Water power
- Making a water wheel

6 Extra activities

- 6.1 Energy scramble - word meanings
- 6.2 Energy word search
- 6.3 Energy word snakes
- 6.4 Energy maze
- 6.5 Energy tangle
- 6.6 Energy safety

Weeks 8 – 10 and beyond

7 What would you change? ... Action!

- 7.1 Energy Vision mapping
- 7.2 Action Planner
- 7.3 Design Planner
- 7.4 Task Programmer
- 7.5 B.E.S.T Seats in the Class
- 7.6 SOS Save our school
- 7.7 School energy saving
- 7.8 Make a difference
- 7.9 Get the message out
- 7.10 Agent B.E.S.T

Goals reached at end of unit

Reflective assessment

Sustainable Schools

Possible Energy Actions

Look at the examples given in the four areas of school life below. Can you add others that will enhance the sustainability of Energy within your school?

Place / Wahi - physical surroundings

Ecological and participatory design to

- create shade and air flow in summer, warmth and light in winter. This could include building design, fittings, and landscaping
- design new buildings to incorporate renewable energy sources, retro-fit existing buildings
- create healthy and environmentally friendly classrooms, roads, grounds and car parking zones that reflect a respect for nurturing people and nature

Programmes / Kaupapa Ako - a living curriculum

Integrating education for sustainable energy use into all aspects of school life will enable students and teachers to

- take informed action on reducing energy use and using sustainable sources
- promote critical thinking on resource use and lifestyle. e.g. through the use of activities and resources, current issues
- promote reflection on personal value and use of energy, and encourage discussion with family and community

People and Participation / Tangata - organisational management

Participatory and democratic school management will enable

- good communication with all concerned
- the ability to carry out self auditing and monitoring
- include everyone in the school and community when making decisions, creating policies
- draw on the combined wisdom of different cultures and their skills and values towards energy that work in harmony with nature
- instil a personal desire to make a difference

Practices / Tikanga - operational practices

Sustainable practices in day to day running of the school enables students and staff to

- reduce energy use and create ways to use alternative, sustainable sources e.g. school travel systems (bus, walking, cycling, school trips, staff travel), insulation, heating, air circulation (shut doors or open doors depending on the weather, temperature etc), turning off lights, heaters, computers when not in use
- develop signs to encourage appropriate behaviour for energy use
- choose environmentally friendly sources and products (solar water heating, photo voltaic cells, energy efficient appliances, buy locally produced products)
- be more aware of natural energy
- be safe around electrical appliances

