

Energy Management Overview

Presented by
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for

Canterbury Education Services

Topics

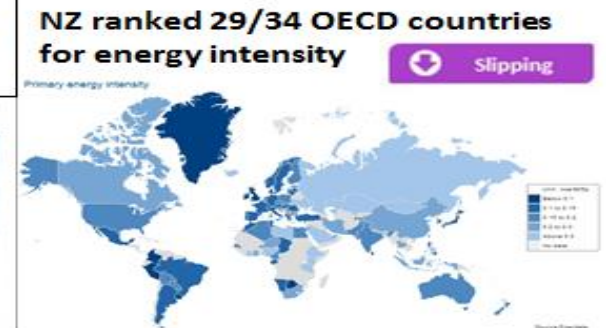
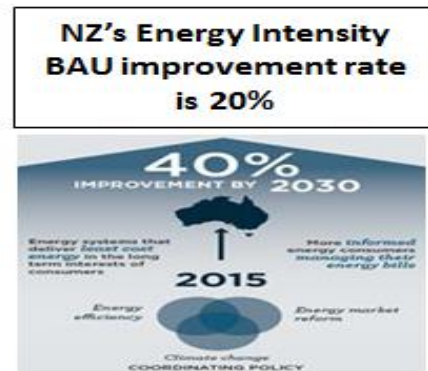
- International context
- NZ energy use and savings targets;
- Energy use by schools;
- Energy savings potential in schools;
- Examples of energy savings measures in schools.

NZEECS Overview

- Energy and climate context
 - International
 - Our situation
- Government direction
- Multiple benefits of energy efficiency and renewable energy
- Energy efficiency potential and barriers
- Update on NZEECS

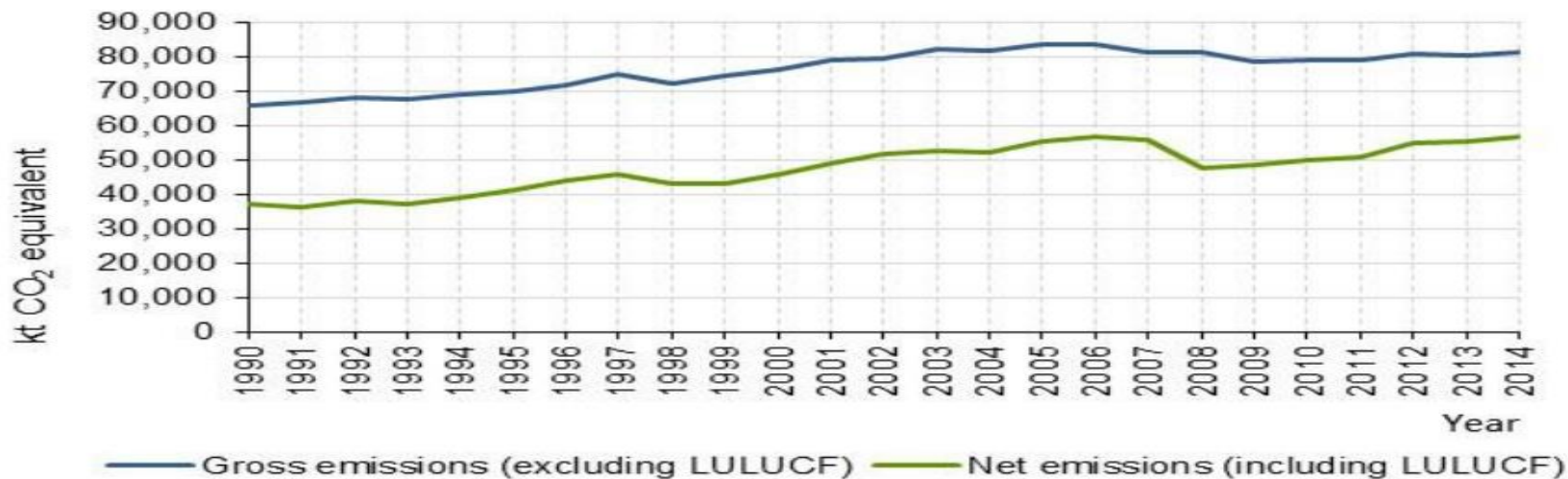
A changing energy context

- 🌀 Raising energy productivity
- 🌀 Embracing technology and innovation
- 🌀 Reducing GHG emissions and switching to renewables



Trends in gross emissions since 1990

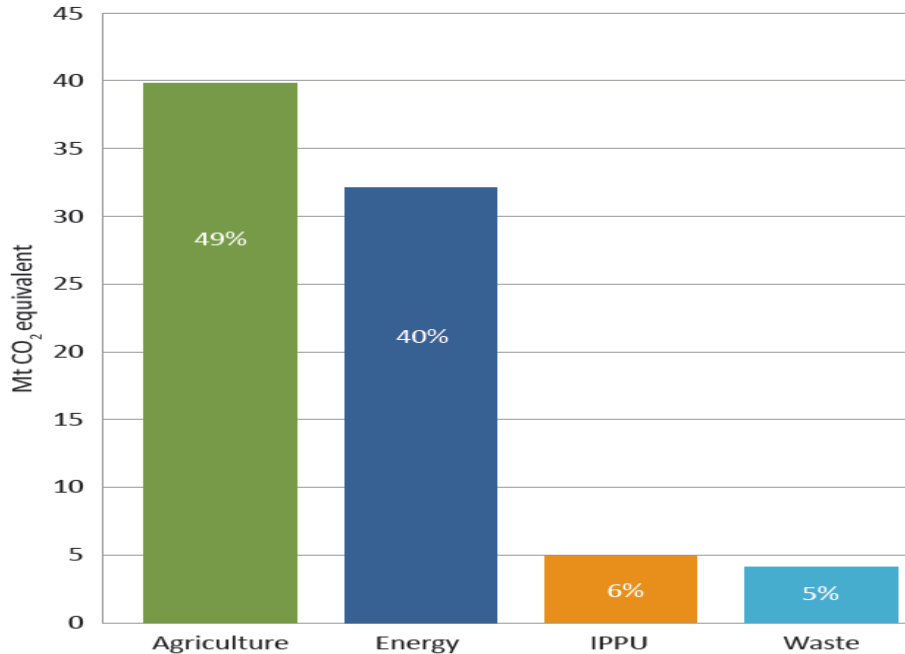
- Production and population growth increase gross emissions
 - In 1990, New Zealand's gross emissions were 65.8 Mt CO₂-e.
 - Between 1990 and 2014, gross emissions increased 23.2 % to 81.1 Mt CO₂-e.



Source: Ministry for the Environment (2016): New Zealand's Greenhouse Gas Inventory 1990-2014.

Contribution of energy to GHG emissions

Figure 1: New Zealand's gross greenhouse gas emissions by sector in 2014

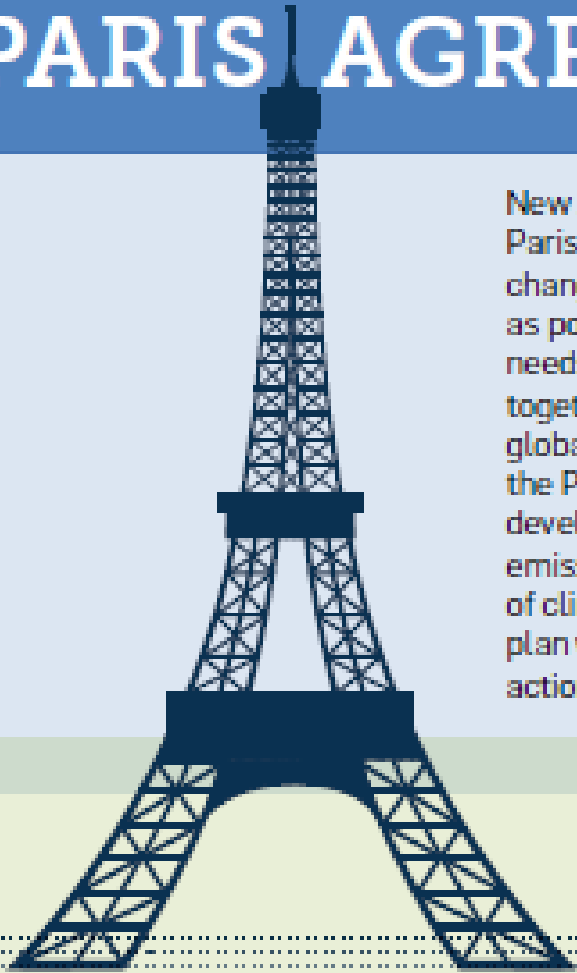


Energy emissions

- In 2014: 32.2 Mt CO₂-e or 40% of total
- 36% higher in 2014 than 1990

Source: Ministry for the Environment (2016): New Zealand's Greenhouse Gas Inventory 1990-2014.
Energy emissions includes transport

PARIS AGREEMENT

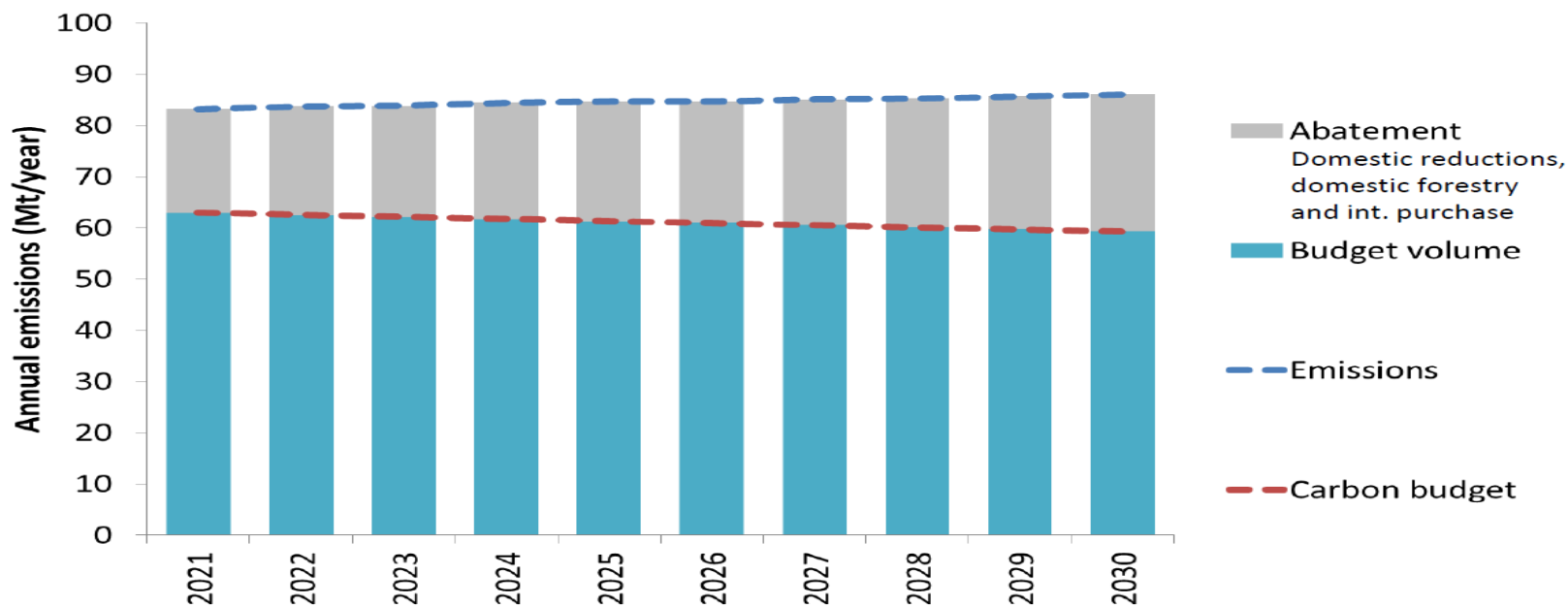


New Zealand signed the historic Paris Agreement on climate change and will ratify it as soon as possible. To come into force it needs ratification by 55 countries, together responsible for 55% of global emissions. All countries in the Paris Agreement are asked to develop a long-term plan to reduce emissions and adapt to the impacts of climate change. New Zealand's plan will shape our climate change action over the coming decades.

- NZ ratified on 4 Oct 2016 (New York Time)
- Came into force on 4 Nov 2016
- “New Zealand’s big challenge now is to develop an effective plan for meeting our target of reducing our emissions by 30 per cent below 2005 levels by 2030”, Climate Change Minister Paula Bennett says.

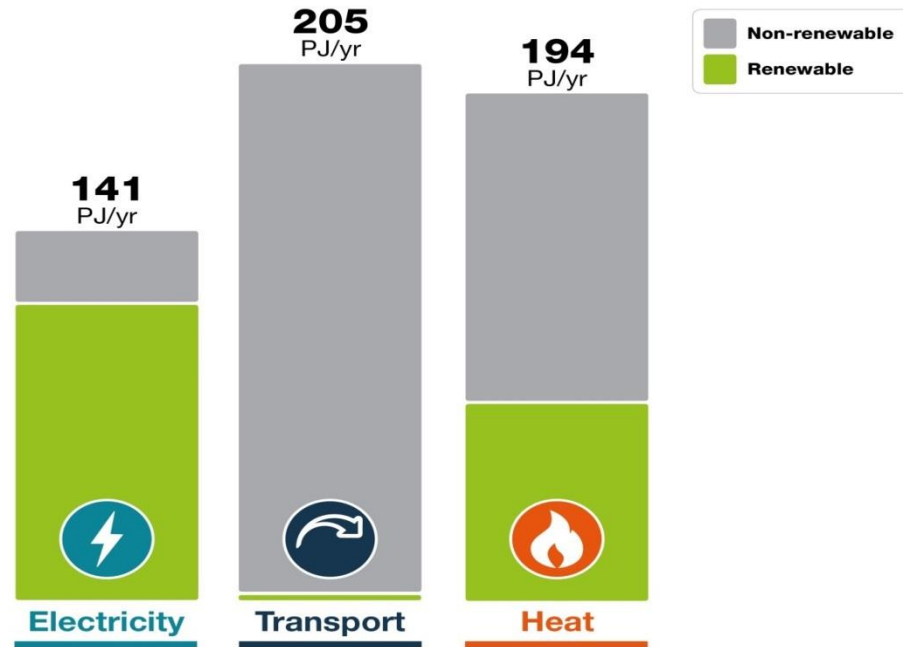
Our Paris Budget

NZ will need to “bend the curve” and reduce domestic emissions



- Source: MfE (October 2016): *New Zealand Emissions Trading Scheme Review 2015/16. Presentation to the Australia-NZ Climate Change Conference*

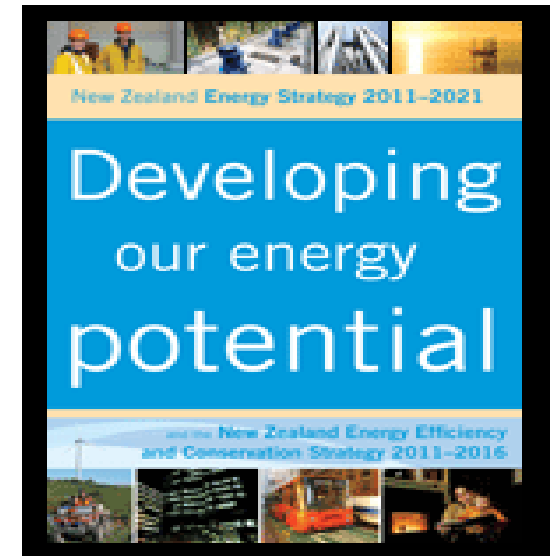
How is energy used in NZ?



Source: EECA 2015

Government direction and strategies

- NZ Energy Strategy (NZES) 2011-2021 remains the overarching statement of policy in the energy sector
- The New Zealand Energy Efficiency and Conservation Strategy (NZEECS) complements the NZES and has a five-year timeframe
- The NZEECS guides policy across government, in particular EECA's work



Related government work

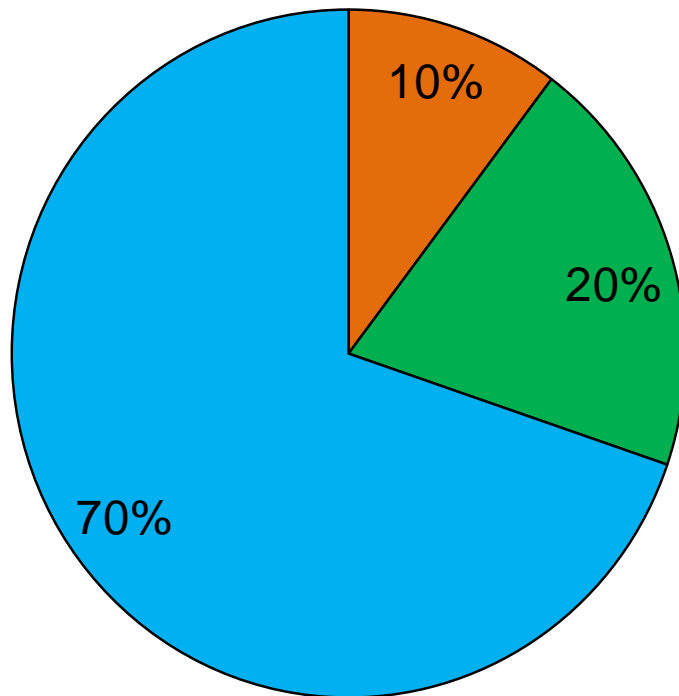
- Ratification of the 2015 Paris Agreement
- Review of the New Zealand Emissions Trading Scheme
- Changes to EECA's levy funding
- The launch of the Government's Electric Vehicles Programme
- Work of the Electricity Authority, Commerce Commission, and MBIE related to the potential implications of emerging energy technologies.

Energy use by schools in NZ

- \$70,000,000 per year
- 2,530 schools
- \$27,700 per school (Average)
- \$10,000 - \$100,000 per year per school
- 350,000,000 kWh per year
- Household 15,000 kWh per year
- 23,300 house equivalents
- 25,000 – 90,000 kg CO₂ per year

Energy Savings Potential

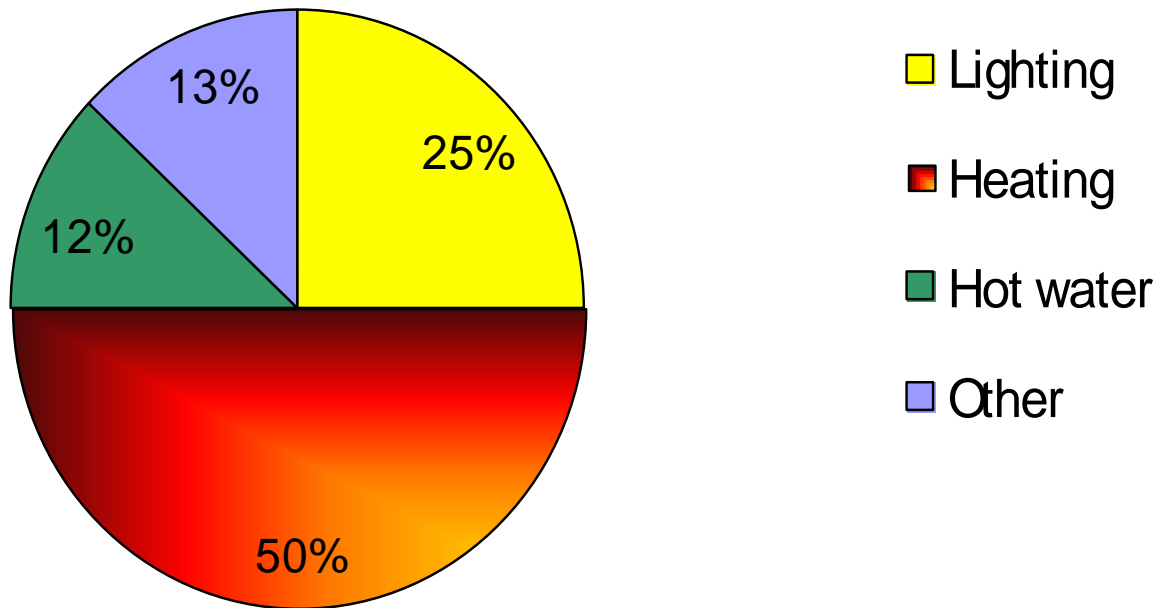
Existing Energy Use



- No cost/ low cost opportunities
- Investment opportunities - 1 - 5 year payback
- Expensive opportunities

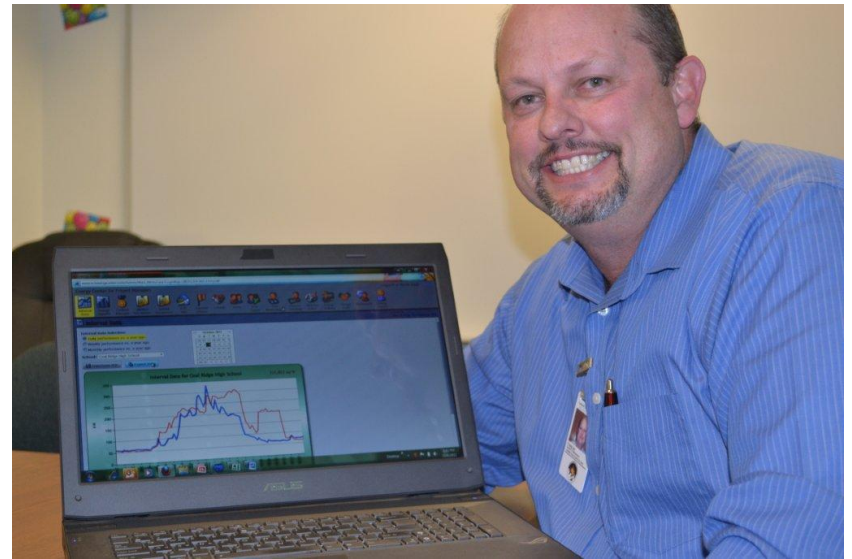
Understanding Energy Use

Existing Energy Use



Benefits

- Reduce energy costs
- Safer environment
- Comfortable
- Reduce maintenance costs
- Less faults/problems
- Happier staff
- Fun projects/ learning

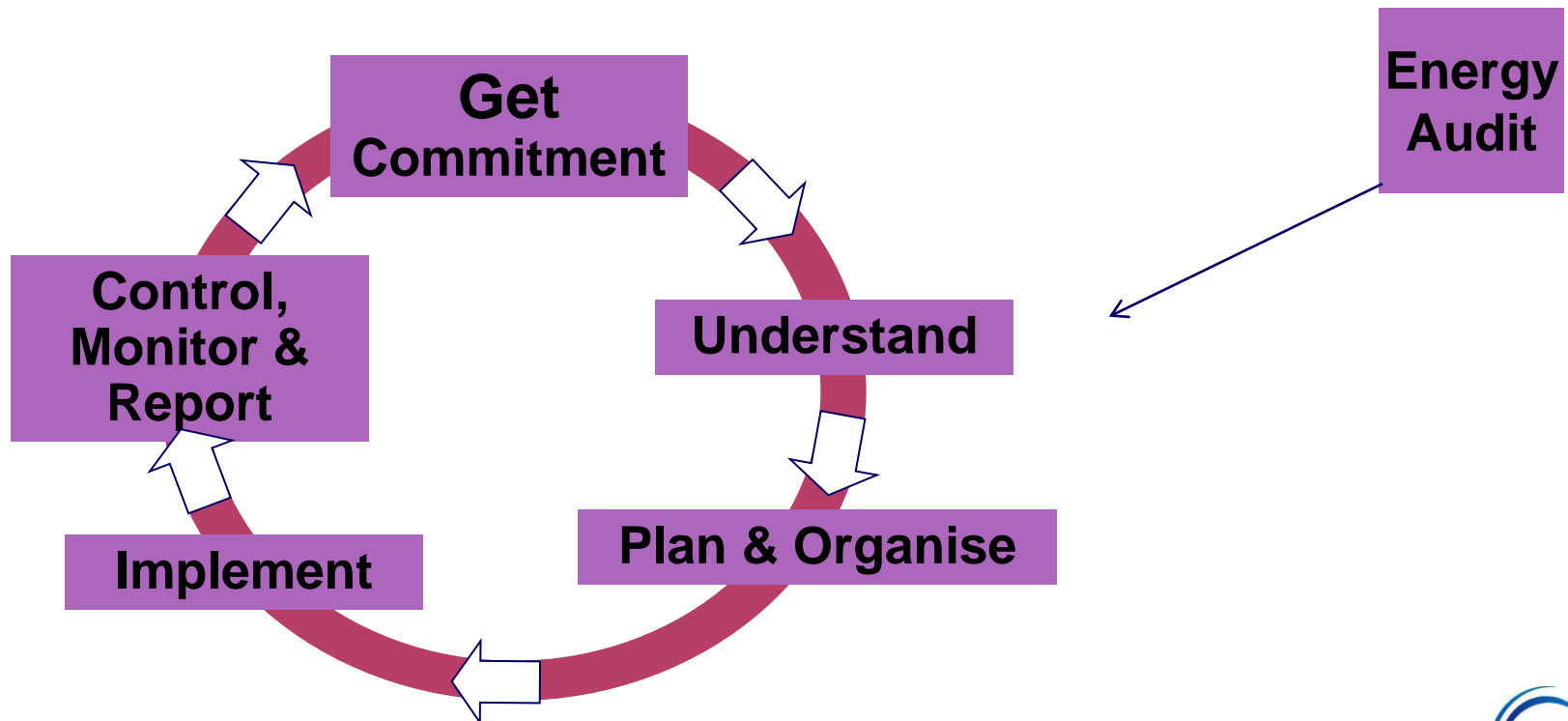


Common Savings Options

- Insulate hot and warm surfaces: valves, cylinders
- Control heating to ambient temperature
- Tune boiler (more than annual service!)
- Control lights to correct lux level
- Switch off some lighting, high natural light
- Upgrade to efficient lamps (use LED)
- Switch off after hours (including holidays)
- Switch off during lunch breaks
- Switch off in unoccupied areas

Energy Management Cycle

And ISO 50001



Energy savings process

- Document total energy bill per year
- Set saving's target (5% - 50%)
- Set up an energy saving's focus group
- Set a budget and list of actions (process and projects)
- Review energy invoices (possible large and quick cost savings)
- Produce a list of energy savings options
- Prioritise projects (cost/benefits)
- Measure and calculate energy savings each month

Other energy savings

- Use occupancy sensor controls
- Scheduling switch on/off times
- Be aware of myths (e.g. “leave it switched on”)
- Good insulation with heat pumps
- Poor insulation with radiant heaters
- Consider water heating heat pumps
- Consider solar water heating
- Consider solar electric
- Consider wood/bio fuels and industrial neighbours
- Hostels and kitchens

Common savings - Boilers

- Usually combustion appliances
- Normally burning coal or gas
- Efficiency varies with load, tuning
- Enough air is needed so combustion is complete
- Some excess air is required to ensure this
- Too much air means heat is diluted
- Modify controls to modulate
- Clean tubes, consider an acid clean

Examples of energy savings measures in schools

- Trident High School (THS) aims to be one of NZ's most energy efficient schools.
- 1200 students
- Energy focus team "Light bashers"
- Switch off, some LED, and heat pumps
- 17,000kWh, energy saving (4.3 %) in 2013
- Logging & monitoring system (ESP)
- More LEDs, insulate hot water cylinders, curriculum outcomes
- EECA funding was \$11,000, with no crown loan
- \$9,000 from the Ministry of Education
- Total saving 9% (approximately half of 20% target)

Examples of energy savings measures in schools

- Wallacetown Primary School
- 42 students
- Includes pool and waste water treatment plant
- Energy audit by a parent
- Tariff change, saved 36% on electricity
- Coal use saved 61%
- Temperature control on boiler,
- Switch off
- Upgrade lights
- Decommissioned excess hot water cylinders

Funding

- Heat, Light and Water
- Minedu - Fixed 2011
- Funding is based on formulae
- Savings reinvest
- 5YA for capital costs
- EECA Crown Loan Scheme

Energy-efficient Schools

A guide for trustees, principals,
teachers, students, caretakers, and
energy managers



Designing Quality Learning Spaces: Lighting

Developed by BRANZ Ltd
for the Ministry of Education



Energy savings

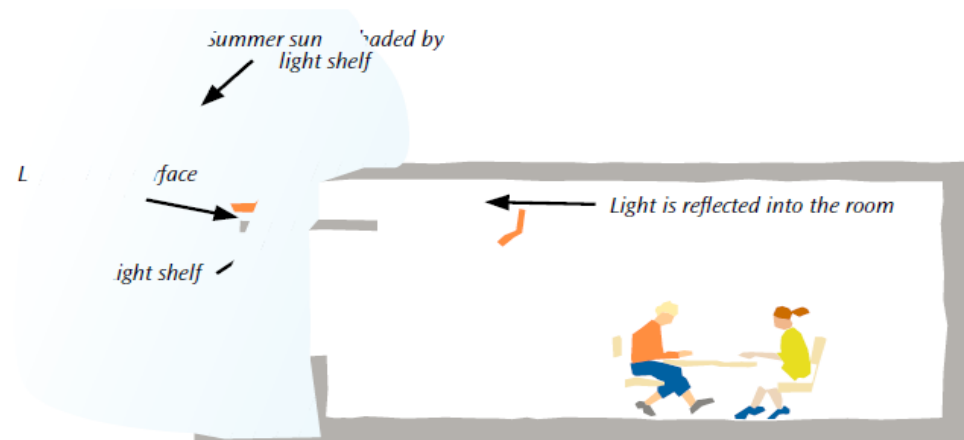
Good daylighting can save electricity as long as electric lights are turned off or dimmed when natural light is adequate. Much of a school's energy budget is for lighting. This can be greatly reduced with well-designed natural lighting provided it is designed to avoid overheating through solar gain and has automatic controls so the lights are off when not needed.

Light shelves

A light shelf is a single large horizontal louvre which cuts out direct sun and reflects light from its top surface deeper into the room, improving light distribution. Light shelves are suitable for north-facing windows in rooms with high ceilings. Ideally, a light shelf should project through the window plane so there is a small overhang

Natural daylighting should always be the main source of lighting in schools, supplemented by electric light when light fades.

FIGURE 17 A light shelf helps to spread light evenly into the room



Designing Quality Learning Spaces: Heating & Insulation

Developed by BRANZ Ltd
for the Ministry of Education



Energy Management Overview

Energy Workshop at 10:30am

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<https://education.govt.nz/school/property/state-schools/day-to-day-management/energy-use-and-conservation>