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CLEAN ENERGY ACTION PLAN

Towards 50/50 by 2020
in the Bega Valley Shire



by the Clean Energy Working Group
Clean Energy for Eternity Inc.

February 2007

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Clean Energy for Eternity Inc.

Clean Energy for Eternity Inc. is a not-for-profit voluntary climate change group formed in the Bega Valley Shire on the far south coast of New South Wales.

Our mission is to:

- See the electorate engaged in a conversation about clean energy issues once a week.
- Raise the level of community knowledge and enable access to reliable information about clean energy issues.
- Promote and stimulate relevant bodies to take appropriate action to reduce energy use and develop local clean energy generation projects.
- Ensure that voters are informed on candidates' policies on clean energy for each election.

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Clean Energy Working Group (2007)

Clean Energy Action Plan – Towards 50/50 by 2020 in the Bega Valley Shire.

A report produced by a community working group on behalf of the Bega Valley Shire community and Clean Energy for Eternity Inc., Bega, 26th February 2007.

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Executive Summary

Over the last few years we have seen clear manifestations of the negative impacts of climate change raising the urgent need to act now to mitigate the far greater impacts projected over the next few decades. Bega Valley Shire, fortunate in many respects, is not immune to the threats posed by climate change. These include reductions in average rainfall and streamflow, more extreme weather events, greater fire frequency and intensity, sea level rise and the social consequences derived from these effects on land productivity, health, and the ability of communities to be remain viable.

The scale of the changes necessary can be daunting. However, the positive side of accepting that climate change is largely due to human action is the recognition that we can all make significant contributions to improve the situation. There are changes that are surprisingly simple and inexpensive and collectively we can make an enormous difference quite quickly.

In the short term, the easiest and possibly the greatest gains can be achieved through energy efficiency. It is important to note that efficiency means getting more for less such as more comfortable homes for less energy use. Actions include using compact fluorescent globes, simple changes to daily routines, switching off lights and appliances, insulation, considering our energy use, choosing sustainable options wherever we have the opportunity whether we're shopping, cooking, washing, traveling or working the land.

Longer term solutions will involve a gradual transition to sources of clean renewable energy. The report outlines some options that are feasible for a rural shire like Bega, and encourages creative approaches to increasing our energy independence and resilience. This report reveals opportunities for the community of the Bega Valley Shire to take action on climate change - at the individual, community and political level.

Two key issues here are **a)** we have to act boldly now and **b)** we have to act collectively as a community. Individual actions can help but achieving the radical greenhouse reductions in time to make a difference will require widespread adoption. We need to encourage our neighbours, our schools, our churches, our sporting clubs and societies across the region to consider what contribution each and every one can make.

Why the urgency to act now on climate change?

The long awaited report from the United Nations Intergovernmental Panel on Climate Change (IPCC 4th Assessment, 2007) carried a stark message – climate change is happening faster than expected and we humans are largely to blame. Since the industrial revolution, the burning of fossil fuels (oil, gas and coal formed from the accumulation of plant material millions of years ago), land use change and agriculture have led to increased levels of carbon dioxide, methane and nitrous oxide in the atmosphere. CO₂ is the most important gas trapping heat near the earth's surface through the greenhouse effect.

Atmospheric carbon dioxide reached 380 parts per million in 2006, the highest concentration in 600,000 years and probably in the last 20 million years. Rapid growth in the world's population, unchecked consumerism and the demand for fossil fuel has increased the rate of climate change to dangerous levels. Respected economists and business leaders are calling for early action, as solutions will be harder, more expensive and less effective with every year that passes.

Internationally, scientists now generally agree that human society has a window of opportunity of perhaps ten years to arrest the more extreme environmental, social and economic effects of climate change. Every year the information becomes clearer and the situation more urgent.

Recommendations

To begin the journey towards tackling climate change and meeting our 50% energy reduction and 50% renewable energy targets (50/50 by 2020), we urgently recommend that our community:

1. **Set up a Clean Energy Taskforce** to carry out these recommendations in partnership with the Bega Valley Shire community and the Bega Valley Shire Council.
2. Call for a professional **audit of Bega Valley Shire's current energy status** (production and consumption) to provide a baseline against which our progress towards 50/50 by 2020 can be measured.
3. Develop a full range of **sustainability pilot projects for the BVS**, from renewable energy installation in education facilities through to biogas generation in agriculture.
4. Actively **promote energy efficient appliances and habits** to the BVS community, ideally by a combination of a media campaign and a one-stop shopfront.
5. **Encourage sensible retrofitting** of existing houses, by providing information on the potential for energy and cost savings using home energy audit teams.
6. Encourage consumers to purchase new renewable energy, true **GreenPower**, for household, commercial and industrial electricity supply and provide community information on its benefits.
7. Promote **economies of scale** in bulk-buying renewable energy systems, particularly solar hot water to replace outdated electric systems, solar photovoltaic micro-wind & water tanks
8. Fund **feasibility studies into longer term renewable energy options** for the BVS, such as wind, wave and hydroelectric power.
9. Consider the benefits of increasing the independence and resilience of local power supplies by **encouraging community-owned and decentralized power generation**.
10. **Develop training and education** to prepare for the new energy future.
11. Encourage community members to call on politicians to implement sustainable regional, state and national **policies on efficient energy use, renewable energy and carbon emission trading schemes**.
12. **Develop an adaptive management strategy** to increase the resilience of the human and natural systems in the Bega Valley

Your Feedback Is Actively Encouraged

The Clean Energy Working Group was set up to consider and report back to the Bega community on the opportunities for achieving energy conservation and increased adoption of clean energy. This report contains a broad-ranging action plan for all levels of the community. It will be published on the web and we invite comments and conversation to extend the ownership and effectiveness of this plan.

See www.cleanenergyforeternity.net.au and click on Action Plan.

You can provide feedback via mail to Clean Energy Working Group c/- PO Box 874, Bega NSW 2550, electronically by email to admin@cleanenergyforeternity.net.au, or by phone to 02-6492 4858.

Introduction

In Bega the Clean Energy for Eternity group was formed with an enormous show of support when 3000 people gathered on Tathra Beach to spell out words of hope for the future. A public meeting in Bega on 21st August 2006 set community targets of 50% reduction in energy use and 50% adoption of renewable energy by 2020, with the aim of significantly cutting our collective greenhouse gas emissions. This report was written by the working group (membership and terms of reference provided in Appendix 1) established after that meeting to gather information and enable the Bega community to reach these goals.

Already nuclear free, Bega Valley shire aims to become a greenhouse gas neutral shire through the adoption of a combination of efficiency gains and smart renewable energy technology. There are some areas of hope but this report will not avoid the inconvenient truth of what we are doing to our atmosphere, oceans and life on Earth with business as usual.

We want to help the move towards a future that is greenhouse neutral or better with clear, honest wide-ranging information. There will be the need for significant changes to truly turn the danger of global warming around, but the first steps are simple and can be taken today. We hope that our efforts will provide a model for communities serious about taking collective regional action on climate change and that this document will encourage you to start now to make your contribution to solving the climate crisis.

Description of Bega Valley Shire

Bega Valley Shire is made up of 7000 square km containing 32,000 people in 19 towns and villages. This population is projected to rise by 50% by 2020 to about 45,000. The Shire extends along 130 km of coastline from Bermagui in the north to the Victorian border and up to the escarpment to the west.

All of the Shire's water supply comes from rivers that run from the escarpment to the coast. These have been showing a marked reduction in stream flow since 1992. This has been longest period of low stream flows since records started over 60 years ago. (Department of Natural Resources South Coast 15/12/2006)

75% of the Shire is forest, of which approx 30% is National Park and Crown land, a small percentage on private land and 70% in State Forests. The main industries in the shire are primary (dairying, fishing, forestry, horticulture, grazing) and associated manufacture (chip mill, cheese factory, gourmet foods, fish processing and crafts). Service industries (transport, retail, health, education, welfare, hospitality) are important, with tourism causing a sharp increase in the population in the peak period over summer.

Implications of Climate Change for the Bega Valley Shire.

The implications of climate change for producers in the Bega Valley and across much of Australia are potentially devastating if action is not taken rapidly to address the causes of the situation. The Stern Report (Appendix 5) clearly points out Australia's vulnerability and the wisdom of taking early action. In addition to the predictions of reduced rainfall in south-eastern Australia¹, there is increased likelihood of more frequent wild weather events and fires, shifts in the timing of seasons and unusual pest and disease outbreaks. Higher temperatures and evaporation may not only reduce pasture growth, but also increase heat stress of livestock and reduce both weight and milk yields, and lead to a reduction in arable land area, crop yields and quality, while fewer frosts will affect fruit set in horticulture and vineyard yields.

¹ By 2030, winter rain runoff in coastal catchments in South-East Australia is expected to change by -20% to +5% (Chiew et al 1995).

Bega's regional economy is highly dependent on agriculture and tourism with vulnerable low-lying coastal populations. Other key consequences of climate change for the Bega area include sea level rises that could damage water supplies, sewerage treatment works and coastal housing roads and bridges. Higher temperatures also increase the probability of toxic and noxious algal blooms in waterways, potentially damaging oyster leases and impinging on recreational use.

Bega Valley Shire Council

The Bega Valley Shire Council (BVSC) has joined the international Cities for Climate Protection (CCP) program, joining 650 other councils in Australia, Canada, Europe, Japan, Latin America, Mexico, New Zealand, South Africa, South Asia, Southeast Asia, and the United States. Under this program, local governments commit to undertake five milestones. BVSC will be conducting an audit of its energy use through transport, waste and land use by shire offices and depots. Council will then set reduction goals, plan and implement actions and monitor their progress.

BVSC is a large user of energy. Total electrical energy consumption across all 197 BVSC sites for 2005/06 was 6,842 megawatt hours (MWh) with an estimated annual CO₂ output of 7,211 tonnes (pers. comm.. David Basil, BVSC, 24/1/07). Our Council has subscribed to GreenPower for all sites under its control and this transition will lead to a saving of 36,000 tonnes of greenhouse emissions over a five year period.

Simple gains can be made by replacing the Council car fleet with smaller, more efficient cars. There are many opportunities for the shire as a whole to develop residential and commercial programs for reducing emissions through partnerships with the council. These include: education and encouragement of the community through example and incentives for local solutions, implementation of sustainable building design and infrastructure provision. Approval and fast-tracking of development that actively reduces greenhouse gas emissions should be considered.

In the medium to longer term, the council will have to undertake a comprehensive review of its policies and make adaptive changes to accommodate climate change. Examples might include coastal development planning, water security and flood mitigation (see later section on adaptation on page 21).

Communities participating in actions to reduce greenhouse emissions benefit through:

- Financial savings in reduced utility and fuel costs to local government, households, and businesses.
- Improved local air quality, contributing to the general health and well being of the community.
- Economic development and new local jobs as investments in locally produced energy products and services keep money circulating in the local economy (see CCP 2007).

Building on success

Historically the Bega Shire has been innovative in energy supply. In 1885 it was the first area in the colony to develop a gas works that piped gas to several users. The Brown Mountain Hydro Station was constructed in 1943 and owned by the Bega Valley Shire council (BVSC). We can be innovative again. The 20 plus years experience of those who set up homes using clean energy in locations remote from the grid is a valuable resource for those newly interested in this technology. Some relied on diesel generators for energy provision, but a considerable number adopted renewable energy and have invaluable experience to share. Two short case studies are provided on page 8, one on micro-hydro operating near Bemboka and the second a family that has been running on a combination of solar and wind for over twenty years at Tanja.

Largely due to support from the general community and the efforts of Dr Matthew Nott and Clean Energy for Eternity, the Bega Shire has rapidly made a name for itself as a community willing to tackle the most pressing challenge of our time, climate change.

By acting quickly to follow up our promises with actions on the ground, our community has the potential to access financial and technical assistance from many quarters. State, Federal and local government grants available for projects that can provide great ecological benefits for the community, with spin-off economic benefits to local business and employees. Already, Clean Energy for Eternity has endorsed grant applications for climate change solutions worth \$2.5 million dollars to date. In brief, these include:

Energy Strategies Pty Ltd has sought NSW funding to carry out residential energy audits in Bega Shire, similar to Home Energy Advice Teams (HEAT) in Canberra. If successful, these will be a major point of engagement with Bega community, providing households with individually tailored plans on energy reduction and improved energy efficiency.

Local environmental business, ngh environmental and LESS (Low Energy Supplies and Services, Sydney) have applied for funding to run a one-stop shop for renewable energy in Bega, aiming to provide economies of scale that, for example, could bring the cost of solar hot water within the reach of average income earners.

A small renewable energy group, consisting of a local plumber and an electrician, are setting up a shop in Bega. They aim to carry out audits of energy/fuel use /greenhouse gas emissions across all sectors.

LifeSaving Energy

The 50/50 by 2020 campaign has kicked off with the Tathra Surf Club Renewable Energy Project. On 20/1 Mayor Tony Allen opened the renewable energy package for the surf club. The surf club's entire electricity supply is now provided by solar photovoltaic cells and a wind turbine. The renewable energy is grid-connected so that when the club is not using electricity, the meter is reversed. By the end of the year the club's electricity bill should be \$0. This will save the club \$1000 each year, allowing them to spend money on lifesaving equipment. Tathra is a pilot for what is hoped to be a national campaign, getting all 305 surf clubs in Australia set up with renewable energy by the end of the year. Once in place, thousands of tonnes of CO₂ will be saved from our atmosphere each year. The slogan for this campaign is "Lifesaving Energy".

Why can't we get lifesaving energy onto the roof of every school, place of worship, ambulance station, or rural fire station in the country? The options are endless, and demonstrate that it is a lack of will, not a lack of technology that is preventing us from solving global warming. Renewable energy is ready to be installed right now. It does not need a technological breakthrough; it does not emit CO₂; it doesn't require large amounts of water; it CAN provide baseload power, and it employs lots of people. There's a win win scenario if ever I've heard one.

Dr Matthew Nott, President, Clean Energy for Eternity

Energy supply and use in Bega Valley Shire.

Power and Heating Sources

Electricity

The major supplier of electricity to Bega Valley Shire is Country Energy. The electricity is sourced from coal-fired power stations in the Hunter Valley with augmentation from the national grid and hydro from the Snowy Mountain Scheme and Brown Mountain Hydro station on the Bemboka River. The power lines come from Cooma down Brown Mountain to a major substation in Bega. Electricity is then distributed as far north as Moruya and south to Eden. The lines from Cooma, while sufficient for current energy demands, are not expected to be adequate for the future growth of the shire. Current consumption of electrical energy is estimated at 230-250,000 MWh with a peak load of approx. 50 MW. The growth in electricity consumption is 6% per annum. Energy companies are currently interested in renewable energy options. There is a singular opportunity to take an innovative and sustainable approach to upgrading the long-term electricity supply for Bega Shire. The cost of expanding the grid infrastructure is enormous and once carried out would preclude investment in alternative energy sources for the region. Decentralised energy supply has a greenhouse advantage as well as increased reliability (see page 13).

Renewable energy

There have been providers of renewable energy systems in the shire and adjacent areas for over 25 years. Examples include St Elmo's Fire Elec-tricks, Pyramid Power and ARTA P/L of Numeralla, collectively dealing with a large portfolio of stand alone domestic, pumping and grid interactive renewable energy generation systems around the shire. There is an extensive list of qualified accredited installers produced by the Australian Business Council for Sustainable Energy (BCSE), see Appendix 5. In due course, CEFE is hoping to develop a trade directory to promote local facilities and tradespeople. It is important to use accredited installers in order to qualify for the Federal Governments renewable energy certificates (RECs) and for the rebates available (see page 18).

A local company that has been providing alternative energy technology in the south of the shire for twenty years, records 800 users of renewable energy providing 380 MWh per year. Suppliers in the north of the shire would have at least as many customers. Renewable systems provide greater emission savings as there are minimal transmission losses and people using their own power are highly motivated to limit power use and avoid waste. Other benefits are a reduced fire risk from transmission lines, quarantine from system blackouts and, of course, no power bills. Grid-interactive systems provide the added potential of 'reversing the meter'.

Gas

3,000 tonnes per annum of Liquid Petroleum gas is supplied through depots and on-site tanks for cooking, heating and hot water systems in preference to electricity. Gas hot water is preferable to grid powered systems and provides considerable greenhouse savings. They can be programmed to deliver water at temperatures required for showering, eliminating the wasteful practice of overheating water and then having to cool it with cold water. However, similar savings could be achieved if houses switched to reverse cycle air conditioners for heating, heat pump or solar HWS and best technology electric cooking. Gas-generated power plants have the capacity to be turned on and off within minutes. This combined with the fact that it emits only half as much CO₂ as coal, makes gas a valuable fuel for facilitating the transition to renewable clean energy sources. However useful, it remains a non-renewable fossil fuel.

Firewood

Firewood is used throughout the shire for heating and cooking. This is either supplied by local businesses or cut from the property. This fuel can be greenhouse neutral but causes the problem of particulate

pollution in towns throughout the shire, exacerbated by incomplete burning of fuel when the stove is closed down for the night. Using wood from planted/managed natural woodlots is preferable to wood taken from natural forest stands, although both currently occur (see pages 13 and 19).

Transport

Transport to, from and within Bega Valley Shire is primarily by road and rural residents rely heavily on their private vehicles, as the public transport system is limited. There are 23,000 vehicles registered in Bega Valley Shire (almost one per head of population).

The consumption of petroleum products by these vehicles is estimated to be greater than one million litres per week. Available statistics indicate that only 2% of vehicles in Bega Valley Shire operate on LPG gas and there are significantly less running on alternate fuels. An average car (2.4 litre engine) contributes 4.6 tonnes of CO₂ into the atmosphere each year. Sharp increases in petrol prices in 2006 have begun to focus attention on more energy efficient vehicles, with concern that the world's supply of oil is peaking and more environmentally damaging, greenhouse gas producing sources of oil are being used (see page 20).

Baseline audit of energy use and greenhouse gas emissions for 2006.

There have been many difficulties in providing accurate figures on the present levels of energy use and CO₂ emissions in the Shire, necessary to show the reductions being achieved and to focus attention on where the reductions can be made. Estimates have been drawn from national and state averages and local sources. Using 45 MW as the present maximum demand for Bega Shire, the total electrical energy delivered from the grid supply can be approximated at between 230-250,000 MWh or 230-250 million kWh (Country Energy, 2004).

We recommend a professional energy audit of the entire Bega Valley Shire be carried out as soon as possible to provide a more detailed baseline for measuring our actions.

The national average for Australia of carbon dioxide (CO₂) emission from energy is 17 tonnes per person per year (one of highest in the world). If we apply that figure to the Bega Valley Shire with a population of 32,000, our total comes to 544,000 tonnes per year. With a projected population growth of 50% by 2020, at the present rate our total emissions will be about 765,000 tonnes of CO₂. This means that the per capita levels would have to drop as low as 6 tonnes per year to meet the 50% reduction target. It is interesting to see how the emissions are produced - Some estimates are that 24% of all emission comes from residential sources. This means that individual households can make an enormous difference to our combined total emissions (source Australian Greenhouse Office).

Mini Hydro near Bemboka

Strawb Walker of Bemboka has set up a simple min-hydro system. He's taken an old car motor, welded up a steel propeller and run 700 metres of 2inch polypipe down a 50 metre fall on a small stream off . This is hooked up to an N200 battery (similar to a basic 12V dozer or truck battery) and a 2000 watt inverter to convert back to 240 Watt power. Strawb's family runs their lights, TV, microwave and toaster off the electricity produced, but have a gas fridge. He's only had to replace one alternator in five years and the system runs along nicely and pretty trouble free.

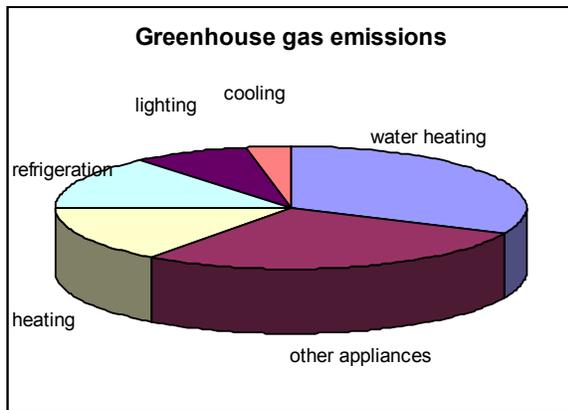
Combined Wind and Solar at Tanja

The Lord family moved to Tanja over twenty years ago and set up their family home in an area with no grid electricity. Since then, they have been successfully running on a combination of wind and solar power, keeping up with the technology as it has changed. The wind generator at the Lord's originally came from a property on Mumbulla where it had run for some years.

Opportunities for Energy Efficiencies

Residential (your home and mine)

As individuals, we actually have enormous potential to reduce our greenhouse gas emission levels. This can begin by simply taking any of the actions suggested below. More strategically, you can embark on retrofitting your house to be more energy efficient, buying Green Power, and changing your power use.



1999 average Australian household greenhouse gas emissions (AGO)

water heating	32%
other appliances	28%
heating	15%
refrigeration	14%
lighting	8%
cooling	3%

Retrofitting your house can produce energy savings that pay for the alterations in the short term, reduce your energy bills in the long term and increase the resale value of your house. These measures include insulation, installation of energy efficient light bulbs and a low-flow shower head, fixing leaking taps (especially hot water), lowering thermostat temperature in water heater, draught proofing around doors and windows, changing to gas or solar hot water heaters, installing curtains and pelmets, double glazing of windows and photovoltaic electricity. This work can be planned and coordinated by a specialist in this field who will give costings and arrange for the work to be done (see Appendix 6 for useful websites).

Retrofitting energy efficiency programs for housing can lead to significant savings in energy costs (and greenhouse emissions). For example, a Canberra house with gas heating cut \$50 off a \$650 winter bill even with the \$300 cost of retrofitting included.

Green Power can be substituted for coal-fired electricity for a relatively small additional cost with the potential to buy purely renewable energy produced with no greenhouse gas emissions (see page 14).

Travel of all sorts produces carbon dioxide emissions. The impacts of car and aeroplane travel can be neutralised by buying carbon offsets that create environmental projects with the same effect as taking your car off the road (again see websites in Appendix 6). Walking and bicycling is greenhouse free and healthy.

Energy efficient practice includes switching off lights including stand-by lights on appliances, taking shorter showers, washing clothes in cold water. All these actions are simple, yet educating ourselves and our families to bother doing them as routine can make a considerable difference to our impacts.

Energy responsible purchases involve responsible choices for energy efficient electrical goods like washing machines and refrigerators (use the star rating system). A lot of “embedded energy” is in food, clothing and transportation, so it is good to buy locally produced food and to recycle unwanted clothing.

You Can Make a Difference as a family or an individual

1. Switch off the lights you don't need, replace old globes that are used for an hour or more per day with compact fluorescents.
2. Take shorter showers, install a water efficient showerhead, buy a rain water tank.
3. Buy GreenPower, support/invest in renewable energy projects, install renewable energy on your house, understand your electricity bill.
4. Buy energy efficient appliances, install a solar hot water system when your old one retires, turn-off standby appliances and all those little clocks on kitchen appliances.
5. Walk & cycle more, drive less and more slowly (80km/hr travel cuts 25% off a fuel bill), car-pool, take public transport if you can, look into bio-diesel and fuel-efficient vehicles.
6. Renovate and build energy efficient houses, insulate your home, make use of passive solar design and save \$\$ per year on your domestic running costs, plant trees for shade (as a bonus, each tree absorbs between 2 and 6 kg of CO₂ each year).
7. Consume less, avoid packaging, support local food producers and farmers market, buy in season to reduce the 'food miles' – the carbon cost of long distance transport is significant.
8. Support businesses that are rising to the challenge of climate change, take personal responsibility for your carbon foot-print.
9. Talk about global warming with friends, write a letter to your local representatives, join a climate action group, support a climate action group.
10. Vote for the politicians who are willing to tackle the most serious issue of our time, and who demonstrate their commitment to acting on climate change.

Built environment

All new buildings must meet energy efficiency guidelines Existing buildings need to be upgraded to a higher level of energy efficiency and this can result in energy savings of up to 50%.

- The NSW Government has brought in environmental housing guidelines, BASIX. These should incorporate mandatory renewable energy elements, including requirement for solar passive design etc (NB Spain has legislated that all new dwellings carry solar hot water systems).
- The sustainable housing development in Bega, BEND, provides NSW with a model of sustainable housing. Developments such as this dramatically reduce the drain on council resources and visually demonstrate to the community what can be done at a domestic level to address climate change.
- Commercial buildings should meet the Australian Building Greenhouse Ratings (www.abgr.com.au) or the National Australian Built Environment Rating System (www.nabers.com.au)
- Design new shopping areas, such as the proposed new supermarkets in Bega and Merimbula, to reduce greenhouse gas emissions through lighting, heating, cooling and refrigerated displays. Ideas for examples are provided at www.bigswitch.com.au
- Design of the new hospital should aim to include natural ventilation and passive solar to decrease reliance on air conditioners and improve building health. Cogeneration of heat and electricity is an option, given the constant need for hot water. A potential combination of wood pellets and solar to replace wasteful electric boilers could also be worth investigating. Auditing greenhouse gas emissions of health facilities like hospitals can provide cost savings, waste reduction and recycling opportunities.

Demand Management and Smart Meters

Our individual demand for energy has grown over the years as our homes, workplaces and industries have become more reliant on electric and oil powered technology. Demand management has a role, but distinguish between managing power distribution by load shifting to reduce peak demands and reducing energy consumption *per se*, as the former does not directly address greenhouse gas emissions. However, it can reduce the need for duplicating powerlines and open the way forward for more renewable solutions. Reducing energy consumption by 50% by 2020 will require significant changes. The potential of energy efficiency programs is huge and some key steps towards this target are remarkably effective despite being very simple and highly practical. A report for the Council of Australian Governments concludes that energy use could be cut by up to 30% using available technologies with a payback time of just four years.

Smart Meters

A smart meter enables you to monitor your electricity use and adjust your use according to peak (more expensive) times. They have the potential to contribute to managing peak load, provide data for baseline audits and assist community education. Electricity is paid at the end of 3-month periods, so it is otherwise difficult to know the energy cost of each appliance. Smart meters can allow electricity providers to remotely turn off air conditioner compressors for short periods on very hot days to maintain continuous supply for emergency services. They may be useful in monitoring a trial of switching off electricity backup on solar water heaters. Combined with time-of-day electricity pricing, smart meters can improve the economics of solar electricity. *EnergyAustralia* installed 200,000 smart meters in Sydney, reducing some power bills by 10-30%. Issues about standardisation, cost and interchangeability between different power companies remain. Country Energy is running a limited smart meter trial in Queanbeyan.

Another ingenious gadget that allow home consumers to learn about the energy use of various household appliances is the Cent-@-Meter, an off the shelf radio signal device available from TLE in Auckland St that can sit on the kitchen benchtop and monitor whatever current being used in kwatts/hour.

Commercial enterprises

The UK Stern Report (2006) and the Australian Business Round Table on Climate Change cite indisputable evidence that climate change will be more difficult and more expensive to manage the longer we leave it. If the community as a whole embraces the concept of 50/50 by 2020, this will provide an economic opportunity for local businesses to diversify and take up incentives to generate new enterprises and help the community withstand the potential economic and social impacts of climate change.

Bega has a chance to demonstrate how effectively a community can address climate change on a regional basis. The people of the Bega Shire are diverse, hardworking, talented and creative. We have all the essential skills to develop a national clean energy model and potentially attract substantial investments into the Shire. Flow-on benefits might include hosting study trips and conferences on climate change solutions, a clean green image for tourism and local production and even the creation of new enterprises.

- Buying power - Investigate a future-friendly labelling program (a greenhouse footprint guide) to encourage thoughtful shopping.
- Businesses can conduct their own individual enterprise energy audit, to identify economic savings to be gained via energy efficiency and reveal new directions for economic gain within their own systems.
- Promotion as a clean energy shire could result in potential investments that could lead to diversification of existing and new enterprises with increased local employment opportunities.
- Several popular local events have become carbon neutral, with travel offsets purchased for the artists attending the Four Winds Festival in Bermagui. Most recently the Wharf to Waves in Tathra offset the estimated energy consumed by all participants driving or flying to the event and that consumed during the event itself, by a donation to Clean Energy for Eternity for investment in renewable energy.

Education facilities

The education sector is a big producer of greenhouse gases and could make changes in design and servicing buildings. Many educational buildings and schools throughout the shire could carry renewable energy systems similar to those set up on Tathra Surf Life Saving Club. Energy-saving programs could be set up akin to the recent Federally-funded water-saving projects.

This sector is also fundamentally concerned with the future, teaching and developing the awareness and skills needed to work in the new climate. There are opportunities to work with both children and adults. An effort should be made to incorporate climate change studies into the curriculum of primary and high schools in the shire, with a positive focus on the solutions available for dealing with the problem.

Inspirational examples of sustainable schools already exist. Thurgoona Campus of Charles Sturt University was built and runs on sustainability principles, incorporating thermal cooling and waste water recycling technologies that reduce both its CO₂ emissions and running costs. Bournda Environmental Education Centre has been running programs that involve energy audits at schools for about 10 years. If your school is interested in taking this further, get in touch with the Centre by calling 02-64945009.

Department of Education and Training NSW have offered to assist in running courses that would be relevant for climate change mitigation. Initial ideas include:

- Professional development programs for teachers on the issues of global warming, energy efficiency and demand management. (www.teachsustainability.com.au and www.mefl.com.au/schools/resources)
- Solar schools project to put solar panels in the school for students to use, observe and study. www.solarschools.net
- AGL Sustainable living competition for school children www.sustainableliving.com.au
- Work out the environmental footprint for the school at www.powerhousemuseum.com/ecotude
- TAFE course units on sustainable cities and demand management could be made available.
- Develop career pathways in sustainable futures, permaculture and other lifestyle courses.
- Green plumbers program to train tradesmen in sustainable water and energy use, installing solar hot water etc. www.greenplumbers.com.au
- Develop a similar training program for retailers and builders, encouraging retrofitting & efficiency.
- Do-it-yourself energy audit and greenhouse gas reduction action courses. Online audits can be found at www.bp.com.au or www.countryenergy.com.au
- Do a home audit with children http://www.ase.org/uploaded_files/educatorlessonplans/audit.pdf

Forests

Bega Valley Shire is blessed with abundant natural forests. Intact areas of native vegetation provide an unparalleled carbon sink and forests are a great way to store carbon dioxide as they also provide natural biodiversity and water catchments. Preservation of natural ecosystems via, for example, the Bush Heritage Fund can be a more effective carbon offset than plantations.

- Funding is available for plantations, (see carbon credits and Landcare below). Regional organisations and landowners can supply carbon sequestration and tap into an additional source of financial support for revegetation activities. Plantings for carbon sequestration can deliver other benefits, such as erosion control, shelter, salinity mitigation, improved water quality and increased biodiversity.
- Logging releases stored carbon into the atmosphere. Recent studies show about 1,000 tonnes of CO₂ per logged hectare are released from the soil, stems and leaf litter (assuming timber is used for long-lasting products such as furniture thereby storing carbon that was held in mature trees). 90% of the

native forests logged in the Shire are turned into woodchips and then paper products, CO₂ emissions would be much higher. One million tonnes of chips were exported from the Eden mill in 2006.

- Timber enterprises, such as the Eden woodchip mill, could convert waste woodchip into valued added biomass, saving money and leading to new enterprises and jobs. Options include production of wood bead fuel for combustion heaters (see box below) and pyrolysis to generate chars (see page 21).
- Arguments that a regrowth forest sequesters more carbon than a mature one have to be balanced against the findings that it takes 152 years for the forest site to recover to 90% of its unlogged levels of carbon sequestration (Roxburgh et al. 2006).

Wood Bead Technology

Bega Valley Shire has a host of businesses that generate thousands of tonnes of wood waste, a valuable commodity with existing markets. Opportunities exist to substantially add value to the end product. Wood beads are made by processing wood waste under high pressure steam to extrude small pellets, which are easy to handle and transport. These wood beads are used in central heating furnaces and slow combustion stoves. Additives can minimize smoke pollution. This technology is growing in Europe and North America, with 2/3 of Austria's central heating now from wood pellets. Some retrofitting of existing combustion systems may be required. Steam for processing could originate via co-generation in conjunction with pyrolysis. Burning wood beads is considered low greenhouse emission as the carbon burnt is derived from the earth's surface (not below the crust) and this carbon can be reabsorbed by vegetation as building blocks for the next harvest. Wood pellets are cheaper than fossil based fuels, but caution must be exercised to ensure such an industry in Australia sourced its products only from genuine wood waste to be sustainable.

Agriculture

The largest practical challenge of climate change for agriculture will remain coping with the natural variability and extremes in the weather and any amplification that may arise from global warming. Producers in the Bega Valley Shire will need to find ways to adapt to the changes likely to occur. The Managing Climate Change program run collaboratively by a host of government departments and rural research and development corporations provides valuable information in this area (MCV 2006).

Yet, by the same token, agriculture can make a significant contribution to reducing the greenhouse gases released in the Shire and benefit while doing so. In addition to managing a significant proportion of the land area, farmers can manage production systems to minimize emissions of both carbon dioxide and methane (relative greenhouse ratings given in appendix 3) and loss of carbon from the soil. Farms can also provide a valuable source of extra carbon sinks for the biological sequestration (capture) of carbon dioxide. A carbon tax would enable farmers to be paid an incentive for carbon sequestration, with spin-off benefits for catchment and river health.

- Carbon credits - Landcare Australia is investigating the option of a carbon pool management and brokering service called CarbonSMART. This will assist companies producing greenhouse emissions at some level to maintain production, but looking for landholders to offset their remaining emissions by planting trees to store carbon as they grow. Combining many sites into one large pool will provide cost savings and advantages for risk management, operational efficiencies and security to landholders.
- Agricultural soils can act as carbon sinks if best practices are applied. This should be used to create carbon credits which can be traded alongside those currently traded for forests. Farmers can play a central role in sequestering carbon in their soils by fostering deep-rooted plant species that have significant biomass in their root systems. Capturing more carbon in agricultural soils will mean water is used where it falls, leading to cleaner waterways and less silting. Soil scientist Christine Jones

believes that “Rewarding landholders for farming in ways that build new topsoil and raise levels of soil carbon and nitrogen would have a significant impact on the vitality and productivity of Australia’s rural industries, reduce the incidence of dryland salinity and soil acidity – and reduce levels of greenhouse gases”.

- Bega Cheese are recycling the effluent generated from their cheese production and using this water to irrigate pasture. Recycling of dairy effluent is creating larger carbon store potential of soils. This effluent could also be used to produce biogas or feed algal ponds to take up carbon dioxide.
- Trading locally or within our bioregion has enormous potential for the local economy. Outlets for local goods and the farmers markets are proving a success. Horticulture could provide excellent opportunities for input into local food supply, be it fresh produce or processed. The Sapphire Coast Producers Association plays an important role in coordinating producers for mutual benefit.

There are other exciting possibilities for a rural community like Bega to generate both income and energy from renewable sources close to home. Examples include biomass (including biogas and biofuels) and investigating carbon credits for carbon sequestration (see later sections on page 19).

Renewable Energy Solutions

The ultimate goal is for all electrical power used in the Bega Valley Shire to be greenhouse gas neutral. It is important that all solutions are sustainable in that they do not result in the systematic increase in concentration of mined or manufactured materials (including emissions), and do not result in systematic ecological or social damage. (See sustainability principles in Appendix 2) There is no simple single solution to climate change. Luckily there is a range of renewable technologies that can contribute rapidly to reducing our global greenhouse emissions. According to German statistics renewable electricity generation employs almost five times as many people, per unit of electricity, as coal or nuclear generation.

Local renewable power generation

Providing the shire with localized electricity from renewable sources would reduce the impact of transmission losses and vulnerability of supply/network constraints experienced by Bega consumers drawing on power from the Hunter Valley. Increased local generation of renewable energy is a very real possibility for the future, although one that will require a lot of thought.

Electrical power generated from renewable sources is currently more expensive than power from coal-fired plants or existing hydro. However, conventional coal-fired plants do not pay for the environmental and health damage they produce and so must be phased out. So renewable power must be subsidised either by governments or customers prepared to pay more. Green power is an example of the latter.

The equation will eventually move into favourable territory because renewable energy will continue to fall in price, while non-renewables will get more expensive with time, particularly when they have to pay a carbon tax or deal with emissions (see page 24 for further information on carbon taxes and emissions trading). It is predicted that in time solar power will be cheaper than coal power. We need to take a long-term decision to invest in local generation and start the process to find a way to make that happen.

The Bega Shire already has an existing renewable energy industry. Aside from the Eraring Hydro station, a series of businesses provide renewable energy installations, both stand alone and grid inter active. The renewable energy sector can incorporate a wide range of enterprises, from energy auditors through to providers of insulation, double glazing, energy efficient building products, green design, etc.

Opportunities exist for this industry to collectively or individually market themselves and firmly increase the status of their products/services to a higher end.

A Town To Mimic

Guessing is a small town (pop 4000) in Austria, which provides an exciting example for the community of the Bega Shire. In 1989, this town began a bid to be the renewable energy capital of the European Union, hosting a series of renewable energy pilot projects. Today, Guessing is home to the European Centre of Renewable Energy and several major EU and nationally funded research projects on energy conservation and renewable energy. Its objective is to become a model region that is self-sufficient in terms of heat, electricity and fuel supply – the town is now half way there.

The region earns income from the pilot projects via employment, fabrication and from the community owned enterprises that have resulted. Both employment (1000 new jobs in 15 years) and wealth (est 18.7 million EU since conception) have increased. Guessing has over 580 members involved in a bio-energy project, earning income from such activities as collecting and processing cow manure into methane, and other exciting projects including the centralized domestic heating of the whole town via underground hot-water pipes, bio-diesel co-operatives and solar energy plants. Guessing is a profitable example of the result of community support for renewable energy.

Green Power

Changing your electricity supplier to accredited Green Power sends an immediate market signal encouraging the development of further renewable energy resources for Australia. Green Power is a highly accessible, relatively low cost way of purchasing greenhouse gas neutral power without the up-front expense of installing solar panels or a wind turbine. Make sure it is real, accredited green energy and not rebadged old renewables like hydro. If you can, install photovoltaic solar panels to produce your own power. The National GreenPower Accreditation Program www.greenpower.gov.au/pages/index.php provides stringent environmental and reporting standards for retailers. If you choose a government accredited Green Power product, your energy supplier agrees that the equivalent amount of energy you nominate is produced from renewable sources, avoiding the use of coal-derived power.

- For example Country Energy and Origin Energy both have 20%, 50% and 100% Green Power programs from renewable sources. Origin Energy offers 100% wind or 100% solar, whereas Country Energy sources its power from a mix of sources, including “old” hydro. We recommend Green Power generated from new renewable sources. Independent research by green non-governmental organizations rated green power providers (<http://www.greenelectricitywatch.org.au/index.php>). Energy retailers offer certified Green Power ranging up to 100% of consumption at prices of up to about \$6 per week extra in the case of 100% solar. This extra cost can be offset by cutting energy use through efficiencies and installing compact fluorescent light globes.
- Some green energy providers may not use renewable energy but off-set the carbon emissions from your energy consumption by planting trees. Although in some cases this may be acceptable, planting trees is not a substitute for the increase in renewable energy generation which is needed.

Solar Power

With our abundant sunshine, Australia has the potential to harness more solar energy than almost any other country in the world. Solar energy can be harnessed in two ways: Solar thermal collectors produce hot water and warm air for homes and industrial applications. Solar photovoltaic (PV) power and solar thermal power generate electricity directly from sunlight.

A solar power system converts the energy from sunlight into direct current (dc) electricity. It then converts this direct current to alternating current (ac) to make it compatible with grid electricity. Solar thermal storage of liquids heated by solar thermal power plants can provide baseload supply.

- Heat pump water heating system uses the principle of a refrigeration circuit drawing heat out of one space into another. This becomes renewable when the heat pump is powered by solar power. Its benefits are that it doesn't rely on sunlight, is easy to install and can provide large amounts of hot water at all times so it is suitable for large scale installations such as hospitals and motels.
- Photovoltaic (PV) panels can use battery storage (either chemical or kinetic) in stand-alone systems or connected to the grid via the meter. When power generation is greater than demand, the meter is driven in reverse and the supply company buys the power at the supply rate. The initial cost of PV systems is quite high so the real cost of the power they produce is currently about 3 times the retail rate, about 45c/KWh. With economies of scale and technological improvements the cost is falling at the rate of 18% per doubling of globally installed PV. If the present rate of increase in PV (over 30% pa) is maintained and technological improvements continue to be made, PV may be one of the cheapest forms of electricity by about 2030. To get to this point will require investment, either by governments or individuals.
- Solar water heaters have the benefits of a clean decentralised system and when combined with water saving practices give a huge boost to the environment. Backup heating may be needed on cloudy days, the most efficient being on-demand gas or wood fired and electricity on a manual or programmable switching system. (Automatic systems that kick in when the water temperature falls below a certain level often lead to overnight heating of water making the solar system redundant).

Wind Turbines

Wind energy is a commercially proven and viable renewable energy technology. Wind can be harnessed and converted to clean, safe and inexhaustible electricity. It's the world's fastest growing renewable energy technology, on track to provide 12% of global energy by 2020. With more than 55,000 wind turbines in operation globally, the industry employs about 70,000 people, is worth \$8 billion and is growing at a rate of almost 30% per year. Projections suggest that wind could rapidly provide at least 20% of Australia's electricity.

- Investigate the potential for wind farms in the Bega Valley Shire. Wind turbines are preferably located near major electricity supply lines and the new types being constructed are extremely large and rely for their efficiency on an adequate supply of laminar wind that is uninterrupted in direction or influenced by surrounding hills. Considering that our electricity supply line comes from Cooma the most suitable sites may be along this supply line between Cooma and Brown Mountain.
- Wind turbines must be located at sites that are exposed to the wind. They are unlikely to be effective at sites surrounded by buildings or trees.
- On the coast the most feasible use of wind would be individual installations of smaller efficient wind generators serving individual buildings supplementing grid supplies. A number of small, relatively cheap wind turbines are available, such as the one recently installed on the Tathra surf club roof.

- Ararat Shire's 35 turbine windfarm in Victoria generates, in addition to its electricity output, \$50,000/year (over the projected 25 year lifespan of the project) that is distributed across local community organizations and projects. A windfarm development can provide significant economic benefit locally by involving local contractors, local services, lease agreements with the land owners involved each receiving up to \$7,000 per year.
- A recent example of a community-owned wind farm has been developed near Daylesford in Victoria. This model warrants further investigation by the Bega community.

Geothermal

Energy from hot rocks has the potential to significantly reduce our global dependence on fossil fuels. 'Geothermal' means heat stored in rock. Energy is produced using heat extracted from buried hot granites by circulating waters through an engineered, artificial reservoir or underground heat exchanger. These hot granites represent a massive source of baseload renewable energy, free from CO₂ emissions. Geothermal projects are currently underway in France, Switzerland, Germany, California, and Japan. Residents of the Bega Valley Shire could push for increased government investment in geothermal developments.

Geodynamics Limited is the only listed public company in Australia whose sole focus is on developing hot rock geothermal energy. Australia has some of the world's best hot dry rock resources, with a large scale resource with recognised energy potential below the Cooper Basin, near Innamincka. Australia is known to have several thousand cubic kilometres of identified high heat producing granites. If tapped and distributed, these have the potential to meet the total baseload electricity demand of the country for hundreds of years. The Centre for International Economics (2006) reviewed Australia's potential development of hot dry rock geothermal energy in Sept 2006.

Hydroelectric Power

Moving water contains an enormous store of natural energy, whether from a running river or waves on the ocean. Water energy can be harnessed and converted to electricity. Apart from wave (see below) Australia has little additional hydro potential that could be tapped in an ecologically sustainable way, however:

- Hydroelectricity is produced locally at the Eraring power station. Micro-hydro units are affordable and can provide power for 24 hours a day as long as there is running water in the creek or river. This is less of a certainty due to reductions in stream flow in the last few decades.
- Brogo Dam was identified as an undeveloped micro-hydro site with great potential by the Sustainable Energy Development Agency around six years ago but, at the time, was deemed uneconomic.
- There are several mini-hydro systems running in the valley, mainly with landholders living in the vicinity of Brown Mountain. One example is Allan Walker at Bemboka, see note on page 8.

Hydroelectric power complements any other power generation source because of its ability to respond almost instantly to changes in demand, so long as there is water available in a dam or flowing stream. The management of Cochrane Dam, like most hydro dams, acts like an insurance scheme to cover the risks of failures elsewhere in the grid or temporary peaks in demand. In this way, a higher price per unit of energy produced is achieved. There is also a commercial relationship between Bega dairy irrigators and Eraring ***energy whereby a reserve of ~1000 ML is held for the irrigation season on payment of a financial bond*** held in a trust account in case the dam spills.

Tidal or Wave Power

There are environmental questions about the suitability of large-scale tidal power generators in our shallow, sandy estuaries. Micro systems may be useful for specific purposes.

- The 500-kilowatt wave-energy plant recently designed by Energetech Australia and constructed at Port Kembla has had successful trials and provided more energy than expected. The Sydney-based company is designing a 10-megawatt plant for installation at Portland in Victoria and maintains that wave-energy is 20% more energy efficient than wind-turbines. (But not as cost effective compared to wind when the set up costs are taken into account-Michael Wood's figures). They need to be located relatively close to existing substations and so Eden would seem to be the preferable site at this early stage. A feasibility study for a wave-energy plant in the shire would involve a fixed buoy measuring wave action and the cost of the study is estimated to be less than \$50,000 (pers comm.. John Bell, Energetech Pty Ltd, www.energetech.com.au).

Biomass - Bioenergy

Biomass is any kind of organic matter produced by plants and animals. Biomass energy systems convert this matter to fuel for energy. Biogas is one particular way of producing biomass energy (see below).

- NSW biomass energy industry is researching energy production from: methane gas (eg, landfills and sewage plants); wet wastes (eg, abattoirs, feedlots and food processing); dry agricultural byproducts (eg, sugar cane waste); municipal mixed wastes (eg, household garbage and prunings); forestry byproducts (eg, remnants from sawmills and forestry operations that could be converted into heat beads). Burning biomass fuels still releases greenhouse gases like carbon dioxide into the atmosphere. However, this is offset by the carbon dioxide absorbed from the atmosphere if the biomass regrows.
- NSW Sustainable Energy Development Authority estimates that a biomass energy plant powered by agricultural and wet wastes from 16 sites across NSW could generate over 60 MW of electricity, or enough energy to power 21,000 homes.
- Sweden is shutting down nuclear power plants and reducing dependence on Australian coal. The Swedes already produces 20 per cent of their energy needs from biomass sourced from dry municipal waste and wood waste from forestry. This has potential for our region.

Biogas – also known as methane, biogas can be generated from many waste organic sources.

Opportunities exist for the production of biogas and oils from forestry byproducts, waste materials and algae in the Bega Valley, and this warrants further investigation. Cow manure can fuel plants that convert waste materials into electric power that can either reduce farm bills or be fed back into the grid.

- An integrated piggery and abattoir in Corowa has re-engineered aerobic ponds for manure into anaerobic biogas generators. It now produces enough steam to power all the boilers in the abattoirs in addition to generating electricity for sale
- Consumers in Vermont, USA can buy “CowPower” from the grid, supporting a network of farmers running large dairy sheds that capture and use the methane from their cows. They earn only about US\$13 per hundred pounds for the milk, a 25-year low, but 12 cents per kilowatt-hour for the electricity, a 4 cent premium over the market price. The premium helps cover the cost of installing an anaerobic digester that extracts methane from cowdung (See Cow Power 2006)
- A 1.79 megawatt biogas installation due on stream in April 2007 near Berlin in Germany, is designed to ferment approx. 24,500 tons of pig liquid manure and 31,500 tons of corn silage/year. Inputs will be supplied by a neighbouring pig farm and the Jüterbog agricultural co-operative society, with long-term supply contractually secured. Fermentation by-products from the power generation will be purchased by the agricultural co-operative society and used in local fields as organic manure, non-polluting and with less odour than conventional manure. Six and a half million cubic metres of biogas will be

produced annually, converted to approx. 13.7 million kilowatt hours of electrical power, fed into the grid over a period of at least 20 years. The annual electrical power output is sufficient to supply some 4,000 households (see http://www.epuron.de/en/desktopdefault.aspx/tabid-114/57_read-531)

Transport and renewable fuels

Distances are relatively large and public transport is limited in many rural areas, beyond provision of the vital school buses and direct bus routes. Not all of us can afford new cars, but when your car inevitably needs replacement, consider a smaller, more efficient car or a flexible fuel vehicle (e.g. petrol-ethanol, biodiesel-diesel or diesel-ethanol) vehicle. Hybrid cars save fuel in city driving but less advantage in rural areas. As the market grows their cost will come down, making them more affordable for everyone.

- One quick gain is to drive more slowly. Travel at 90 kph reduces CO₂ emission by >10% and saves money.
- Develop car pooling services through the internet (see www.thebegavalley.org.au).
- Buy local – transport of goods is a major uses of fossil fuels, hence the interest in food miles
- Use public transport whenever possible
- Bike paths joining local towns can benefit the existing residents as well as providing incentive for tourists to visit and enjoy our natural scenery.
- Flexible fuel vehicles are retrofitted to consume, eg. petrol blended with up to 85% ethanol
- Use commercial offsets to neutralise your transport CO₂ emissions. Tree-planting offsets may not cover the full emissions from a car, with an estimated need to plant about one tree for every 20 km. Other schemes exist where your money goes towards developing new renewable energy generation (e.g. www.climatefriendly.org).
- Drive less, walk or cycle more, it's good for us all!

Biofuels

Fossil fuels were formed over millions of years: coal from buried wood, and natural gas (methane) and oil from buried marine plants (algae). The hydrocarbons in wood and algae are formed from atmospheric carbon dioxide (CO₂) by the sun-powered process of photosynthesis. When fossil fuels and biomass are burnt, carbon is released back into the atmosphere as CO₂. However, biofuels can be carbon neutral, provided biomass is regrown, absorbing the same amount of CO₂ from the atmosphere that was emitted during combustion. To maintain the CO₂ balance, it is also essential that large amounts of fossil fuels are not burnt in converting the biomass into biofuels. The environmental costs of growing the fuel source and the demand for water need to be taken into account when considering biofuel production.

The Senate committee report on security of oil supply (Feb 2007) called for mandatory fuel-efficiency targets for all new cars pointing out that Australia's demand for petroleum products is expected to almost double by 2030 to 1.2 million barrels a day and "peak oil" is less than twenty years away.

- Biodiesel blends are commercially available. They are produced from vegetable oils, e.g. sunflower or rapeseed. Biodiesel has lower emissions of pollutants and greenhouse gases than conventional diesel, but a major challenge is obtaining sufficient affordable feedstocks. There is the potential of import substitution by using the remnant meal as stock feed once the biodiesel has been extracted.
- Alcohol, produced from the fermentation of sugars from beets, wheat, or corn, can substitute for some petrol and, in the presence of a certain additive, can also be mixed with diesel.
- Ethanol blended with petrol is widely used as a vehicle fuel in some countries. In Australia it is currently produced from sugarcane (generally using molasses), grain and grain residues. E10 is an example, with fewer greenhouse gas emissions than neat petrol. The number of US ethanol refineries

is expected to double within the next few years, and an estimated 3 billion gallons of new capacity will be ready by 2008--a 40% increase over today's capacity just to try and keep up with demand.

- Biogas (methane) can be produced from wet organic wastes.
- The production of traditional biofuels requires extensive land areas for cultivation. This has led to interest in producing biofuels from algae farms, particularly located next to power plants providing free land and CO₂. Concerns are growing about the destruction of remnant rainforests in developing Pacific nations for massive plantation of palm oil to provide biodiesel for developed countries

Pyrolysis

Pyrolysis is the process of extracting carbon and renewable energy fuels in the form of oil and gas from hydrocarbon-containing materials like wood and algae. Pyrolysis is a system of heating the materials in the absence of oxygen so that the carbon, oil and gas are not burnt to produce activated charcoal (char).

This char can be used in industry and as an agricultural soil improver, where it is stable for thousands of years. It is beneficial as it replaces depleted organic material and increases soil water holding capacity and fertility, reducing the need for fertilizers. The carbon is stored as char and not released as CO₂, so the process removes CO₂ from the atmosphere.

Unlike other renewable energy technologies like wind and solar, pyrolysis of biomass also produces oils with the potential to fill the roles of fossil oil for the production of a range of fuels including aviation fuel, and feedstocks for industries such as plastics manufacture. Excess heat generated can provide steam for wood bead production and/or electrical generation.

Electric Scooters

Electric Vehicle Transport (EVT) technology is expanding rapidly around the world, as faster models of greater range emerge in Europe and China. Domino's Pizzas in Holland are all delivered on electric scooters, while the Italian police force has over 100 on inner city beats. Here they could be used for local postal deliveries.

Clean Energy for Eternity facilitated the sale and distribution of 50cc equivalent electric scooters with a local supplier. These scooters can travel at 50km per hour and cover up to 65km between charges, at a cost of 0.5 cents per kilometer. They are very cool and retro, require no petrol, emit no noise or CO₂. With renewable energy, they will be a carbon neutral transport option. Small changes in transport habits will help in the battle against global warming. Be part of this transport revolution. Contact Dave Forrest, EVT Project Coordinator davidf@bvcc.nsw.edu.au

Other Proposed Technologies

Geosequestration of Carbon Dioxide.

It has been suggested that the global warming effects of burning coal to produce electricity can be neutralised by the capture, compression and storage underground of the CO₂ in the exhaust gases of coal-fired power stations. This is called geosequestration. To date, there are no commercial examples of this experimental technology for coal power, although some natural gas projects have incorporated the separation on unwanted CO₂ and its re-injection into underground strata.

Problems with geo-sequestration include the risk of escapes from underground repositories and the low likelihood of finding suitable geological structures close to existing power stations and coal fields.

The additional energy required to capture and compress CO₂ in exhaust gases makes geosequestration inefficient.

Nuclear Energy.

We believe there are exciting possibilities for Bega (and Australia as a whole) to rapidly invest in renewable technologies that will significantly reduce our greenhouse gas emissions without incurring a radioactive legacy for future generations. This position is taken because the BVSC is a non nuclear shire and nuclear energy is unsustainable according to sustainability principles (Appendix 2).

Nuclear power:

- Is not clean - no country has yet successfully dealt safely with high level radioactive waste disposal. Spent nuclear fuel rods have to be stored under water for about 40 years as they are too highly radioactive to be re-processed, continuing to produce waste heat without electricity.
- Is very expensive - no full-size nuclear power plant has yet been successfully decommissioned : the estimated cost of de-commissioning Britain's aging nuclear power stations is 90 million pounds sterling.
- Is not available now – evidence shows that it will take time (15-20 years) and money (government subsidies) to get nuclear reactors in place. Any investment in this area will undoubtedly reduce funds available for clean renewable technologies.
- The recent UMPNER review (2006) admits that 25 nuclear reactors along Australia's eastern seaboard would only decrease greenhouse emissions 18% from business as usual
- Produces considerable waste heat, contributing to local heat pollution of local waterways. The efficiency of electricity production from nuclear power stations is about 20% at best.

In addition:

- Known world reserves of high-grade uranium ore represent only 40 or so years of demand. It seems foolish to invest in a technology which is at best stop-gap and will leave an expensive legacy of radioactive waste and contaminated redundant power stations.
- Once low-grade uranium ore has to be used, the CO₂ emissions from the fossil fuel used in mining and milling it become significant.
- The expertise and infrastructure for uranium enrichment is a by-product of the development of nuclear weapons. Increasing the world-wide distribution of enriched uranium will increase the risk of nuclear weapons proliferation and the potential risk of the use of radioactive materials for terrorist acts.

- The requirement for long-term storage of nuclear reactor waste away from the biosphere is about 200,000 years. This is longer than the existence so far of *homo sapiens* (estimated at 150,000 years) and many times longer than the historical life-span of any stable human society.

Encouraging Political Action

We can act to assist in the move towards a more sustainable future and clean energy. The most important thing is to be informed and to start acting now. The challenge of facing the future and working towards the best outcomes is energising and engaging. You won't be bored and you won't be lonely, there are many people already doing what they can to turn the situation around, so join in and think creatively.

One of the major problems is the lack of leadership by our governments making it much harder for individuals to have an effect. Tim Flannery wrote that he would never cast a vote without first talking to the politician to find out what they think, what they are doing in their personal life and what their party policy is on climate change.

- Put pressure on our politicians (local, State and Federal) to take the lead with good policies. There are many examples out there including the German government's Renewable Energy Act. Don't let the politicians think that fossil fuel lobby has the only point of view. The Australian Government is particularly shamed in the international arena through its questionable arguments against signing Kyoto, at a time when we need government leadership in this critical area.
- Encourage creative government incentives and subsidies to promote installation of stand-alone and grid-interactive renewable systems. A good example is the Photovoltaic Rebate Program which can bring the cost of a solar panel system down by \$4,000.
- The Bega community could make strong calls for radically increasing Australia's Mandatory Renewable Energy Target (MRET) to send a signal for more renewable energy production. The nominally 2% MRET is already fully exploited and no longer influential, while by contrast, China has set an MRET of 16% of total energy by 2020. The NSW Renewable Energy Target (NRET) sets mandatory targets for renewable power of 10% by 2010 & 15% by 2020 for NSW power retailers.
- At the local level we can set goals for GreenPower and encourage efficiency measures. GreenPower does not count towards NRET nor does the federal government MRET program. i.e. Green Power is additional to NRET and MRET. Collectively this could lead to 20% or more renewable energy by 2020 nationally and locally much higher levels with strong advocacy of GreenPower.
- We all have money invested in the stock exchange through our superannuation. Find out how this money is invested and if it could be used for better effect. If buying new shares yourself, consider investing in renewable energy companies and geothermal developments in Australia.
- Talk about the issue. People need to have heard the same thing at least three times before it starts to take effect. Action for the future is one way to avoid the drop from denial to despair. This is a serious, global problem, it is huge and overwhelming. Acting now, while there is still enough energy, goodwill and water, will make it easier to change - it will be much, much harder in the future. Ignoring climate change won't help the children who will be living in this world we are creating.
- Don't take a back seat on the future, we all have influence in what we do today. You can join the Citizens' Climate Campaign by emailing climatez@aapt.net.au.

Mandatory Renewable Energy Targets

Incentives are now in place in most developed nations to promote the development of clean, renewable energy. One of these is the mandatory renewable energy target or MRET. In 1997, the Prime Minister's Statement "Safeguarding the Future: Australia's Response to Climate Change" indicated that by the year 2000 a mandatory requirement would be imposed on retailers and other large buyers of electricity to source an additional 2% of their electricity from renewable energy sources by 2010. This culminated in the Renewable Energy (Electricity) Act 2000, specifically to encourage additional generation of electricity from renewable sources by issuing renewable energy certificates (RECs), which provide an income stream for renewable energy generators. <http://www.geodynamics.com.au/IRM/content/faq.htm>.

MRET is actually 9500 gigawatt-hours per year. Taking into account the projected growth in electricity demand, MRET is really only about 0.5%. It is so small that sufficient renewable energy required to meet the 2010 target had already been installed by mid-2006.

Carbon trading – National Emissions Trading

The global carbon market, worth \$13 billion in 2005, grew to \$18 billion in the first half of 2006 – it is worth asking why Australia is not participating. The importance of putting a price on greenhouse emissions (primarily carbon dioxide, hence carbon trading) is that it provides a universal incentive for developing and commercialising technologies to reduce these emissions.

Developed countries (excluding the US and Australia), signed up to a global carbon-trading scheme as part of the Kyoto Protocol and collectively agreed to reduce their greenhouse gas emissions. An emissions trading scheme can bring about structural change in the economy, shifting resources and labour from high to low emitting activities in a way that minimises the loss to overall economic activity.

Carbon trading has international business models that deal directly with offsets. These offsets are a mechanism whereby industry or individuals can pay for their current CO₂ emissions until mitigated altogether, directing funds into tree planting projects to sequester carbon or renewable energy investment.

State governments in Australia recently committed to putting a national carbon-trading scheme in place by 2010, encouraging the Federal government to join after its National Emissions Trading Taskforce reports on 31 May 2007. Under the state and territory scheme, electricity generators would need to hold permits to emit greenhouse gases. The scheme allows trading of unused permits - emitters can offset emissions through forestry and the capture and storage of carbon. As time goes by, the number of available permits is lowered, with the eventual aim of cutting Australia's emissions to 60% below 1990 levels by 2050.

Unfortunately the 2006 discussion paper for the States scheme does not adopt any of the following key requirements for an effective emissions trading scheme, that is to include:

- A strong cap on total emissions;
- All industries and electricity generation to be covered. The only 'exemptions' should be rebates for products exported to countries that do not have carbon pricing, where the exported products are competing with products made in those countries;
- At least half the emissions permits to be issued initially by auction, rather than by 'grandfathering' (handing out permits free of charge) to the big greenhouse gas emitters;
- Emissions permits to be temporary licences, not property rights.

Other Incentives for Reducing Greenhouse Gas Emissions

A Carbon Tax is a tax on energy sources that emit CO₂ into the atmosphere. It is an example of pollution taxes, favoured by economists because they tax a "bad" rather than a "good" (such as income). A carbon tax addresses a negative externality - an externality is a cost or benefit from an economic transaction that parties "external" to the transaction receive. Externalities can be either positive, when an benefit is generated, or negative, when an external cost is imposed upon others. Because of the link with global warming, a carbon tax is sometimes assumed to require an internationally administered scheme; that is not intrinsic to the principle, however. The European Union has discussed a carbon tax covering its member states to supplement the carbon emissions trading scheme begun in January 2005. However, in an emissions trading systems (a) the payment for emissions is not received by a governmental body, and (b) the price per unit of emissions is not fixed as it is in tax systems, rather it is a market price that fluctuates.

The NSW Greenhouse Gas Abatement Scheme was developed by the NSW Government to encourage businesses, (particularly electricity companies) to reduce their greenhouse emissions. Participants who develop projects that prove to reduce greenhouse gases can then register a certificate for every tonne of greenhouse gas reduced. Each NSW Greenhouse Gas Abatement Certificate (NGAC) can be traded for cash, currently valued at approximately \$11-11.50 each. Anyone can negotiate with an electricity company to sell NGACs, however a government registration fee first needs to be paid. Because the administrative costs of these dealings are high, it may not be profitable for an electricity company to deal with small operations or individuals (source Sydney Water 2007).

This scheme does not put a cap on emissions. In practice, a large fraction of the NGACs is going to coal-fired power stations, some in Victoria, for making small improvements in the efficiency of electricity generation that they would probably have made anyway.

Measuring success - Future reviews of plan

This document, and the actions that will flow from it, will need to be reviewed on an annual basis. Monitoring will need to be carried out to track changes over time. This will require identifying measures of success under the Action Plan, and putting in place practical methods for assessing which actions are making real contributions towards meeting the 50/50 by 2020 targets.

This process will involve gathering hard data to enable us to set a baseline for current energy use/greenhouse gas emissions and then to measure progress towards the 50/50 targets over time. These targets and means of measuring them may need to be revisited on an annual basis.

However, the first step is to encourage significant numbers of individuals, households and enterprises within the Bega Valley Shire to commence the journey towards a carbon-neutral future. An account of how many households had carried out retrofitting, how many had moved across to purchasing true new renewable GreenPower and how many had contributed to travel abatement projects, would, for example, begin to give us measurable targets that could be monitored over time.

Future annual reviews of the plan will assist in the process of identifying and prioritizing options for action and ensuring the entire process is streamlined through adequate strategic and adaptive planning.

An Adaptation Strategy for Bega Valley Shire

Climate change will undoubtedly occur in our region over the next few decades, driven by the action of greenhouse gases already accumulated in the atmosphere. Therefore we have a responsibility to consider what might be an appropriate adaptation strategy for the Bega Valley Shire.

Our aim is to increase the resilience of the human and natural systems in the Shire. Any increase in severe weather events linked with climate change will put pressure on the community and the environment.

Volunteer emergency services will be in the front line in dealing with more bushfires, high winds, heatwaves or even welcome heavy rainfall events like the one recently experienced in February. Local governments have an important role here in ensuring that support systems for these voluntary crews is adequate and that forward planning and training is carried out.

Landholders may need support to discuss adaptive management strategies that look into breeding and investment decisions and the potential of minimising the potential impacts of ongoing drought. There may need to be transition strategies for diversifying different types of agricultural production in the future.

The Shire's water supply may come under increasing pressure, with the potential not only for water stress from reduced rainfall but also from unusual rain events that may breach dams or even from salt water incursion if sea level rises affect coastal water sources.

Adaptation strategies for biodiversity and ecosystems are harder to envisage. The critically endangered mountain pygmy possum will have nowhere to go if climate change makes its alpine habitat of boulder fields uninhabitable and diminishes its access to seasonal food sources any further (Beeby 2007).

Energy planning will be affected, with potential impacts on energy generation and transmission and even the stability of the energy systems themselves in the face of cumulative events. Solutions will include demand management and energy conservation measures as well as renewable options.

A report put together by the Allan Consulting Group (2005), from which this section is largely drawn, points out that Australian regional priorities include low-lying coastal populations and resort centres that may be vulnerable to inundation and erosion from storm surges. Centres with a high dependence on agriculture and/or eco-tourism are also deemed to be vulnerable to economic pressures.

The National Climate Change Adaptation Programme was launched by the Federal Government in September 2006, to start preparing Australian governments, vulnerable industries and communities for the unavoidable consequences of climate change. Priority areas of focus include a national assessment of the risks of climate change, development of tools and methods, and research to fill major knowledge gaps. See <http://www.greenhouse.gov.au/impacts/publications/pubs/nccap.pdf>

Glossary

Adaptation to global warming involves taking action to minimize the negative effects of global warming

Biodiesel - a diesel-like fuel made by chemically modifying vegetable oils or animal fats

Biofuel is any fuel that is derived from biomass — recently living organisms or by-products, such as manure from cows. It is a renewable energy source, unlike other natural resources such as petroleum, coal, and nuclear fuels.

Biogas typically refers to gas produced by the anaerobic digestion or fermentation of organic matter including manure, sewage sludge, municipal solid waste, biodegradable waste or any other biodegradable feedstock. Biogas is comprised primarily of methane and carbon dioxide.

Biomass, in the energy production industry, refers to living and recently living biological material which can be used as fuel or for industrial production. Most commonly refers to plant matter grown for use as biofuel, but also includes plant or animal matter used for production of fibres, chemicals or heat & may also include biodegradable wastes that can be burnt as fuel but excludes coal or petroleum

Carbon credits are certificates awarded to countries that are successfully reducing the emissions that cause global warming. For trading purposes, one credit is considered equivalent to one tonne of CO₂ emission reduced and can be sold in the international market at a prevailing market rate.

Developed countries that have exceeded the levels can either cut down emissions, or borrow or buy carbon credits from developing countries. Carbon credits create a market for reducing greenhouse emissions (carbon) by giving a monetary value to the cost of polluting the air.

Carbon dioxide (CO₂) sink is a carbon reservoir that is increasing in size, and is the opposite of a carbon "source". The main natural sinks are (1) the oceans and (2) plants and other organisms that use photosynthesis to remove carbon from the atmosphere by incorporating it into biomass. This concept of CO₂ sinks has become more widely known because the Kyoto Protocol allows the use of carbon dioxide sinks as a form of carbon offset.

Carbon emissions trading involves trading of permits to emit CO₂ (& other greenhouse gases), one way countries can meet their obligations under the Kyoto Protocol to reduce carbon emissions and mitigate global warming. The world's only mandatory carbon trading program is the European Union Emissions Trading Scheme that in 2005 capped the amount of carbon dioxide that can be emitted from large installations, such as power plants and factories, in the EU's 25 member countries.

Carbon offset is a service that reduces the net carbon emissions of one party, by reducing the carbon emissions—or increasing the carbon dioxide absorption—of another party.

Carbon sequestration is the term describing processes that remove carbon from the atmosphere. To help mitigate global warming, a variety of means of artificially capturing and storing carbon -- as well as of enhancing natural sequestration processes -- are being explored.

Climate change refers to the variation in the Earth's climate over time. It describes changes in the variability or average state of the atmosphere over time scales ranging from decades to millions of years. These changes can be caused by processes internal to the Earth, external forces (e.g. variations in sunlight intensity) or, more recently, human activities.

Global warming is the observed increase in the average temperature of the Earth's atmosphere and oceans in recent decades and its projected continuation.

Greenhouse gases are components of the atmosphere that contribute to the greenhouse effect. Some greenhouse gases occur naturally in the atmosphere, while others result from human activities. Naturally occurring greenhouse gases include water vapour, carbon dioxide, methane, nitrous oxide, and ozone. Some greenhouse gases are accumulating in the atmosphere mainly from burning fossil fuels, land use change and agriculture since industrial revolution. The result is that some of the heat given off by the planet accumulates, making the earth warmer, hence 'global warming'.

Greenhouse Gas Abatement Scheme - trading scheme that aims to lower greenhouse gas emissions, eg the NSW Greenhouse gas abatement scheme, which commenced on 1 January 2003, is a mandatory greenhouse gas trading scheme that aims to lower greenhouse gas emissions to 7.27 tonnes of carbon dioxide per capita by the year 2007.

Kilowatt, megawatt, gigawatt. The basic unit of power (the rate at which energy is used) in the metric system is the watt (W); a kilowatt is 1000 watts. A watt is a very small amount of power and in most mechanical applications we count power in kilowatts. A kilowatt is about equal to the heat energy put out by a single bar radiator, and is also about equal to the power expended by a person running up stairs. A car engine typically produces 50 to 100 kilowatts. One megawatt is 1000 kilowatts and one gigawatt is 1000 megawatts.

Kyoto Protocol to the United Nations Framework Convention on Climate Change is an amendment to the international treaty on climate change, assigning mandatory targets for the reduction of greenhouse gas emissions to signatory nations.

MWh . One megawatt is 1000 kilowatts or 1000,000 watts – one watt-hour is the amount of (usually electrical) energy expended by a one-watt load (e.g. light bulb) drawing power for one hour.

Mitigation of global warming involves taking actions aimed at reducing the extent or likelihood of global warming

Photovoltaic (PV) cells. Also known as solar cells. A photovoltaic cell is made of thin wafers of two slightly different types of silicon. Sliver cells can increase the efficiency of silicon many-fold.

Pyrolysis. A process which involves heating biomass to drive off the volatile matter, leaving behind the black residue we know as charcoal. More sophisticated pyrolysis techniques have been developed recently to collect volatiles – gaseous compounds – that are otherwise lost to the system. The collected volatiles produce a gas rich in hydrogen and carbon monoxide.

Renewable energy is derived from resources that are regenerative or for all practical purposes can not be depleted. Renewable energy sources contribute approximately 29.3% of human energy use worldwide and the prime source of renewable energy is solar radiation, i.e. sunlight.

Retrofitting refers to the addition of new technology or features to older systems. In the case of retrofitting houses, we refer to adding new features that will improve the house's energy efficiency.

Grateful thanks to Wikipedia, the free encyclopedia

Appendix 1 – Clean Energy Working Group Membership & Terms of Reference

MEMBERSHIP

Bill Caldicott – Bermagui, farmer, ex doctor, sustainability advisor.

David Hede – Merimbula, BVSC councillor and Independent candidate

Sue Norman - Kiah, artist, writer, TAFE literacy teacher.

Derek Povel – Jellat Jellat, nurseryman, owner of Bega Plants, CEFE Secretary

Philippa Rowland – Angledale, agricultural consultant, mother of 2 small children, CEFE Public Officer

Rodger Ubrihien – Tathra, road engineer, some experience of clean wind energy

Michael Wood – Tathra, electrician with long-term practical experience in renewable, small scale solar

OBJECTIVE OF THE BEGA CLEAN ENERGY WORKING GROUP:

To work with the Bega Valley Shire Council and the community to achieve the greenhouse targets of

- 50% reduction in the Bega Valley Shire’s total community energy consumption by 2020
- 50% of the Bega Valley Shire’s energy to come from clean, renewable sources by 2020 “50/50 BY 2020” as determined by the community referendum on Monday 21st August 2006 at the Bega RSL Club.

The proposed outputs from the Working Group

Stage 1 – current working group to act as a catalyst & write an action plan by Feb 2007, providing real possibilities for affordable, strategic action across all levels in shire

Stage 2 – Feb 2007 onwards - implement the Action Plan, with timelines, partnerships, monitoring progress, to be handed over to another working group with some common members

14 year commitment to 2020, with a clear need for ownership and implementation of the action plan.

TERMS OF REFERENCE

The Bega Clean Energy Working Group will consider and report back to community within six months on the following matters:

(a) Development of a climate change action plan for the Bega Valley, setting out the policies and investments required to meet its targets of 50% energy reduction and 50% clean energy by 2020, including:

- i). an energy audit to identify current and projected future energy needs
- ii). feasible options for achieving energy conservation and increased community adoption of sustainable energy practices and clean energy
- iii). potential key projects that will practically assist in increasing the renewable energy capacity in the Bega Valley (solar photovoltaics, wind, micro-hydro, biogas, biofuel and others}

(b) Partnerships required to provide funds, expertise and support for the successful implementation of the proposed climate change action plan.

Appendix 2 - Sustainability Principles

The fundamental principles of sustainability that we have adopted for this action plan are to live:

1. Without the systematic build up in nature of substances extracted from the earth’s crust.
2. Without the systematic accumulation in the biosphere of industrial substances foreign to nature.
3. Without long-term degradation of natural systems through physical impacts on land, water and bio-diversity.
4. Without social, economic and political conditions that undermine the capacity of people to meet their needs.

(Based on the Four System Conditions for sustainability of the Natural Step, 2003.)

Appendix 3 - Possible Pilot Projects

<i>What</i>	<i>How</i>	<i>Who</i>
<i>Households – domestic electricity use</i>	Awareness, behaviour change, energy audits, GreenPower, compact fluorescent light globes, retrofitting, solar hotwater	
<i>Energy Efficiency options</i>	Significant gains can be made in this area quite simply	
	Smart metering– upgrade Country Energy trial with Bayard?	
<i>Built environment</i>	Project to improve BASIX with mandatory renewable elements and solar passive design etc	
	Surf clubs – solar and wind turbines in 2007	
	Schools – energy saving & climate change projects across shire	
	New Supermarkets – seek best practice energy efficient design	
<i>Communication and Information Sharing</i>	Develop an unbiased reliable clearing house for inquiries, and set up a local service directory with redirection as appropriate.	
<i>Primary Industries: agriculture</i>	Biogas trial in dairy industry – investigate carbon credits Identify options for horticulture, nursery & other ag. industries	
<i>forestry</i>	Value-adding for timber industry plus increased forestry sinks	
<i>Producers</i>	Capitalize on clean green image, provide information for responsible purchases, brand local products for consumers	
<i>Business</i>	Create a membership of businesses willing to embrace energy efficiency, provide identification and program	
<i>Commercial</i>	Promote corporate responsibility, advertising, benefits of reduced consumption, potential for new jobs/enterprises	
<i>Manufacturing</i>	Bega Cheese Factory – trial biogas &/or energy efficiency?	
	Other enterprises – eg. Bega Dried Foods in Tathra?	
<i>Tourism</i>	Encourage Eco-tourism. Inform tourists of Bega targets, build bike paths to & from tourist attractions in Shire	
<i>Transport</i>	Potential for biofuel plant in Bega shire? More public transport?	
<i>Shire-wide energy options</i>	Solar – hot water economies of scale, also larger PV systems	
	Wind – local potential for individual or community wind farm	
	Geothermal & Wave – worth investigating future options now	
<i>Management (private and public)</i>	Local government action as part of Cities for Climate Change	

Appendix 4 - Characteristics of Greenhouse Gases

Taken from the Moyne Shire Council *Local Greenhouse Reduction Action Plan – May 2004*

Greenhouse Gas	Source	Atmospheric Lifespan (years)	Greenhouse Warming Factor CO₂e	Global warming contribution
Carbon Dioxide CO ₂	1 Burning fossil fuels Cement manufacture.	50-200	1.0	52%
Methane CH ₄	1 Waste decomposition without air (i.e. buried waste in landfill) 2 Coal-bed methane from coal mining 3 Natural gas leakage 4 Grass digestion by grazing animals Burning of biomass fuels	12-17	21	19%
Nitrous Oxide N ₂ O	1 Soil, nitrogen fertiliser decomposition Burning of petroleum products	120	310	19%
Chlorofluorocarbons and carbon substitutes	1 Leakage from refrigeration and air-conditioning systems Aluminium	>1000	CFC12 8,500 HCFC-113 93 HFC-134a 1,300	10%

Appendix 5 – Why the Storm over the Stern Report?

At the end of October 2006, the Stern Review on the Economics of Climate Change was released in the United Kingdom, detailing the likely impacts of unchecked climate change. Sobering reading, especially the predictions made for Australia. As the world's driest continent, we are particularly vulnerable to the impact of rising sea temperatures on overall rainfall patterns and yearly variations. In the past 30 years, stronger tropical typhoons have led longer droughts and declining rainfall along the east coast. "River flows in NSW, including those supplying Sydney, have been predicted to drop by 15 per cent for a 1-2 degree Celsius rise in temperature. Drier and hotter summers threaten the survival of the Queensland rain forest. Warmer winters and reduced snowfall endanger the habitat of mountain top fauna and flora".

Reuters reported that ignoring climate change could lead to economic upheaval on the scale of the 1930s Depression, underlining the need for urgent action to combat global warming. If no action is taken, climate change will reduce global consumption per head by between five and 20 percent. The costs of extreme weather alone could be 0.5 to 1 percent of global Gross Domestic Product by 2050.

The report's author, UK Government Economic Service head and former World Bank chief economist Sir Nicholas Stern, said the Kyoto Protocol should be seen as a first step towards global emissions trading. Change now would save about \$US2.5 trillion (\$A3.26 trillion) compared with doing nothing, and would help avert possible economic and planetary catastrophe. Markets for low-carbon energy products are likely to be worth at least \$500 billion per year by 2050, and perhaps more.

Clean Energy Action Plan – Towards 50/50 by 2020 in the Bega Valley Shire

Large-scale uptake of a range of clean power, heat and transport technologies are required. The global power sector will have to be decarbonised (i.e. shifted from carbon dioxide emitting fossil fuels to renewable sources) by between 60 and 75 percent, by 2050 to stabilise greenhouse gases.

Appendix 6 – References and Useful websites

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- UMPNER review (2006) *Uranium Mining, Processing and Nuclear Energy Review (UMPNER)* – (see <http://www.pmc.gov.au/umpner/index.cfm>)

Useful Websites

Helpful hints for taking action at home:

Please note there are many experienced local tradespeople in Bega Shire, their details are in the Yellow Pages and the Australian Business Council for Sustainable Energy (BCSE) list of accredited installers. Australian Greenhouse Office and building industries <http://www.greenhouse.gov.au/yourhome/>
Energy Matters Renewable Store www.renewablestore.com.au/
HEAT (2006) Home Energy Audits, ACT Energy Wise <http://www.heat.net.au/home-energy-audits.html>
Energy Rating guide for household and other appliances <http://www.energyrating.gov.au/>
Australasian Energy Performance Contracting Association www.aepca.asn.au for retrofitting & more

Information on Renewable Energy Resources

Australian Business Council for Sustainable Energy (BCSE) <http://www.bcse.org.au/home.asp>
Alternative Technology Association (Australian ngo) <http://www.ata.org.au/>
Solar Energy Australia <http://www.solaraustralia.com.au/>
Australian Wind Energy Association (AUSWEA) <http://www.auswind.org/auswea/index.html>
Australian Greenhouse Office Renewable Energy site <http://www.greenhouse.gov.au/renewable/>
Geothermal Energy – Geodynamics Limited <http://www.geodynamics.com.au/IRM/content/home.html>
Bioenergy Australia www.bioenergyaustralia.org set up to foster biomass development for fuel & energy
Pyramid Power, a Pambula company providing alternative energy www.pyramidpower.com.au

Information on successful Australian and international projects

An Inconvenient Truth - The Al Gore movie on climate change <http://www.climatecrisis.net/>
Rocky Mountain Institute, innovative ideas on reducing greenhouse emissions <http://www.rmi.org>
The Climate Institute and its 5 point plan for greenhouse www.climateinstitute.org.au/cial/index.php
Cities for Climate Protection Australia and Oceania <http://www.iclei.org/index.php?id=2291>
Global site for Cities for Climate Protection <http://www.iclei.org/index.php?id=800>
Local Energy Farm Demonstration Project & Biogas generation, Vancouver <http://www.energyfarms.net/>
Biofuels and algae <http://www.theoil drum.com/story/2006/1/16/155759/653>

Transport/Lifestyle/Carbon Offsets

GreenPower Watch (rating green power providers) <http://www.greenelectricitywatch.org.au/index.php>
Reduce fuel usage and emissions <http://fuel economytips.com>
Open source discussions on saving fuel and dramatically reducing emissions <http://mpgresearch.com>
Choice green car ratings <http://www.choice.com.au/> and search for green car ratings under car section
Carbon offsets for travel <http://www.climatefriendly.com.au/>
Carbon offsets for car and plane travel, households, <http://www.neco.com.au/categories.asp?cID=152>
A climate friendly diet <http://www.eatkind.net/inconvenient.htm>
The Phoenix Fridge Project – a guide to making your fridge efficient www.mefl.com.au

General Information

Climate Change in Rural & Regional Australia www.greenhouse.gov.au/nrm/publications/pubs/climatechange.pdf
Carbon Planet Greenhouse Gas Emissions Audit Nov 2006 www.carbonplanet.com (others in text p12)
Information on peak oil and related topics from nuclear to ethanol <http://www.peakoil.org.au/index.htm>

Funding sources and incentives

CarbonSMART management and brokering service <http://www.landcareonline.com/page.asp?pID=128>
State NSW Climate Action Grants Program www.deus.nsw.gov.au/Energy/Energy%20Savings%20Fund/Public%20Facilities%20Program/Public%20Facilities%20Program.asp#TopOfPage
NSW Greenhouse Abatement Credits – see www.sydneywater.com.au/publications/factsheets.NGAC/pdf