National Energy Efficiency and Conservation Strategy

Towards a sustainable energy future

September 2001

EECA

Ministry for the Environment
Manatū Mō Te Taiao

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PREFACE

This is New Zealand's first National Energy Efficiency and Conservation Strategy, prepared as a requirement of the Energy Efficiency and Conservation Act 20001 . Its purpose is to promote energy efficiency, energy conservation and renewable energy within the context of a sustainable energy future.

The Strategy is a result of a 15 month process that began in July 2000. That process included "vision" pieces prepared by energy commentators, five sectoral workshops with stakeholders, eight hui and numerous one-on-one meetings. A Draft Strategy was released in March 2001, with over twenty public presentations being made throughout the country during April. Three hundred and thirty nine written submissions on the Draft Strategy were received from individuals, small and large energy users, energy suppliers, and other institutions. While some different points of view were expressed, and suggestions for changes on a number of details, the vast majority of submissions supported the general direction of the Draft Strategy to move towards a sustainable energy future. Many suggestions have subsequently been incorporated into the final Strategy2 .

As required by the Act the Strategy is organised around objectives, policies and targets, supported by a set of means (or measures). The measures tend to have a short-term focus while the objectives, policies and targets are set within a longer timeframe. It should be noted that a number of measures in the Strategy cannot be considered a commitment at this stage, either because they depend on other Government policy development, or because they require additional funding that will need confirmation through normal Government budget-setting processes.

The Strategy has been developed within the context of sustainability3 and is closely linked to related issues including New Zealand's climate change response, the proposed New Zealand Transport Strategy, and the National Waste Minimisation Strategy. It is also intended that the Strategy be a core element within a wider sustainability framework provided by a New Zealand Sustainable Development Strategy which Government is preparing.

The vision of a sustainable energy future also embraces the principles of the Treaty of Waitangi. EECA recognises its obligations under the Treaty of Waitangi and its role as kaitiaki of energy resources4 . It is committed to working with Maori in accordance with the principles of partnership, participation and development. This commitment is signalled through a number of actions within the Strategy to work with Maori communities on issues of energy use and supply.

[1] Hereafter referred to as the Strategy and the Act respectively (see Appendix 1 for details).

[2] EECA's analysis and recommendations on these submissions is contained in a separate report to the Minister of Energy. This report is available from the EECA website (see Appendix 2).

[3] Sustainability principles underpin the Act under which this strategy is prepared (see Appendix 1).

[4] EECA uses the word kaitiaki (guardian) in its Maori title and accordingly assumes responsibility as a guardian of the use and supply of energy resources.

Foreword from the Minister of Energy

energy conservation and renewable energy in New Zealand finally has a recognisable face, soul and direction.

In 2000 the new Energy Efficiency and Conservation Act started a chain of events resulting in this, the first National Energy Efficiency and Conservation Strategy.

The Strategy marks a rite of passage for New Zealand society. Our toying with energy efficiency and renewable energy has come to an end.

The Strategy is not designed to be a universal panacea. It has not pandered to vested interests. Instead, extensive consultation has identified problems and focussed on practical solutions.

First and foremost the Strategy provides strong direction spanning all parts of the economy. But it goes much further. It also provides a rich agenda for action, engaging both the public and private sectors.

The goals recognise the serious contribution that energy efficiency and renewable energy will make to the economy, the environment and our social development. In short, it gives effect to sustainable development principles.

New Zealand's commitment to honour the Kyoto Protocol on greenhouse gas reductions reinforces just how important the Strategy is to our overall climate change response.

The national target set for energy efficiency is challenging yet realistic. The exact target for renewable energy sources will be pinned down by the middle of next year.

The scope of the job ahead is now clear. Government is committed to providing the leadership to turn the Strategy's words into real achievements. But Government is just one player. The Strategy requires participation from all sectors as we start down the path of transforming our energy system.

Energy efficiency and renewable energy has finally come of age in New Zealand.

Hon Pete Hodgson
Minister of Energy

1. Towards a Sustainable Energy Economy

1. In the last 100 years New Zealand's use of energy doubled every 22 years. Energy lies at the heart of our prosperity and way of life. It provides our basic needs for warmth and cooking, powers our transport systems, agricultural and industrial processes, and an ever-increasing range of appliances on which modern life is founded. Yet most of the energy we use comes from fossil fuel reserves laid down millions of years ago. Some of these reserves are now depleted and others will become so over the next two decades. Reserves of oil will be increasingly concentrated in a few countries. Carbon dioxide (CO2) emissions from burning fossil fuels are raising the concentration of greenhouse gases in the atmosphere and threatening the global environment. New Zealand's CO2 emissions increased 22 percent from 1990-2000 and are projected to increase by 45 percent from 1990 to 2012 if growth in energy consumption continues unchecked[5] .

2. Internationally, countries are facing the challenge of sustainable energy - to change the way energy is supplied and used so that economic, social and environmental aims of sustainable human development are supported. New Zealand is no different. Three essential building blocks for a sustainable energy future are:

   - *Energy efficiency.* At present the overall technical efficiency of energy use averages 25 percent. There is scope for ongoing cost-effective improvements in efficiency across all sectors. These improvements should deliver immediate and realisable gains for the environment, the economy and peoples' welfare.
   - *Energy conservation.* There is scope to avoid energy waste and reduce energy use (with overall net benefits) by actions such as switching off equipment when not in use. Energy conservation complements energy efficiency initiatives.
   - *Renewable energy systems.* Renewable energy systems will ultimately be the main source of energy for a sustainable economy. They replace dependency on fossil fuels and provide permanent solutions to the issue of energy sector CO2 emissions. They do have potential localised environmental effects, but these can be managed by effective processes.

3. Some progress towards a sustainable energy future is occurring. Energy efficiency across the economy is estimated to be improving by 0.5-1 percent p.a. through technology improvements and energy efficiency programmes undertaken by some businesses and communities. A number of renewable energy opportunities are also being investigated and developed. However, this natural (and partly–assisted) rate of progress is significantly less than what is both cost effective and strategically advantageous. Well-known barriers, such as pricing structures and information shortcomings, must be overcome to achieve optimum levels of energy efficiency improvement. Barriers also stand in the way of renewable energy development. Prominent is the absence of a "level playing field" with fossil fuel pricing, in particular the lack of a consistent requirement on fossil fuel users to internalise environmental costs[6] .

4. New Zealand already has one of the highest rates of renewable energy supply in developed countries (29 percent of consumer energy compared with 6 percent for Australia and the US, and 25 percent for Sweden). Our geographic location provides a natural advantage in renewable wind, wave, water and direct solar radiation. The rapid development of technologies, particularly in the last two decades, to harness renewable energy means the future potential is exciting. For example, the cost of electricity from wind has halved in the last decade and at favourable sites is now cheaper than electricity production from coal. With suitable encouragement other renewable energy technologies can also become more cost effective. New Zealand also has a very large woody biomass resource which will increase over the next decade.

[5] Ministry of Commerce. 2000. "New Zealand Energy Outlook to 2020".

[6] Government has signalled its intentions that prices should "reflect the full costs of supply including environmental costs" (Energy Policy Framework, Oct 2000 – see Appendix 1). There are a number of taxes on fossil fuels but none that currently relate specifically to carbon abatement.

5. Not only does development of renewable energy technologies provide a more sustainable energy base for this country. There is the potential to foster internationally competitive renewable energy industries to meet the growing international demand for renewable energy technologies. Some countries are actively pursuing these opportunities. Australia for example has developed a nine-point strategic action plan and a vision "to achieve a sustainable and internationally competitive renewable energy industry which has annual sales of $4 billion by 2010"[7] . Targeted government-industry programmes and goal setting has enabled Denmark to become the world's leading wind power technology exporter. New Zealand, also, has the opportunity to develop a broad-based, strategic approach to a sustainable energy economy.

6. Change within energy systems is ongoing. Over the last century energy sources and technologies have risen, and declined with regularity. Coal supplied up to 75 percent of the country's primary energy in the 1920s, but now provides less than 10 percent. Oil and gas have both peaked in terms of their share of primary energy supply. Electricity has emerged as a major form of energy, and this is likely to strengthen in the future. The changes promoted in this Strategy - greater energy efficiency, conservation and renewable energy – through a mix of market transformation approaches are consistent with the general direction being mapped out internationally for a sustainable energy future[8] .

2. Direction and Goals

Policy Direction

7. The Strategy's two key policy directions are as set out in the Government's Energy Policy Framework (October 2000)[9] . For the purposes of this Strategy energy conservation measures are included as part of the sector energy efficiency programmes.

1. Continuing improvement in our energy efficiency

2. Progressive transition to renewable sources of energy

Goals

8. The Strategy's six goals are outlined below, listed by environmental, economic and social outcome areas. No particular priority is attached to the order in which the goals appear.

Goal 1: Reduce CO_2 emissions

- Energy efficiency and renewable energy measures will reduce CO_2 emissions and help New Zealand meet its international climate change responsibilities. The overall response to climate change will be wider than this, but the Strategy's initiatives are recognised as a sensible place to start.

[7] Department of Industry, Science and Resources, 2000. "New Era New Energy" - Renewable Energy Action Agenda.

[8] United Nations Development Programme, 2000. "World Energy Assessment – Energy and the Challenge of Sustainability".

[9] See Appendix 1.

Goal 2: Reduce local environmental impacts

- Energy efficiency and conservation will reduce local environmental effects of energy production and use. It is recognised that the local impacts of expanded renewable energy supply will also need appropriate management.

Goal 3: Improve economic productivity

- Cost effective energy efficiency measures will improve New Zealand's economic performance and improve the value the economy derives from the use of energy resources.

Goal 4: Promote industry development

- Energy efficiency and renewable energy initiatives can result in profitable business opportunities and regional development. The Strategy aims to realise this potential.

Goal 5: Improve economic resilience

- Energy efficiency, conservation, and a diversified portfolio of renewable energy supply can improve the resilience of the New Zealand economy to future energy supply disruptions or energy price shocks.

Goal 6: Improve health and welfare

- Energy efficient homes reduce energy deprivation and improve occupant health and welfare. The Strategy's energy efficiency measures aim to improve community wellbeing by enhancing the provision of adequate energy services for all in the community.

3. Targets and Outcomes

TARGETS

9. The Strategy has two high-level targets – one relating to energy efficiency[10] and the other to the level of energy supply from renewable energy sources.

Energy efficiency:

- At least 20 percent improvement in economy-wide energy efficiency by 2012[11].

Renewable energy:

- Increase renewable energy supply to provide a further 25-55PJ of consumer energy by 2012.

[10] Energy conservation outcomes will be incorporated and measured as part of this target.

[11] 2012 is the final year of the first commitment period of the Kyoto Protocol.

10. Targets are required by the Act to be "measurable, reasonable and practicable". The basis for meeting this requirement is discussed below, with further details given in Boxes 1 and 2. Box 1 details how the energy efficiency target will be measured and progress monitored. Box 2 provides some background on commitments and target-setting elsewhere.

Energy efficiency target

11. The energy efficiency target is the equivalent of a continual improvement rate of 2 percent p.a. to 2012. It accounts for a slightly lower achievement in the first two years as the energy efficiency measures are progressively ramped up. Given the anticipated natural rate of improvement is 0.5-1 percent p.a. the Strategy seeks an additional improvement of 1-1.5 percent p.a. over the next ten years. This target is at the upper end of what is accepted internationally as cost-effectively achievable. It will need to be supported by effective policy implementation.

12. The energy efficiency target establishes a benchmark but is not a mandatory requirement. It is something to aim for. Based on international comparisons, sector-level analysis and input from submitters the target is considered to be "challenging but achievable". It will provide significant net benefits to the country but to be realised, action will be required across all sectors of the economy. One of the biggest challenges will be to achieve widespread, and ongoing participation from individuals and institutions. While it is known that quite large energy efficiency improvements are typically achievable from individual businesses or institutions (often 15-25 percent over three to five years), the nature of the target means that participation must move beyond the current relatively small number of active energy efficiency players, and beyond the initial "easy gains". A consistent theme across this Strategy's sectoral programmes is for sustainable energy "best practice" to become embedded into the culture of individuals and organisations.

Box 1

HOW PROGRESS TOWARDS THE ENERGY EFFICIENCY TARGET WILL BE MEASURED

The energy efficiency target is a big picture measure of energy efficiency in the New Zealand economy. Progress towards the target will be communicated by a national energy efficiency index. This index will be built up from a comprehensive programme of sectoral and sub-sectoral monitoring which will include the development of a number of key indicators for each sector. The indices will track changes in energy efficiency and conservation, and will factor out other variables such as changes in activity levels or the mix of outputs from each sector.

Some of the necessary monitoring information already exists, but further expansion is required. EECA is developing a framework to identify data gaps and determine key monitoring indicators. Additional data gathering and analysis is a priority with many Strategy measures containing an integrated monitoring programme in order to track energy efficiency progress.

The frequency of reporting monitoring information is still to be decided but annual reporting for key indicators is anticipated.

Renewable energy target

13. The renewable energy target is intended to give effect to the required progressive transition to renewable energy. In the last decade the market share of consumer energy provided by renewables has declined and is currently 29 percent (132PJ). No significant change in consumer renewable energy supply has been recorded in the last seven years. Even although 10-20PJ of new renewable energy supply is predicted in the next decade under business as usual[12] , renewables' share of total consumer energy is expected to decline further.

14. The target represents a 19-42 percent increase over the current renewable energy supply, and would most likely increase renewables' market share to 30-35 percent[13]. The 25-55PJ target includes the renewable supply expected to occur under business as usual.

15. The target is currently expressed as a range. This recognises that further analysis and input from interested parties is required before a specific target is finalised. (Note: the target maybe specified as sub-targets for individual technologies or sectors). The 25-55PJ range was selected based on a number of key criteria:

    - The lower end provides a clear margin of renewables expansion over business as usual;
    - The upper end is consistent with reasonable cost and practicality;
    - No realistic possibilities are excluded;
    - The likelihood of a carbon price operating in future is factored in; and
    - There is scope to use both mandatory and voluntary mechanisms.

16. Overall, the range provides a realistic envelope from which to carry out the necessary further work. The lower end would most likely be met by geothermal, woody biomass, hydro and wind options providing electricity and process heat (Table 1). At the upper end further expansion of process heat and electricity sources are predicted as well as a contribution from solar water heating. While the target does not exclude transport fuel options (such as biofuels) at present they do not appear to be available at relatively low net costs, and are not anticipated to be part of the least-cost mix.

17. The interaction of the energy efficiency target with the renewable energy target also needs noting. Lower energy growth in the future (as implied by achieving the energy efficiency target) is likely to make achievement of the upper end of the renewables target more expensive because market opportunities for low cost renewables supply will be reduced. Thus while analysis suggests that with higher energy growth an upper end renewables target could be achieved with an increase in overall energy prices of 1 percent or less[14] , there are many uncertainties about costs at this stage.

[12] Ministry of Commerce. 2000. Op Cit. The 20PJ projection comprises 9PJ electricity and 11PJ of mainly woody biomass for the forestry industry. There is high confidence that 15PJ would occur without further policy intervention.

[13] Note that while in theory the market share is potentially wider, 30-35 percent is considered to be a more realistic range.

[14] PA Consulting Group. 2001. "Transition to Renewable Sources of Energy". Report to the Ministry for the Environment and Energy Efficiency and Conservation Authority. The projected increase in energy prices assumes the cost of additional renewables is spread across the total $8 billion retail cost of energy.

Table 1 CHARACTERISTICS OF THE RENEWABLE ENERGY 25-55PJ TARGET RANGE		
	Lower end of target range	**Upper end of target range**
Most likely renewable energy supply option (at reasonable cost)	• Industrial process heat from geothermal and woody biomass. • Electricity from small and medium hydro, geothermal and low cost wind.	• As for the lower end of the target range supply. • Further electricity (geothermal, wind and large scale hydro eg, Lower Waitaki development); • Additional wood and geothermal utilisation under a "high forestry processing" scenario; • Solar water heating.
Mechanisms most likely to be required	• Either voluntary (eg. information provision, negotiated commitments, sector-based programmes), or mandatory mechanisms could be used.	• Mandatory mechanisms (eg. renewable energy obligations on retailers) would most likely be required in order to provide surety that the target is achieved.

18. The setting of the final target needs to acknowledge these, and other uncertainties in the demand and supply of energy over the next decade including:

    - The effect and timing of possible measures to introduce a carbon price;
    - The extent to which the considerable volume of wood becoming available in the next ten years will be partially or fully processed in New Zealand;
    - Changes in the costs of future renewable energy supply; and
    - Decisions on the construction of new gas fired power stations in the North Island.

19. A further issue to address is the appropriate mix of renewable energy supply to ensure that the stability and resilience of the overall energy supply system in New Zealand is improved. The country's relatively high reliance on hydro-power with limited water storage can lead to electricity shortages in low rainfall years. Further large scale development of hydro-power, unless accompanied by other diversified sources, might heighten this risk.

20. Further work on mechanisms to achieve the renewables target will focus on:

    - Tradeable renewable energy requirements placed on all energy retailers;
    - Tradeable fossil fuel use restrictions placed on all electricity generators and other energy suppliers;
    - Tradeable renewable energy requirements placed on retailers of electricity only. This is an option because a large portion of the additional lower cost renewables appears to be for electricity supply, and thus it would simplify application of a tradeable instrument;
    - Specific support measures for sectors such as solar hot water and industrial process heat;
    - Voluntary measures such as negotiated industry agreements, green pricing of renewable energy, the provision of information to address barriers to investment in energy supply from renewable sources, and reliance on a CO_2 economic instrument operating in the economy.

21. Further technical analysis on the target range and potential mechanisms will be carried out through to February 2002. It is intended that this work will dovetail with climate change policy options being developed over that time. Public consultation on both work streams is scheduled for March/ April 2002. Officials plan to report to Government by June/July 2002 with recommendations on:

    - Detailed target(s) and measures; and
    - The preferred form of enabling legislation for regulatory promotion of renewable energy, if required.

22. Further design and implementation of the renewables mechanism(s) will take place from July 2002 to November 2003.

Box 2

International target setting on energy efficiency and renewable energy

Energy efficiency

Only a few countries have set comprehensive energy efficiency targets. The Netherlands has proposed a one-third improvement in energy efficiency by 2020 compared to 1990. Actual achievement in the Dutch Voluntary Greenhouse Gas Programme for industry in the 1990s was a 2 percent p.a. average improvement in energy efficiency[15] . Japan has set a target to decrease energy consumption growth from 1.1 percent p.a. to 0.1 percent p.a. (ie. a 1 percent p.a. reduction in energy use net of any "natural" energy efficiency improvement). Slovenia has set an objective of reducing energy intensity by 2 percent p.a.

The recent World Energy Assessment, published by the United Nations and the World Energy Council, considered that in industrialised countries primary energy required for a given level of energy service could be cost-effectively reduced by up to 35 percent over 20 years when accompanied by effective policies[16] . In the US, the Electric Power Research Institute (EPRI) has proposed an energy efficiency improvement target of 2 percent p.a.

Renewable energy

Many developed economies have policies to increase the use of renewable energy. A number of countries have set renewable energy targets, although starting from a much lower base than is the case in New Zealand. Australia has a mandated "2 percent target" for electricity, aimed to raise the renewables share of electricity from 11 to 13 percent by 2010. This has been since quantified to a target of 9,500GWh (34.2PJ). The mechanism being used is a system of tradeable renewable energy certificates for electricity retailers, with penalty charges for retailers not meeting the renewables requirement. Denmark has set a target of 20 percent renewable electricity by 2003, and a requirement for all electricity subscribers to purchase an increasing quantity of electricity produced from renewable energy. The Danes are using renewable energy certificates that can be sold on a green market. They also have a history of financial support mechanisms for wind power. Finland has set a target of a 50 percent increase in renewable energy use by 2010 compared with 1995, with the majority of the increase expected to come from biomass. In the United Kingdom, the "Renewable Electricity Supply Obligation" sets a target to increase the renewable proportion of electricity supply from 3 percent in 1999 to 5 percent in 2003 and 10 percent in 2010 (ie. at least a trebling in renewable energy supply over 11 years). This is being supported by a fund to accelerate deployment of renewable energy technologies.

A number of countries (individually or collectively) also have targets for biofuels. For example the European Union has a target of producing 6,000 million litres of liquid biofuels by 2003, a sixfold increase on current production.

[15] Krarup, S and Ramesohl, S. 2000. "Voluntary Agreements in Energy Policy – Implementation and Efficiency". AKF. Institute of Local Government Studies, Denmark.

[16] United Nations Development Programme, 2000. Op Cit.

23. Achieving the two high level targets of the Strategy will change the direction of future consumer energy supply noticeably. Figure 1 provides an indicative estimate, based on moderate to high achievement levels for renewable energy supply and energy efficiency compared with business as usual (BAU). It suggests that by 2012, total consumer energy would be reduced by over 10 percent, with renewables making an increasing contribution. Under this scenario total fossil fuel use would stabilise if 45PJ of renewable energy supply was added between now and 2012, and would begin to decline if either the energy efficiency or renewable energy contribution was higher.

24. Table 2 summarises outcomes by the six high level goal areas of the Strategy (assuming the high level targets are met). Not all Strategy measures can be quantified at this stage so a qualitative assessment is provided for some outcomes.

Figure 1 CONSUMER ENERGY OUTCOMES TO 2012

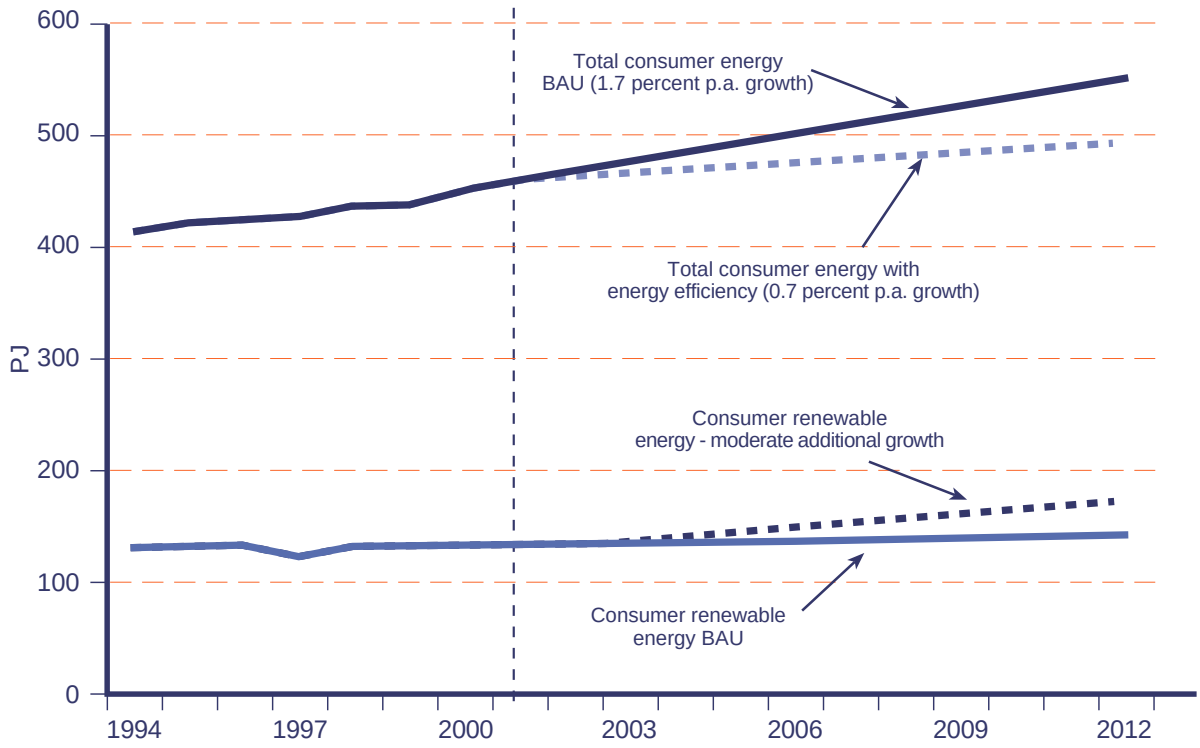


Table 2 PROJECTED 2012 OUTCOMES	
Goal areas	**Outcomes sought**

Reduced CO_2 emissions	• Net reduction in energy CO_2 emissions (compared with business as usual) implied by the respective energy efficiency and renewable energy targets are:
	  • Energy Efficiency - 3.0 million tonnes p.a.
	  • Renewables - 0.6-2.3 million tonnes p.a. approximately.
	  • Total[17]- up to 4.5 million tonnes p.a. approximately.
	• This represents a 30-40 percent reduction on the 10 million tonnes p.a. average excess CO_2 emissions anticipated in the first Kyoto protocol commitment period (2008-2012) under business as usual energy growth compared with 1990 emissions.

Reduced local environmental impacts	• Improved urban air quality resulting from:
	  • Pollution reduction through energy efficiency improvements in residential and industrial heating; and
	  • Reductions in vehicle pollutants through energy efficiency improvements and promotion of eco-efficient vehicles and fuels.

Improved economic productivity	• Net economic benefits from energy efficiency available for more productive uses in the economy. Present value of energy savings from measures in government, buildings/appliances and industry programmes conservatively estimated at $2.0 billion compared to present value of costs of $1.1 billion. • Reduced costs of renewable energy technologies (than would otherwise have been the case) as a result of the "experience curve" effect*.
Industry and business development	• Increased employment and economic activity through the development of high value economic clusters around sustainable energy-focussed businesses. • Community and iwi small business development.
Improved economic resilience	• Greater resilience to physical disruptions through a more diversified (geographically and by source) portfolio of renewable energy supply. • Reduced exposure of the country's economy to international oil price volatility and supply disruptions through efficiency and conservation and developing renewable energy sources.
Improved health and welfare	• Health benefits (heart, respiratory function) through warmer homes and reduced dampness resulting from retrofit insulation primarily in some 150,000 houses occupied by lower income households. • Improved availability of energy services through developing low energy options in the marketplace.

* The "experience curve" is the observed systematic reduction in technology costs over time due to cumulative knowledge and experience gained, and economies of scale in production.

4. Policies and Programmes

POLICY MEASURES

25. The Strategy consists of a number of generic policy measures, applied as appropriate to address barriers and meet specified sector needs. For instance, in a relatively mature market, information may be the main need. In less developed markets a comprehensive market transformation process might be needed involving research and development, trials, incentives etc. The generic categories of policy measures are outlined below, and summarised as a set of Strategy policies in Box 3.

[17] Note that the energy efficiency target outcome and the high-end range of the renewable target should not be added together. As noted earlier, if energy growth is substantially reduced by the Strategy's energy efficiency measures, the achievement of the high level renewable energy target within the "reasonable cost" range is less likely.

Information

26. The Strategy emphasises active rather than passive information provision ie. information to directly enhance other initiatives, or information that actively empowers players in the marketplace (eg. the proposed Home Energy Rating Scheme (HERS) provides information that incentivises energy efficiency improvements).

Education and training

27. Targeted information will be supplemented by education and training. Some broad education issues and specific training needs will be addressed through the Strategy.

Pricing

28. No direct pricing initiatives are part of the Strategy. A number of energy pricing matters are being considered by other government processes including the New Zealand Climate Change Programme, transport legislative reform and the tax review. It is government policy that prices should "reflect the full costs of supply including environmental costs"[18] . The application of this policy across all energy types will assist the attainment of this Strategy's outcomes.

Financial assistance

29. Direct financial assistance is being provided through current schemes and a redeveloped residential grants programme.Other assistance mechanisms are flagged for investigation.

Institutional commitments

30. Institutional commitments to energy efficiency, greenhouse gas mitigation and renewable energy investment are an important focus of the Strategy. They include negotiated greenhouse agreements (NGAs) with industry, and the Energy-Wise Companies and Energy-Wise Councils Partnerships.

Rules and plans

31. The Strategy seeks to integrate sustainable energy outcomes into local and regional plans under the Resource Management Act (RMA). Some further workstreams are signalled to develop the best means of achieving this.

Standards

32. Improving energy standards is one of the most effective (and cost effective) means of improving energy efficiency. Workstreams will be established to develop a wider range of more ambitious energy standards.

Research

33. The Strategy seeks a reorientation of New Zealand's energy research effort to support sustainable energy outcomes

[18] See Appendix 1.

Box 3

Policies

1. Develop educational resources and approaches to improve the understanding of energy issues and solutions by New Zealanders.
2. Provide energy users and decision makers with timely and relevant information.
3. Ensure that energy industry personnel have the necessary skills and training to support sustainable energy outcomes.
4. Develop and implement pricing mechanisms that enhance sustainable energy outcomes.
5. Develop and implement appropriate financial assistance mechanisms.
6. Develop and strengthen voluntary institutional commitments to energy savings and use of renewable energy sources.
7. Incorporate sustainable energy principles and outcomes into policies and plans at a central and local government level.
8. Develop and implement energy performance standards on energy equipment and infrastructure.
9. Enhance research and development outputs to support sustainable energy outcomes.
10. Provide a supportive environment for a transformation in the market for energy services.
11. Align energy sector institutional arrangements to support sustainable energy outcomes.

FIVE SECTOR PROGRAMMES

34. The Strategy is organised into five programmes as follows:

1 Central and local government

2 Energy supply

3 Industry (including agriculture)

4 Buildings and appliances

5 Transport

35. The central and local government programme consists of policy development and leadership, cross-sectoral activities (such as broad eduction/publicity measures) and operational activities to improve energy efficiency within the sector. The energy supply programme aims to improve efficiency within the supply sector and develop renewable energy. This programme also integrates with the demand-side programmes by ensuring that significant energy efficiency information from the supply sector is passed on to end-users. The industry, buildings and appliances, and transport programmes mainly address demand-side energy efficiency and conservation.

36. Each programme has core objectives, a series of proposed measures, timeframes, and institutional responsibilities. Some programmes also specify sectoral targets. Table 3 shows how each programme's objectives and means link back to the overall goals of the Strategy.

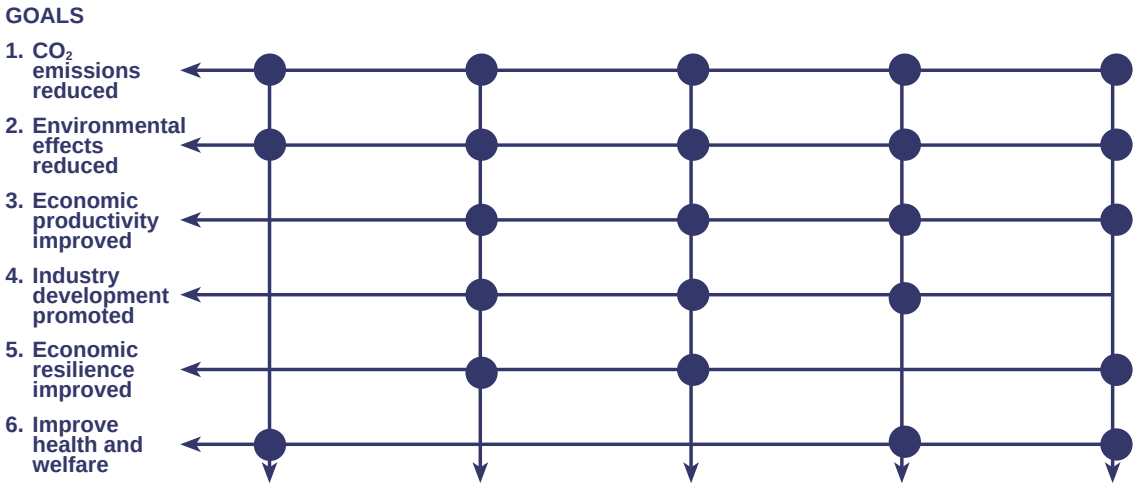
37. The Strategy involves a large number of players – government departments, crown agencies, local authorities, Maori groups, educational institutions, energy businesses and trusts, consumer interests, professional and trade bodies, through to the vast array of energy users. All have a role to play and some are identified in the Strategy as having particular responsibilities. However, this is a reflection of their importance in achieving particular outcomes, rather than a binding commitment at this stage. Apart from EECA, most organisations have not yet built Strategy commitments into annual or long-term plans. Further consultation between EECA and these key players is necessary to develop agreement and firm institutional commitments.

38. The Government budgetary allocation to EECA for energy efficiency and renewable energy activities in 2001/02 and out-years is $9.665 million p.a. (including GST)[19]. The Strategy's measures will require additional funding from government and third parties in future years, estimated to be $79 million over the five year life of the Strategy. Half of this is for the proposed residential upgrade assistance programme. Work will be ongoing to develop and refine these estimates. Bids for additional resources will be made as part of the normal government budget process.

39. The following sections summarise each programme. More detailed action plans for each programme are available on the EECA website and in hard copy from EECA.

[19] This excludes the one-off $2.5 million allocated to EECA to promote energy conservation in response to the low hydro lake levels during winter 2001.

Table 3 STRATEGY GOALS, OBJECTIVES AND MEANS
Significant linkages



	Central and local government	Energy supply	Industry	Buildings and appliances	Transport
Objectives	Leadership in own operations.	Increase amount of renewable energy supply and develop an industry base.	Improve energy efficiency to international best practice.	Upgrade the performance of existing building stock.	Reduce energy use by reducing the need for travel.
	Leadership in incorporating sustainable energy into commitments.	Improve energy sector system efficiencies.	Maximise cost-effective utilisation of renewable energy.	Achieve best practice design in new buildings.	Progressively improve energy performance of the transport fleet.
	Align central and local government policies and actions for sustainable energy.	Institutional arrangements to support sustainable outcomes.		Improve appliance energy efficiency to best practice.	Greater provision and use of low energy transport options.
Means (output categories)	Central and local government leadership programmes.	Electricity sector review to ensure consistency with sustainable energy directions.	Voluntary commitment programmes.	Information and education on building components and appliances.	Transport demand management pilots and programmes.
	Sustainable energy information and communication activities.	Gas sector review to ensure consistency with sustainable energy.	Financial incentives and assistance.	Information provision on whole building performance.	Pricing policies for sustainable transport.
	Ensuring energy pricing is consistent with sustainable energy outcomes.	Develop and implement mechanisms to increase renewable energy supplies.	Standards and promotion for generic technologies.	Standards and design briefs for new homes and buildings.	Eco-efficient vehicles and fuels options developed.
	Planning and resource management initiatives.	Renewables industry development support.	Sectoral benchmarking, information and research.	Incentives for improvements to existing homes and buildings.	Develop and facilitate energy-efficient mode choices.
		Monitor and research emerging energy supply	Industry training support.	Industry research (including health aspects of energy efficient homes).	Energy efficient road networks and traffic management.
			Energy efficiency market promotion.		Education and information.

1. Central and Local Government Programme

Key Facts

- Public sector energy use is 2 percent of national total.
- Central government has already committed to a 15 percent energy efficiency improvement in its operations in five years[20].

Objectives:

1. Leadership from central and local government through target setting and integration of sustainable energy outcomes into corporate commitments.
2. Cross-sectoral activities and policy development to support achievement of the Strategy goals and targets.

THE STRATEGIC APPROACH

40. As energy users and influencers, both levels of government can demonstrate leadership to the wider community through their energy use practice. Central government entities are already committed to improving energy efficiency in their own operations by 15 percent in five years, and the Strategy is extending this target to local government via voluntary commitments through the Energy-Wise Councils Partnership. The Strategy also seeks more explicit recognition of sustainable energy outcomes through the goals and statements of intent of government institutions.

41. Central and local government have a unique role because of their public policy and planning responsibilities in the community. The sustainable energy outcomes of the Strategy need to be supported through a range of cross-sectoral actions of government institutions. Main output areas are information, education and monitoring activities, policy development on pricing, and better integration of policies through resource management planning processes. A number of initiatives are proposed to bring sustainable energy principles more clearly into RMA processes.

42. It is important the two areas of government work together to achieve common energy aims and develop partnership processes.

[20] The central government target is to be measured by energy use per employee or per square metre of office space, with adjustments for changes in service.

CENTRAL AND LOCAL GOVERNMENT PROGRAMME

Output Activity	Key Measures	Timeframe	Responsibilities*
Leadership and commitment Central and local government have a crucial leadership role in the community.	• Central and local government energy leadership through 15 percent energy efficiency target.	Ongoing for five years.	**EECA**, government departments and agencies, LGNZ, local authorities (LAs).
	• Provide guidance to public sector entities on incorporation of energy sustainable development principles.	Outcomes reviewed by 2002/03.	**MfE**, EECA, DPMC.
Information and communication Creating understanding of energy impacts and actions at all appropriate levels throughout the community is fundamental to developing a sustainable energy future.	• Energy monitoring and analysis upgraded.	Review and implement by 2002/03.	**EECA**, Statistics NZ.
	• Energy-Wise information services.	Ongoing.	**EECA**.
	• Sustainable energy in schools, training and wider public education.	Report by 2003.	**EECA**, Ministry of Education, tertiary institutions.
	• Facilitation of community energy efficiency programmes (in association with residential retrofits).	Implement from 2003.	**EECA**, LAs, government agencies.
Pricing Pricing of the full costs of energy supply (extraction, transformation and transmission) is an important sustainable energy principle.	• Development of greenhouse gas pricing mechanism through the New Zealand Climate Change Programme.	Ongoing.	**DPMC**, Treasury, MED, MfE.
	• Processes to reduce pricing barriers to energy efficiency and renewables (eg. tax review).	Ongoing.	**MfE**, **EECA**, other government depts.

Planning and resource management
Energy impacts need to be appropriately recognised through resource planning and management procedures. A number of work streams are associated with planning processes and the Resource Management Act (RMA) in order to support energy efficiency and renewable energy development.
	• Promoting energy efficiency and renewable energy under the RMA:
	  • Assess means to provide guidance including a National Policy Statement (NPS) or changes to the RMA to give greater prominence to sustainable energy, and
	  • Provide guidance for use in RMA processes eg. on solar orientation, management of environmental effects of renewable energy projects.
		Assessments complete by 2002/03.
		Advisory support from 2003.
			MfE, EECA, LGNZ, engaging with LAs, energy industry players, Transpower, and other stakeholders.

	• Identify long-term energy saving potential through investigating sustainable urban form.	Preliminary urban form investigation by 2002/03.	**MfE**, EECA, MoT, LGNZ, engaging with LAs.
	• Identify opportunities for using waste as an energy form.	Initiated by 2002/03.	**MfE**, EECA, industry players.
	• Undertake regional energy accounting.	All complete within five years.	**MfE**, EECA, engaging with LGNZ, regional councils.

2 Energy Supply Programme

Key facts

- New Zealand's primary energy supply increased at 2.5 percent p.a. in the 1990s and is forecast to increase at 1.7 percent p.a. for the next decade.
- Approx 28 percent of primary energy is lost or used within the energy supply industry for the production and transport of finished energy products to end users.
- Total consumer energy in 2000 was 453PJ at a cost to consumers of over $8 billion.
- Consumer energy in 2000 comprised 71 percent fossil fuels and 29 percent renewable sources.

Objectives for sustainable energy supply:

1. Increase supply from renewable energy sources over time including developing a local renewable energy industry base.
2. Improve whole-system efficiencies in the energy supply sector.
3. Improve institutional arrangements within the energy supply sector so prices to energy consumers consistently support sustainability outcomes.

The Strategic Approach

43. Energy supply involves producing, transmitting and distributing energy. It takes place within a largely decentralised, commercial framework in which market processes drive decisions on the type of energy source used and energy efficiency within the energy supply chain. It involves a large number of players. A few have a very strong historical renewable energy supply base but there is no "renewable" supply industry as such. There is considerable scope for the energy supply industry to contribute to sustainable energy outcomes but the current incentives are very mixed. Therefore, a key strategic focus is to develop consistent rules and incentives within the industry to support long-term sustainability.

44. The Strategy's initial priority is developing better understanding and knowledge to inform actions on renewables and energy sector efficiencies. The work plan focuses on information gathering, investigations and relationship building. Associated with final decisions on the renewable energy target are strategic initiatives to develop a renewable energy industry base in New Zealand.

45. The electricity and gas sectors involve networks that are natural monopolies. Because these network elements can create barriers to energy efficiency the electricity and gas sectors are the focus of a number of Strategy measures. The electricity industry involves a large number of players, including new institutions such as the proposed Electricity Governance Board who will have an important role to play in facilitating industry arrangements so that sustainable energy outcomes occur.

ENERGY SUPPLY PROGRAMME (production, transmission, distribution)			
Output Activity	Key Measures	Timeframe	Responsibilities*
Electricity sector Improved institutional arrangements within the electricity industry can improve whole-system efficiency of electricity supply.	• Conduct a multi-faceted work programme to investigate improving whole-system efficiencies in the sector (to cover optimising network losses, investigating opportunities for distributed generation, pricing to facilitate energy efficiency and appropriate tools for assessing whole system efficiency of the sector). • Develop improved assessment of supply risks and appropriate strategies to deal with interruptions. The initial focus will be on electricity but will be extended to other energy types.	Ongoing series of initiatives planned for reporting by 2002/03.	**EECA**, **MfE**, MED, Treasury, engaging with Transpower, **EGB**, generators, network companies, M-co, retailers and electricity users.
Gas sector Expanded use of gas directly by end-users can achieve national energy efficiency gains. Improved institutional arrangements can improve whole system efficiency of gas supply.	• Ensure issues of network expansion, market development and pricing are appropriately reflected in the Government's governance of the gas sector, initially focussing on the gas sector review. • Promote high efficiency end-uses for gas.	Ongoing with assessement by 2002/03. Ongoing.	**EECA**, **MfE**, MED, Treasury engaging with gas network companies, gas suppliers, retailers and consumers.
Renewable energy supply Developing and deploying renewable energy systems is a core strategic priority. Initiatives focus on information and mechanisms to ensure base levels of new development.	• Develop and evaluate mechanisms to increase proportion of energy from renewable sources. • Regional renewable energy resource studies including iwi interests. • Facilitate use of woody biomass in forestry processing sector.	Government decision by July 2002. 2002 to 2005. Ongoing.	**EECA**, **MfE**, MED, Treasury, MoT, engaging with key stakeholders. **EECA**, regional councils, iwi, MfE. **EECA**, forest industry.
Renewable industry development Developing a dynamic renewable energy industry capable of meeting market needs will enhance consumer confidence and provide the base for any export potential.	• Support renewable industry associations. • Develop an action agenda regarding opportunities for renewable industries. • Investigate possible support mechanisms for solar water heating industry. • Investigate opportunities for transport biofuels.	Ongoing. Initiate by 2003/04. Report by 2002/03. Report by 2003/04.	**EECA**, Industry NZ, MfE, MED, Treasury engaging with renewable industry associations, energy industry, consumers and other interested parties.
Research on emerging energy supply technologies Research on sustainable energy technologies provides opportunities to maximise the benefits to New Zealand of future sustainable energy opportunities. Hydrogen and fuel cell technology development is a specific area for investigation.	• Enhance FRST energy research focus on sustainable energy technologies. • Monitor developments in fuel cell and hydrogen technologies and develop a work programme to identify and evaluate alternative pathways for increasing the use of hydrogen as an energy carrier to maximise benefits to New Zealand's economy.	Ongoing. 2002 onwards.	**FRST**, MfE, EECA, engaging with sustainable and traditional energy sector players, users and research providers.

3. Industry Programme

Key Facts

- Industry uses 33 percent of consumer energy, agriculture uses a further 4 percent.
- Industrial energy use is dominated by a relatively small number of very large, energy-intensive, export-oriented industries – methanol, steel, aluminium, pulp and paper, dairy and meat products.
- These industries account for over 85 percent of energy use by the sector.
- Energy is a significant component of these industries' costs eg, up to 17 percent for the base metals industries.

Objectives for industry:

1. Progressive energy efficiency improvement to meet international best practice, industry by industry.
2. Maximise the cost-effective utilisation of renewable energy.

The Strategic Approach

46. The ongoing improvement in industrial energy intensity is estimated to be up to 1 percent p.a. as process equipment is replaced and updated, and control and monitoring of energy use improves. Greater management commitment can increase this rate eg, the Netherlands achieved up to 2 percent p.a. Well-funded and ambitious commitment programmes and substantial economic incentives contribute to this performance.

47. The Strategy measures are headlined by leadership commitment programmes. These are intended to increase management focus on energy and progressively bring best energy practices to business. They will help give industrial companies an incentive and create a culture of continuous improvement in energy efficiency.

48. Voluntary programmes will be complemented by other measures. These include developing appropriate standards, training, information, research and investigating the effectiveness of assistance measures. Information provision through sector studies and benchmarking is a priority.

INDUSTRY PROGRAMME			
Output Activity	Key Measures	Timeframe	Responsibilities*
Voluntary commitments The expertise and drive required to make improvements in energy efficiency has to come mainly from industry itself. Voluntary commitments aim to tap these resources.	• Establish Negotiated Greenhouse Agreements with major energy-intensive industries. • Establish a more ambitious Business Commitment Programme aimed at small and medium-sized industry (note this will include commercial building owners).	Ongoing – heads of agreement by 2001. Ongoing – implement by 2002/03.	**MfE**, **Treasury**, **EECA**, engaging with industry partners, energy services industry.
Financial assistance Financial incentives will help ensure the substantial private sector investments needed to achieve long-term efficiencies are made in the short term.	• Grants to carry out energy audits. • Investigate and develop potential investment assistance programme through tax concession or other mechanisms.	Ongoing. Investigate and report by 2002/03.	**EECA**, **Treasury**, Inland Revenue Department engaging with wider industry.
Standards and promotion for generic technologies Appropriate standards are required to ensure generic products are bought with consideration to life-cycle cost, and to avoid dumping of substandard products.	• Ongoing implementation and improvement of Minimum Energy Performance Standards (MEPS) for electric motors. • Assess and develop 'challenge' programmes to promote life-cycle costing and application of best practice equipment. • Standards, labelling and promotion as appropriate for other products.	Ongoing. Investigate and design by 2002/03. Ongoing.	**EECA**, **MfE**, MED engaging with industry users, product suppliers and liaising with the Australian Greenhouse Office.
Information and research A good understanding of trends and potential for efficiency by sector will inform negotiation and monitoring of voluntary commitments.	• Sector studies, starting with priority sectors. • International benchmarking to identify world best practice and benchmarking of sector performance. • Research technical and economic issues of woody biomass collection and utilisation within industry.	Ongoing. Investigate and report by 2002/03. Investigate and report by 2003/04.	**EECA**, engaging with industry research organisations, industry, universities, FRST, Forest Research, Centre for Advanced Engineering and other researchers.
Industry training support Energy management, auditing and instrumentation are areas in which skill shortages are likely.	• Investigate and develop a programme of appropriate industry training support.	Investigate and design by 2003/04.	**EECA**, MED, INZ, engaging with industry, education providers.
Energy efficiency market promotion There is apparent potential to encourage greater energy efficiency and renewable energy utilisation through developing new markets for energy service provision.	• Investigate scope and status of energy services market, including the possible promotion of energy service companies and develop any support programmes. • Investigate scope to promote better site integration and shared services.	Ongoing investigation with design by 2003/04. Investigate by 2003/04.	**EECA**, MED, INZ, engaging with existing providers, industry and LAs.

4 Buildings and Appliances Programme

Key Facts

- Buildings and the appliances used in them, account for 22 percent of consumer energy:
- 13 percent is used in New Zealand's 1.4 million residences[21] and
- 9 percent is used in about 80,000 commercial buildings.
- Two-thirds of energy used is electricity (accounting for 55 percent of total electricity use).

Objectives for buildings:

1. Progressively upgrade energy performance across all sectors of the existing building stock with the following 15 year targets:

- All pre-1977 houses retrofitted with a suite of cost-effective energy efficiency measures, and
- Existing commercial buildings to achieve a mean energy performance less than 150kWh/m^2.

2. Achieve best practice energy performance in new residential and commercial buildings:

- New homes are able to maintain an internal temperature of not less than 18^{o}C and not more than 25^{o}C at reasonable cost and without resorting to significant external use of heating or cooling energy, and
- New commercial buildings achieve a mean energy performance of less than 100 kWh/m^2.

3. Improve appliance energy efficiency to best practice.

The Strategic Approach

49. Existing initiatives in this sector cover voluntary standards, building code requirements, market education, appliance standards, eg, MEPS, and assistance through the residential grants programme. The Strategy programme builds on this base but proposes a more aggressive pursuit of energy objectives. There is a significant gap between existing energy use patterns and best practice. The Strategy aims to narrow this gap.

[21] It is estimated that about 1.2 million are permanently occupied.

50. The Strategy programme is a mix of market-based initiatives, mandatory measures and targeted assistance. Because the knowledge and technology required for improving the building sector largely exists, major research investments or lengthy implementation delays are not necessary. The programme focuses on information provision (eg, developing and disseminating best design practice, HERS), ongoing upgrading of energy standards, and developing and refining implementation support mechanisms (financial grants, etc).

51. Improving the design process especially for new commercial buildings is a priority. It is frequently disjointed and does not produce optimal energy, environmental design, cost and quality performance. Energy efficiency improvements can be made at little or no overall extra cost. A suite of measures is proposed to improve the effectiveness of the design process.

52. While achieving best practice for new buildings is vital for long term sustainability, most realisable energy efficiency gains over the next five to ten years will come from improving the existing stock.

BUILDINGS AND APPLIANCES PROGRAMME

Output Activity	Key Measures	Timeframe	Responsibilities*
Information and education All groups (occupiers, owners, builders, and designers) need appropriate information so they are empowered to make better decisions.	**Components** • Mass and glazing optimisation design guides for buildings. • Water heating technology programme, including solar. • Energy labelling and MEPS development. • High efficiency domestic luminaires design competition and development.	Established by 2002/03. Networks established by 2002/03. Ongoing. Developed by 2002/03.	**EECA**, **MfE**, engaging with wide range of players in the building industry, appliance suppliers, etc.
	Whole Building • Instigate programme with aim of developing national Home and Building Energy Rating Schemes (HERS and BERS). • Energy efficiency and renewables information gathering and dissemination programmes eg, HEEP and BEEP, energy benchmarking studies.	Pilot and trial by 2002/03, implement 2005. Ongoing.	**EECA**, Environment Canterbury (Pilot HERS), BRANZ, industry stakeholders.
Standards Voluntary and mandatory Standards to establish minimum performance levels and best practice targets for design and operation.	**Components and Design** • Develop better and best practice design standards and guides. • Commercial buildings and building services design support. • Develop a standard or a code of practice to define good practice in the commissioning and operation of building systems. • Develop a new standard for insulation materials and installation.	Completed by 2004/05. Ongoing design - implement from 2004. Development by 2004. Development by 2003.	**EECA**, BRANZ, SNZ, BIA, building industry stakeholders.
Minimum mandatory energy standards are required for health, safety, comfort and economic efficiency. Changes to the Code could improve new buildings at no additional lifecycle cost.	**New Zealand Building Code** • Review and amend, as appropriate, the New Zealand Building Code Clause H1 – Energy Efficiency (applies to residential and commercial) under the existing periodic review process determined by the Building Industry Authority.	Review every five years starting 2003.	**BIA**, EECA, BRANZ, SNZ, building industry stakeholders.

Implementation Support
Seventy percent of housing stock was built before the first minimal codes. These houses are often damp and cold and should be improved for health reasons.
 	
All existing commercial buildings are pre New Zealand Building Code H1 and should be assessed and upgraded.
	• Residential grants funding supporting two current transitional programmes:
	  • Sustainable market-based activities in the residential sector and
	  • Socially focussed residential retrofit programme to assist energy upgrades on lower socio-economic housing.
	• Further development of residential grants programmes
	• Housing New Zealand efficiency retrofit programme and other initiatives.
	• Commercial buildings commissioning and maintenance skills upgrading.
		Transitional through 2001/02, re-assess by June 2002.
		2002/03 onwards.
		Ongoing.
		Initiate from 2002.
			EECA, engaging with iwi, energy trusts, residential energy efficiency businesses, LAs and the wider community.
			Housing New Zealand Corporation
			EECA, engaging with industry stakeholders.

Research Research to underpin energy initiatives.	• Health and Energy in Residential Buildings Research Project – a study of 1400 houses to determine health impacts of poor energy efficiency.	Ongoing - completed by 2003/04.	**Wellington School of Medicine**, EECA.

5 Transport Programme

Key Facts

- Domestic transport accounts for 42 percent of consumer energy use.
- From 1990-99 transport energy use grew at an average of 3.5 percent p.a. (highest of any sector).
- Transport energy use produces 45 percent of New Zealand's energy CO_2 emissions.
- 90 percent of transport energy use is used in land transport vehicles.
- New Zealanders have the second highest car ownership rate in the world.

Objectives for transport:

1. Reduce energy use through reducing the need for travel.
2. Progressively improve the energy performance of the transport fleet.
3. Improve the provision and uptake of low energy transport options.

The Strategic Approach

53. The Strategy identifies six output areas for energy savings and adoption of renewable energy. Of these, only two have a specific energy focus – information, and vehicle and energy systems. The other output areas have a wider focus on improving the overall functioning and efficiency of the land transport system. Responsibilities will rest with a range of stakeholders. It is important that sustainable energy objectives are incorporated into their decision-making frameworks.

54. Several of the Strategy's outputs are a natural extension of current government workstreams in transport and climate change. This work has the objective of improving the overall functioning of the land transport system, improving its efficiency and providing a framework for delivering better economic, social and environmental outcomes.

55. It is not appropriate for energy efficiency to lead overall transport policy. However, many of the structural and process changes proposed can be expected to support improvements in energy efficiency.

56. Short-term measures aim to promote attractive, low energy transport options, eg, cycling, walking and public transport, and to conserve energy through developing trip reduction initiatives, eg, tele-working. Better price signals and the development of eco-efficient vehicles[22] and energy sources are considered the two most significant output areas for long-term energy sustainability.

[22] See Glossary for description.

57. A number of studies undertaken in the last decade have shown that road use is not well priced. Better pricing will come from applying improved pricing principles, eg, ensuring that pricing reflects the full costs of energy supply including environmental costs, and from adopting new technology such as electronic road charging systems. Such changes could also improve the way the land transport system is funded. Better pricing overall will potentially contribute to all three transport objectives of this Strategy.

58. For eco-efficient vehicles, the major short-term proposal is to investigate measures to improve vehicle fuel efficiency. This will include efficiency standards for vehicles, subject to detailed proposals to be reported to the Government in late 2001 as part of its climate change work programme. Ultimately, transforming the energy systems of vehicles is fundamental to energy sustainability. While New Zealand has little impact on the pace of such technology changes, the Strategy approach is to be pro-active in adapting, trialing and adopting new innovations. Unless there is this involvement, potential opportunities for local innovation are less likely to be realised.

TRANSPORT PROGRAMME

Output Activity	Key Measures	Timeframe	Responsibilities*
Substitutes for travel and demand management Energy savings can be achieved if realistic alternatives to travel are made more accessible.	• Facilitate, run and promote demand reduction trials eg, teleworking, personalised marketing. • Investigate developing a traffic demand management fund.	Ongoing. Dependent on govenment approvals.	**EECA**, Transfund New Zealand, **LAs**. **Transfund New Zealand**.
Pricing Pricing mechanisms can alter behaviours and steer investment decisions towards energy efficiency. Supportive pricing will reinforce non-price mechanisms.	• Land transport pricing policy development through current transport sector and climate change work streams, including investigating the initiation of road pricing trials (subject to pending Government decisions on land transport policy). • Improve the effectiveness of funding for alternatives to roading.	Ongoing. Ongoing.	**MoT**, LAs, MfE, Transfund New Zealand, EECA, Transit New Zealand. **MoT**, **Transfund New Zealand**, MfE.

Eco-efficient vehicles and fuel options
Long-term transport energy sustainability depends largely on transforming the technology and energy systems powering the transport fleet – initially improving energy efficiency and moving in the long term to renewable sources of energy.
	• Facilitate eco-efficient vehicles into public and private sector fleets.
	• Investigate measures to improve vehicle fuel efficiency, including:
	  • Vehicle efficiency standards and related measures, and possible future application; and
	  • Vehicle fuel consumption information eg, via labelling and consumer awareness schemes.
	• Fuel specifications to support energy efficient vehicles and renewable energy sources.
		Ongoing.
		Recommendations to government in late 2001.
		Ongoing.
			EECA, MoT, MfE, engaging with motor industry, oil industry and other stakeholders.

Energy efficient modes Energy savings can be achieved if people and businesses choose less energy intensive forms of travel and freight transport.	• Provide greater financial, promotional, strategic policy and institutional support for low energy modes eg, public transport, walking and cycling, and higher vehicle occupancies. • Review energy advantages of rail and coastal shipping. • Provide direction through the New Zealand Transport Strategy.	Ongoing. Ongoing. Ongoing.	**Transfund New Zealand**, **LAs**, **MoT**, **EECA**.
Energy efficient road networks and traffic management Energy savings are achievable by improving the management of traffic flows and improving the roading characteristics eg, reducing rolling resistance.	• Investigate traffic demand management and road network changes to achieve greater energy efficiency – particularly on high volume parts of the road network. • Enforcement and other management approaches to reduce excessive speed on the open road.	Ongoing. Ongoing.	**Road Controlling Authorities**, **Transfund New Zealand**, EECA. **Police**, **LTSA**, MoT, road controlling authorities.
Education and information Information and education activities will support other proposed measures and help change perceptions, purchase decisions, management practices and other behaviours.	• Run energy efficient vehicle management programmes and other available means to emphasise energy efficient driving practices, choice of vehicles and maintenance. • Provide information to individuals emphasising energy efficient behaviours and modal options.	Ongoing. Ongoing.	**EECA**, LAs, LTSA, MoT, MfE.

Appendices:

1. THE ENERGY FRAMEWORK

The Energy Efficiency and Conservation Act 2000

59. The Energy Efficiency and Conservation Act 2000 requires the Minister to develop a National Energy Efficiency and Conservation Strategy by 1 October 2001. The Strategy is to give effect to the Government's policies on promoting energy efficiency, energy conservation and renewable sources of energy.

60. In achieving this purpose, Section 10(2) of the Act requires the Strategy to state:

    (a) the Government's policies in relation to promoting energy efficiency, energy conservation and use of renewable sources of energy,

    (b) the objectives to achieve the policies,

    (c) any targets to achieve the policies and objectives,

    (d) means by which the policies, objectives and targets are to be achieved, and

    (e) such other matters as may be necessary to achieve the purpose of the Act.

61. The term of the Strategy is five years, but the Strategy may be replaced before that time if decided by the Minister.

Sustainability Principles

62. The key principles of the Act are those of sustainability and therefore the Strategy will be a key element of the Government's wider sustainable development policy framework. Section 6 of the Act sets out a number of overarching sustainability principles to guide all people exercising responsibilities, powers or functions under it:

    (a) the health and safety of people and communities, and their social, economic and cultural well-being; and

    (b) the need to maintain and enhance the quality of the environment; and

    (c) the reasonably foreseeable needs of future generations; and

    (d) the principles of the Treaty of Waitangi.

63. The Maori principle of kaitiakitanga complements the sustainability principles under which this Strategy has been developed. Kaitiakitanga carries with it an obligation for each generation to look after the resource base and sustain the environment. The current kaitiaki should exercise the type of management and use of a resource in such a way that their successor receives it in a condition better or similar to how it was received.

Energy Policy Framework

64. In October 2000, the Government released its Energy Policy Framework. This framework outlines an Overall Energy Policy Objective and the overall Outcomes sought by the Government. Formulation of the Strategy has been guided by this overall framework.

Overall energy policy objective:

Ensure the delivery of energy services to all classes of consumer in an efficient, fair, reliable, and sustainable manner.

Energy outcomes:

1. Environmental sustainability, including continuing improvement in our energy efficiency and a progressive transition to renewable sources of energy.
2. Costs and prices to consumers which are as low as possible, while ensuring that prices reflect the full costs of supply including environmental costs.
3. Reliable and secure supply of essential energy services.
4. Fairness in pricing, so that the least advantaged in the community have access to energy services at reasonable prices.
5. Continued public ownership of publicly owned assets.

2. SUPPORTING INFORMATION

The following documents provide additional information to the Strategy. They will be available as PDF documents from EECA's website. You can also obtain a copy of any document by ringing EECA on 0800 111 127.

1. Report on Submissions and Recommendations on the Draft National Energy Efficiency and Conservation Strategy (prepared by EECA).
2. Action Plans for each of the sectoral programmes. These provide detailed information on each measure and specific actions, how achievement will be measured, timeframes and key milestones, and lead/supporting agencies. The five action plans are:

- Government and local government
- Energy supply
- Industry (including agriculture)
- Buildings and appliances
- Transport

3. Consultation documentation on the renewable energy target and mechanism. Further consultation on the target will occur after 1 October 2001 and documentation will be available to inform this discussion. This will include the report Transition to Renewable Sources of Energy, prepared by PA Consulting for the Ministry for the Environment and EECA, which has helped inform the renewable energy analysis to date.

4. Background report entitled Monitoring Energy Efficiency Performance in New Zealand; A Conceptual and Methodical Framework. This report has been prepared for EECA to provide a framework and methodology for monitoring the Strategy's progress.

5. Ongoing Strategy communications. EECA's website www.eeca.govt.nz will be regularly updated with progress on the Strategy implementation. This is likely to include examples of successful and innovative initiatives, and monitoring information in relation to the Strategy targets. Other communications activities, such as media releases and sector meetings, will be developed as appropriate for the various sectors.

3. GLOSSARY OF TERMS

BEEP	Building Energy End-Use Project - a programme to measure the energy characteristics of the existing commercial building stock.
BERS	Building Energy Rating Scheme.
Best practice	The best energy performance (technical and management) being achieved within each sector.
BIA	Building Industry Authority.
Biofuels	Fuels derived from organic plant matter, in particular wood and biogas.
Biomass	In the energy context, any recent organic matter, originally derived from plants as a result of the photosynthetic conversion process, which is destined to be used as a store of chemical energy.
BRANZ	The Building Research Association of New Zealand.
Building Code	The New Zealand Building Code, a regulation under the Building Act 1991. Clause H1 specifically covers energy efficiency.
Cogeneration	The generation of both useful heat and electricity from one plant.
CCGT	Combined cycle gas turbine – an electricity generator with a steam turbine driven generator using steam from a boiler heated with the exhaust from a gas turbine generator.
Commissioning	The setup or "tuning" of building energy systems after installation.
Consumer energy	Amount of energy used by final users (consumers).
CO_2	Carbon dioxide, the main greenhouse gas emitted from the energy sector.
Distributed generation	Small-scale (typically) electric generators that are located close to demand loads.
DPMC	Department of Prime Minister and Cabinet.
DSM	Demand-side management - methods used to manage energy demand including efficiency, load management and price signalling.
Eco-efficient vehicle	A term used as a descriptor of vehicle designs, technologies and related fuels which have recognised environmental and/or energy efficiency advantages over traditional petrol and diesel vehicles.
Economic potential for energy savings	The potential energy savings that are financially viable at current prices.
EECA	Energy Efficiency and Conservation Authority.

EGB	Electricity Governance Board.
Energy conservation	Defined by the Act as a reduction in energy use.
Energy efficiency	Defined by the Act to mean a change to energy use that results in an increase in net benefits per unit of energy.
Energy Intensity	Energy use (primary or consumer) per unit of output or activity.
Energy service	The service (such as heat or light) derived from using energy.
Energy transformation (conversion) losses	Energy used or lost during the transformation, treatment or refining of one energy form into another.
FRST	Foundation for Research Science and Technology.
Fuel cell	Technology where hydrogen is chemically fused with oxygen to produce electricity and water.
GEELP	Government Energy Efficiency Leadership Programme - a programme targeting 15 percent energy efficiency improvement by 2005 from central government institutions.
Greenhouse gases	Gases in the atmosphere that retain more energy from outgoing infra red radiation than from incoming solar radiation. They include carbon dioxide, methane and water vapour.
HEEP	Household Energy End-Use Project is a programme to measure the energy characteristics of actual existing houses.
HERS	Home Energy Rating Scheme - a system to quantify the energy performance of houses, eg, through a star rating.
INZ	Industry New Zealand.
Joule (J)	Basic unit of energy.
Kilowatt-hour (kWh)	Unit of electrical energy. One kWh =3.6MJ.
Labelling	Design and provision of consumer information by labels which advise of the energy performance of appliances.
LAs	Local authorities, comprising regional councils and territorial local authorities.
LGNZ	Local Government New Zealand
LTSA	Land Transport Safety Authority.
Landfill gas	Gas (principally methane) extracted from landfills.
Luminaires	Combination of light fitting and bulb.

Mass	In the context of buildings, the denser parts of the building that absorb and release heat energy to limit temperature swings.
MED	Ministry of Economic Development.
MEPS	Minimum energy performance standards.
MfE	Ministry for the Environment.
MoT	Ministry of Transport.
NGAs	Negotiated Greenhouse Agreements - agreements negotiated between government and industry to achieve agreed reductions in CO_2 emissions.
p.a.	Per annum
Passive solar energy	Energy obtained through solar radiation, normally through being trapped within the structure of a building.
Primary energy	Energy as it is first obtained from natural resources.
PVs	Photovoltaic cells – technology to convert the energy in light directly to electricity.
Renewable energy source	Energy that occurs naturally, the use of which will not deplete energy sources of that kind. This includes water, wind, solar, geothermal (with certain controls) and biomass.
Renewable energy technologies	Technologies to capture and transform renewable energy into a useful form eg. wind turbines, hydro generation, PV systems, biomass co-generation etc.
RMA	Resource Management Act, 1991.
SNZ	Standards New Zealand.
Thermal generation	Generation of electricity by heat, usually from burning fossil fuels but also including geothermal generation.
Woody biomass	An energy source derived from conventional forest operations, wood process residues and purpose-grown fuel wood plantations.

Energy unit prefixes	k	kilo	(10^3)	eg kJ (kilojoule) = 10^3 joules
	M	mega	(10^6)	
	G	giga	(10^9)	
	T	tera	(10^{12})	
	P	peta	(10^{15})	