



**Asia-Pacific
Economic Cooperation**

**Peer Review on Energy Efficiency
in New Zealand**

Final Report

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Endorsed by the APEC Energy Working Group

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PREFACE

The objectives of the APEC peer review on energy efficiency (PREE), endorsed by APEC leaders at their 2007 meeting, are to:

- share information on energy efficiency performances as well as on policies and measures for improving energy efficiency;
- provide opportunities for learning from other APEC member economies' experiences and for broadening the network among energy efficiency policy experts;
- explore how energy efficiency goals on an overall and/or sectoral basis and action plans could be effectively formulated in each APEC economy under review, taking into account the diversity of possible strategies that could be used, according to the circumstances of individual member economies;
- monitor progress toward attaining energy efficiency goals on an overall and/or sectoral basis and implementing action plans, if such goals and action plans have been already formulated at the time of the review;
- provide recommendations for voluntary implementation on how implementation of action plans could be improved with a view to achieving energy efficiency goals.

Two activities are being undertaken as part of the peer review on energy efficiency, namely:

- individual peer reviews of volunteer member economies; and
- compilation of a compendium of energy efficiency policies of the APEC member economies based on either the APEC voluntary peer reviews or on the energy efficiency aspects of the International Energy Agency in-depth energy policy reviews.

This report presents the results of a peer review on energy efficiency in New Zealand. New Zealand volunteered to undergo a peer review and this was the first review of an APEC economy undertaken under the PREE.

The primary accountability for each individual peer review is shared by the APEC economy being reviewed and the review team. The peer review in New Zealand was undertaken by a review team of five experts (see Appendix A, page 29) who visited New Zealand from 23 to 27 February 2009.

The team considered written material provided in advance of the visit. During the visit, the team attended comprehensive presentations on energy efficiency in New Zealand given by representatives from various government and private sector organisations (see Appendix B, page 30). The team also had the opportunity to discuss this information with the presenters.

The review team wishes to thank all the people who made presentations and the representatives of the Government of New Zealand who organised the visit.

EXECUTIVE SUMMARY

The review team was impressed with the level of attention and resources allocated to energy efficiency policy and programmes by the New Zealand Government. Most of the work on energy efficiency carried out by New Zealand Government agencies is high quality and some is world class. The recommendations made by the review team are intended to apply slight corrections to a regime of energy efficiency policy and programmes which essentially is in good shape.

The review team identified some lack of flexibility in the ability of the Energy Efficiency and Conservation Authority (EECA) to design, develop and implement energy efficiency programmes. This lack of flexibility may be resulting in the development and implementation of programmes that are not optimal in relation to achieving their established objectives. In particular, EECA may be prevented from subsequently modifying a programme after it has been implemented if experience shows that the design of the programme can be improved. EECA may also be prevented from reallocating funds between existing programmes or to new programmes if experience shows that this would result in a more optimal achievement of specified objectives.

Consequently, the review team recommended that the New Zealand Government should review the method of funding EECA with the aim of providing it with more discretion about how its funding is expended.

The review team also made a number of other detailed recommendations covering:

- the institutional context for energy efficiency policy and programmes in New Zealand;
- energy efficiency goals and strategies;
- energy data collection and monitoring;
- energy efficiency in the transport sector;
- energy efficiency in the residential sector;
- energy efficiency in the industrial sector;
- energy efficiency in the commercial sector;
- energy efficiency in the electricity sector;
- energy efficiency activities by local government and non-governmental organisations;
and
- energy efficiency research and development.

The review team did have some concerns that there is currently some lack of clarity about the New Zealand Government's overall direction and priorities in relation to energy efficiency. In particular, there is no clear statement by the Government about its desired policy priorities between saving petajoules, reducing greenhouse gas emission, increasing energy security, improving health outcomes in the residential sector, and achieving other social benefits. Given that the current Government came to power only recently, it is understandable that these questions are currently unresolved and they will no doubt be resolved over time.

RECOMMENDATIONS

Institutional Context

Recommendation 1 (page 6): The New Zealand Government should review the method of funding of the Energy Efficiency and Conservation Authority with the aim of providing it with more discretion about how its funding is expended.

Recommendation 2 (page 6): The Government of New Zealand should further improve coordination of responsibilities for energy efficiency policies, implementation and delivery among the relevant entities.

Energy Efficiency Goals and Strategies

Recommendation 3 (page 9): The Ministry of Economic Development should ensure that sectoral-based energy efficiency targets are consistent with overall economy-wide targets

Recommendation 4 (page 9): The New Zealand Government should review existing sector-based targets to clearly identify the expected outcomes in terms of energy saving and reduction of GHG emission.

Recommendation 5 (page 9): The New Zealand Government should issue a short statement which sets out its overall direction and priorities in relation to energy efficiency.

Energy Data Collection and Monitoring

Recommendation 6 (page 11): The Energy Efficiency and Conservation Authority should ensure that the design and development of energy efficiency programmes is based on relevant information from the Energy End Use Database.

Recommendation 7 (page 11): The Energy Efficiency and Conservation Authority should promote the use of the Energy End Use Database to inform other New Zealand Government functions, particularly energy policy decision making and forecasting by the Ministry for Economic Development.

Transport Sector

Recommendation 8 (page 13): The Ministry of Transport and the Energy Efficiency and Conservation Authority should work together to develop and implement programmes to improve the fuel economy of petrol- and diesel-powered vehicles.

Recommendation 9 (page 13): The Ministry for the Environment should develop and implement urban land use planning and design that enables and promotes energy efficient behaviour.

Residential Sector

Recommendation 10 (page 17): The New Zealand Government should establish a long term sustainable funding mechanism to support the *EnergyWise™ Homes* programme.

Recommendation 11 (page 17): The New Zealand Government should explore ways to synergise the residential sector's energy efficiency improvement with peak demand management measures.

Recommendation 12 (page 17): The New Zealand Government should monitor residential sector energy end-use.

Recommendation 13 (page 17): The New Zealand Government should enhance and expand the inefficient appliances retirement programme by improving the resource allocation and establishing innovative ways to induce more participation.

Industrial Sector

Recommendation 14 (page 19): The New Zealand Government should review the Electricity Commission's energy efficiency obligation, funding and activities to determine whether these would be better transferred to the Energy Efficiency and Conservation Authority.

Commercial Sector

Recommendation 15 (page 20): The Energy Efficiency and Conservation Authority should consider initiating energy efficiency programmes directed towards:

- increasing the efficiency of energy use in commercial buildings;
- increasing the efficiency of energy use by small and medium enterprises in the commercial and industrial sectors.

Electricity Sector

Recommendation 16 (page 21): The New Zealand Government should encourage electricity businesses to play an active role in funding and delivering demand-side energy efficiency and conservation improvements among their customers.

Recommendation 17 (page 21): The Energy Efficiency and Conservation Authority should consider initiating activities to support the development of an industry that provides energy efficiency services in New Zealand.

Local Government and Non-governmental Organisations

Recommendation 18 (page 22): The Energy Efficiency and Conservation Authority should take action to provide ongoing financial support for energy efficiency programmes implemented by NGOs and community groups to alleviate fuel poverty.

Research and Development

Recommendation 19 (page 24): The New Zealand Government should develop high level research governance, strategies and coordination of existing energy research and development to support the *New Zealand National Energy Efficiency and Conservation Strategy*.

Recommendation 20 (page 24): The New Zealand Government should continuously assess overall research and development priorities with a view to improve targeting and reallocation of available funds to increase funding for energy efficiency research and development.

Recommendation 21 (page 24): The New Zealand Government should improve the conditions for commercialization of the results of energy research and development activities through collaboration of industry and research institutes to develop the knowledge base and technologies of strategic importance.

Recommendation 22 (page 24): The New Zealand Government should review the policy decision-making process to ensure that decisions are properly informed by the evidence and research that have been developed by Crown agencies, private sector institutions and universities.

1. INSTITUTIONAL CONTEXT

1.1 Institutional Framework for Energy Efficiency Policy in New Zealand

New Zealand's energy efficiency policy is heavily influenced by the *Energy Efficiency and Conservation Act 2000*¹ (the Act) and the related *New Zealand Energy Efficiency and Conservation Strategy*² (NZE ECS) released in October 2007. Under the Act, the Minister must ensure that a national energy efficiency and conservation strategy is prepared, publicly notified and issued, and that there is a strategy in force at all times. The Act is quite prescriptive about the strategy, including specifying the content of the strategy and how it should be prepared.

The Act is the legislative basis in New Zealand for promoting energy efficiency, energy conservation and renewable energy. The Act established the Energy Efficiency and Conservation Authority (EECA) as a stand-alone Crown entity with an enduring role to promote energy efficiency, energy conservation and renewable energy across all sectors of the economy. The Act also empowers regulations implementing product energy efficiency standards and labelling (the *Energy Efficiency (Energy Using Products) Regulations 2002*³) as well as the disclosure of information to compile statistics on energy efficiency, energy conservation and renewable energy.

In 2007, NZE ECS replaced the inaugural 2001 *National Energy Efficiency Conservation Strategy*. NZE ECS provides action plans and various energy efficiency targets for the transportation, residential, business, renewable electricity and government sectors, as well as a monitoring and reporting framework. In addition to being influenced by the NZE ECS, transport-sector energy efficiency policy is mainly guided by the *New Zealand Transport Strategy 2008*⁴.

New Zealand has historically relied on a "light-handed" approach to regulation. Under this policy, the government relies on existing general competition and economic regulation instead of developing industry-specific regulations or regulators for all markets. As a result, energy market regulation has generally been left to each industry, with the stipulation that the government would step in if industry could not come to an agreement, or if the market arrangements were at the expense of customers. The

¹ Parliament of New Zealand (2000). *Energy Efficiency and Conservation Act 2000*. Available at:

http://www.legislation.govt.nz/act/public/2000/0014/latest/DLM54948.html?search=ts_act_efficiency&sr=1

² Energy Efficiency and Conservation Authority (2007). *New Zealand Energy Efficiency and Conservation Strategy: Making It Happen*. Wellington, EECA. Available at:

<http://www.eeca.govt.nz/eeca-library/eeca-reports/nzeecs/report/nzeecs-07.pdf>

³ Parliament of New Zealand (2002). *Energy Efficiency (Energy Using Products) Regulations 2002*. Available at:

<http://www.eeca.govt.nz/eeca-library/products/standards/report/energy-efficiency-energy-using-products-regulations-04.pdf>

⁴ Ministry of Transport (2008). *The New Zealand Transport Strategy 2008*. Wellington, MoT. Available at:

<http://www.transport.govt.nz/assets/Downloads/NZTS-final-PDF.pdf>

exception to this has been Government regulation for minimum energy performance standards for various household appliances and compulsory vehicle efficiency labelling. However, with a newly elected National government (elected in November 2008), early indications suggest that government policy will remain committed to regulation that has as light a touch as possible with reliance on market mechanisms being paramount.

1.2 Key Institutions in Energy Efficiency Policy and Programmes

The Energy Efficiency and Conservation Authority (EECA). EECA is a government agency working to improve New Zealand's energy choices across all sectors of society. Its work programme focuses on the delivery of its operational programme accountabilities under NZEECS. EECA also works closely with government operational and policy agencies to help them design implement and monitor policies to promote efficient energy use and make better use of New Zealand's abundant renewable energy resources. EECA works to:

- help business get more from their energy dollar;
- improve New Zealander's quality of life by promoting warmer, drier homes and better transport choices; and
- promote the uptake of renewable energy.

EECA is a Crown entity established under the *Energy Efficiency and Conservation Act 2000*. Under section 21 (1), the Act requires EECA to "encourage, promote, and support energy efficiency, energy conservation, and the use of renewable sources of energy". EECA is governed by a Board of eight members which reports to the Minister of Energy and Resources. As of March 2009, EECA had 107 staff in its offices in Wellington, Auckland and Christchurch and its budget for the 2008/09 is forecasted to be NZD27 million for operations and NZD28 million in managed funds to be applied as grants for increasing the uptake of energy efficiency and renewable energy.

Ministry for Economic Development (MED). MED has primary responsibility for energy policy advice to the Minister of Energy and Resources including energy efficiency policy advice. It also has responsibility for monitoring EECA and ensuring integration between EECA and the Electricity Commission in the delivery of energy efficiency programmes.

Electricity Commission (EC). The EC is a Crown entity set up in 2003 under the *Electricity Act* to oversee and regulate New Zealand's electricity industry and markets. It promotes and facilitates *electricity* efficiency and conservation in the areas of lighting, industry (electric motors and compressed air), and commercial buildings.

Ministry for the Environment (MFE). MFE is the Government's primary adviser on the New Zealand environment and international matters that affect the environment. The Ministry is responsible for the *Resource Management Act*, the Emissions Trading Scheme, and has a growing leadership role in sustainable development.

Ministry of Transport and New Zealand Transportation Agency. These agencies are responsible for most transport related energy efficiency initiatives with the exception of fuel consumption labels for motor vehicles which EECA oversees.

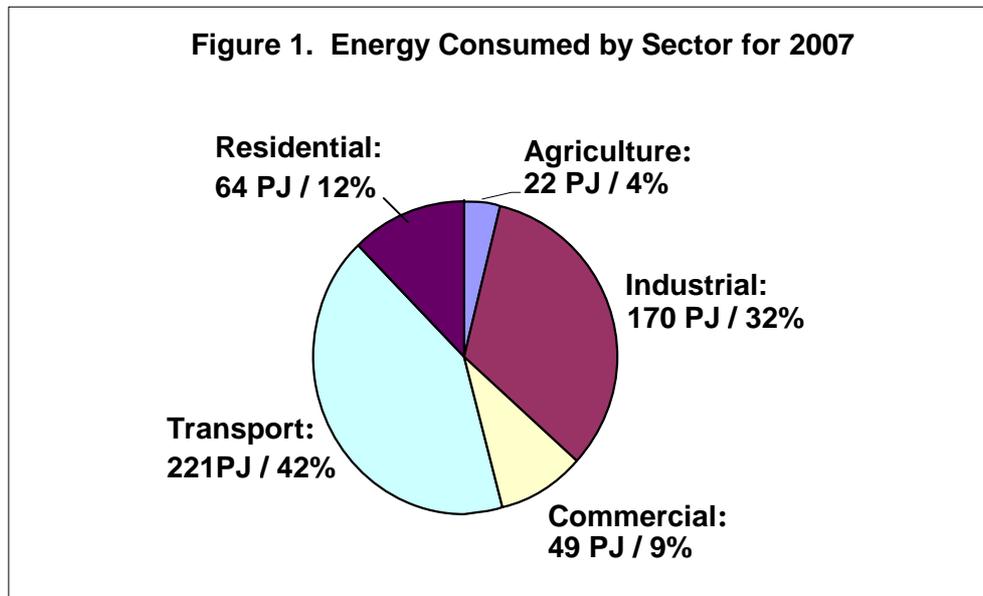
Department of Building and Housing. This department is responsible for the New Zealand building code (applies to all buildings-commercial and residential) and updates to the code that would improve their quality and performance, including energy efficient measures.

EECA works closely with all of these agencies to ensure energy efficiency issues are taken into account wherever possible (for example in the building code).

1.3 Trends in Energy Efficiency

1.3.1 Overview

In 2007, New Zealand's energy use was 525 PJ. New Zealand's total energy demand is projected to grow to 643 PJ by 2030^{5,6} producing an annual energy demand growth rate of 1.2%. Transportation is the largest and fastest-growing energy consuming sector in New Zealand. In 2007, transport accounted for 42% of total consumer energy, outstripping the industry sector (32.4%), the residential sector (12.3%), the commercial sector (9.0%) and the agriculture sector (4.2%). (See Figure 1).



1.3.2 Fuel-Mix

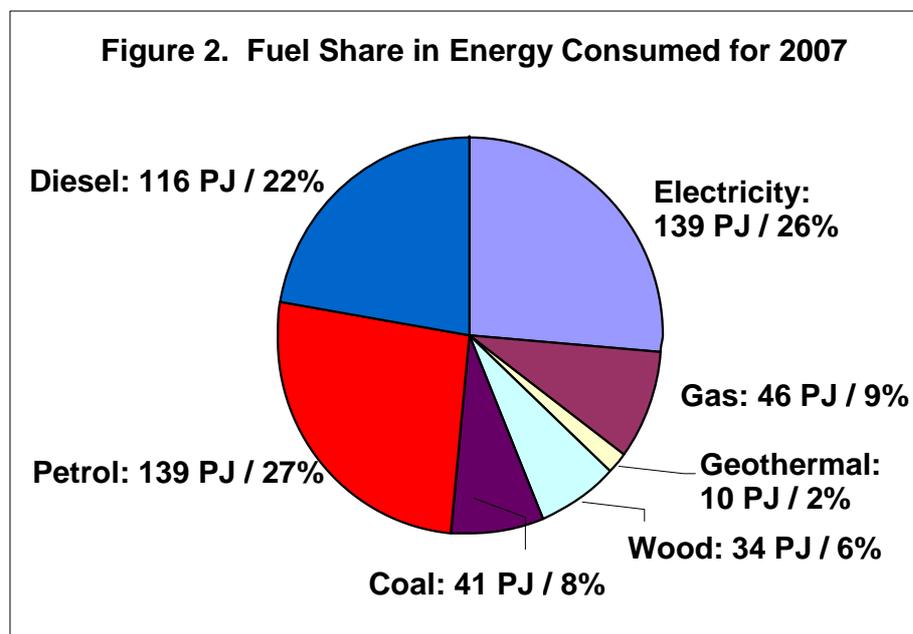
Given that transportation dominates energy use, it is unsurprising that in 2007 liquid fuels (petroleum and diesel oils) were the most consumed energy source representing 49% of the total energy consumed in New Zealand. Electricity was the second most consumed energy source at 26.5%. Hydro generation dominates New Zealand's electricity supply representing 55% of total electricity supply in 2007. When geothermal (7.7%) and wind (2.2%) electricity generation are included, renewable electricity accounts for approximately 70%⁷ of New Zealand's total electricity supply. Direct use renewables

⁵ Energy Efficiency and Conservation Authority (2009). *Energy Efficiency and Renewable Energy in New Zealand: Year Six Report, March 2001-2007*. Wellington, EECA.

⁶ Energy Efficiency and Conservation Authority (2007). *Monitoring Energy Efficiency and Renewable Energy to March 2006: Year 5 Report*. Wellington, EECA.

⁷ *Ibid.*

(not electricity) such as wood, geothermal, solar and biogas represented 9% of New Zealand's energy use. This leaves gas and solid fuels such as coal, representing 8.7% and 8% respectively. (See Figure 2).



1.3.3 Energy Efficiency Trends

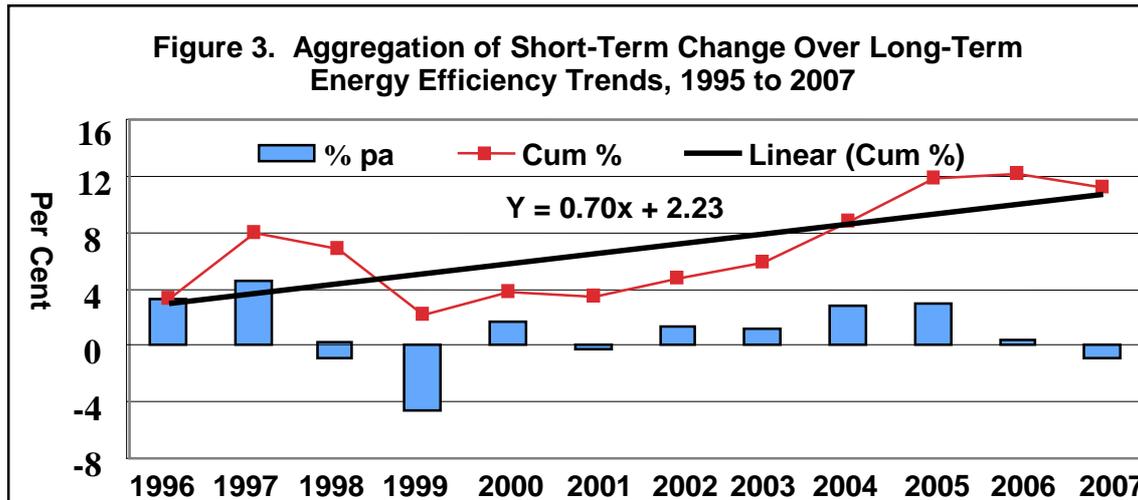
Since 2001, energy efficiency practices have reduced energy demand growth by 38 PJ, a rate of 6.3 PJ a year. The figures indicate that if energy efficiency had not improved, New Zealand's total consumer energy use would have been 563 PJ instead of the observed 525 PJ in 2007. About half of the observed 6.3PJ energy efficiency gains in 2006 can be directly attributed to the government's energy efficiency policy and programmes.⁸ The majority of New Zealand's energy efficiency gains came from improvements in energy use in the industrial (including the primary sector) and commercial sectors.⁹ By fuel, electricity and wood fuel use contributed to the largest energy efficiency gains.

Since 2001, economy-wide short term energy efficiency improved at an average rate of 1.8% pa – boosted significantly in 2003 and 2004 by the export led increase in GDP.¹⁰ Over the longer term, New Zealand's energy efficiency has been improving at 0.7% per annum from 1995 to 2007. This medium term improvement rate is similar to other OECD economies, and given the current recession is likely to be the ongoing rate. (See Figure 3, page 5).

⁸ 2006 is the first year for which data of this nature is available

⁹ Energy Efficiency and Conservation Authority (2007). *Op cit.*

¹⁰ EECA utilises the Divisia decomposition methodology to isolate factors driving energy use in the economy in the various sectors. In this methodology, energy efficiency is treated as a residual of external factors such as fuel switching, weather, activity etc. When these factors are held constant, any increase in GDP (in this instance arising from exchange rate adjustment) while the economy uses the same amount of energy, demonstrates an increase in energy efficiency.



1.4 Critique

The review team identified some lack of flexibility in the ability of EECA to design, develop and implement energy efficiency programmes. This lack of flexibility may be resulting in the development and implementation of programmes that are not optimal in relation to achieving their established objectives. In particular, EECA may be prevented from subsequently modifying a programme after it has been implemented if experience shows that the design of the programme can be improved. EECA may also be prevented from reallocating funds between existing programmes or to new programmes if experience shows that this would result in a more optimal achievement of specified objectives.

There are several causes of this lack of flexibility:

- directions from Government Ministers may be very specific in relation to the details of the programmes to be developed and implemented by EECA;
- Crown funds provided by the Government to EECA may be specifically tied to a particular expenditure item and may not be available for reallocation to other items;
- the Electricity Commission may decide to use funding from the levy on electricity market participants to develop and implement energy efficiency programmes in areas in which EECA has particular interest, experience and/or expertise.

The review team believes that all factors should be removed that may reduce the flexibility of EECA to design, develop, implement and subsequently modify energy efficiency programmes to enable the most optimal achievement of specified objectives.

Coordination among the relevant ministries has been enhanced by the establishment of a Senior Energy Officials Group that oversees the implementation of the New Zealand Energy Strategy (NZES) and NZEECS. However, there is room for improving coordination in some areas, for example, the responsibilities and roles of EECA and the Electricity Commission would be better synergised and the responsibilities of Ministry of Transport and Ministry for the Environment could be better coordinated to ensure the successful delivery of programmes.

1.5 Recommendations

Recommendation 1: The New Zealand Government should review the method of funding of the Energy Efficiency and Conservation Authority with the aim of providing it with more discretion about how its funding is expended.

Recommendation 2: The Government of New Zealand should further improve coordination of responsibilities for energy efficiency policies, implementation and delivery among the relevant entities.

2. ENERGY EFFICIENCY GOALS AND STRATEGIES

2.1 New Zealand Energy Strategy

The New Zealand Energy Strategy (NZES)¹¹, published in 2007, provides government leadership for the energy sector to respond to long term challenges of energy security and climate change. In the strategy document, demand side management is prioritised with two key principles being:

- investment should occur in energy efficiency measures where this is cheaper than the long-term costs of building extra generation capacity, including environmental costs;
- for the foreseeable future, it is preferable that all new electricity generation be renewable, except to the extent necessary to maintain security of supply.

The NZES also established a renewable energy goal that 90% of electricity will be generated from renewable sources by 2025. At present, 70% of New Zealand's electricity supply is generated from renewable sources.

New Zealand's new central government (elected in November 2008), has indicated that the NZES will undergo a review in mid to late 2009.

2.2 New Zealand Energy Efficiency and Conservation Strategy

In 2007, New Zealand released its second national energy efficiency and conservation strategy (NZECS)¹², completed as a requirement of the *Energy Efficiency and Conservation Act 2000*. The strategy was written as a companion document to, and will give effect to a number of objectives set out in, the NZES. The purpose of NZECS is to promote and increase the uptake of energy efficiency, energy conservation and renewable energy programmes across the economy and to make doing so part of the normal behaviour of New Zealanders. Unlike the NZES, it is currently uncertain if the new government will carry out an early review of this document.

¹¹ Ministry of Economic Development (2007). *New Zealand Energy Strategy to 2050: Powering Our Future*. Wellington, MED. Available at: <http://www.med.govt.nz/upload/52164/nzes.pdf>

¹² Energy Efficiency and Conservation Authority (2007). *Op cit*.

2.2.1 NZEECS Goals

The following savings are expected to be delivered as a result of the programmes outlined in the NZEECS¹³:

- 30 PJ of savings in non-transport energy per year by 2025;
- 9.5 PJ of additional direct use renewable energy per year by 2025;
- 20 PJ of energy savings in the transport sector by 2015; and
- total combined impact of 5-6 Mt of CO₂ emission reduction per year in 2025.

The NZEECS acknowledged that to reach the targets outlined in the strategy, the previous rate of improvement in energy efficiency must be increased by 40%. This would entail maintaining the current rate of improvement (as calculated for the medium term) of 0.7% per annum.

2.3 Emissions Trading Scheme

The previous government decided in principle that New Zealand will use an emissions trading scheme (ETS) as its core price-based measure for reducing greenhouse gas emissions and enhancing forest carbon sinks.

The New Zealand Emissions Trading Scheme (ETS) was developed to operate alongside other policies and measures to reduce domestic emissions and also help New Zealand meet its international obligations to reduce its greenhouse gas emissions under the United Nations Framework Convention on Climate Change and the Kyoto Protocol. The development of the ETS involved coordinated efforts from the Treasury, Ministry for the Environment, Ministry of Economic Development, Ministry of Transport, and Ministry of Agriculture & Forestry.

The ETS has been designed and enabling legislation was passed in September 2008.¹⁴ Most of the provisions of the *Climate Change Response (Emissions Trading) Amendment Act 2008* came into force on 26 September 2008. The sections of the Act relating to the Goods and Services Tax came into force on 1 January 2009 and sections relating to offsetting of pre-1990 forest land may come into force at a later date.¹⁵

The legislation proposes that the ETS will cover the following sectors of the economy: forestry, liquid fossil fuels (transport), stationary energy, industrial processes, synthetic gases, agriculture and waste. Under the legislation, the forestry sector will be the first to enter the scheme. The stationary energy and industrial process sectors will assume unit obligations under the scheme next, followed by the liquid fossil fuels (mainly transport) sector. The final sectors to enter the scheme will be agriculture, waste and synthetic gases. Later entrants to the scheme (ie, the liquid fossil fuels, agriculture, waste and synthetic gas sectors) will have an “on ramp” into the scheme through voluntary reporting starting

¹³ For complete targets, see Annex 1 of NZEECS.

¹⁴ Parliament of New Zealand (2008). *Climate Change Response (Emissions Trading) Amendment Act 2008*. Available at: <http://www.legislation.govt.nz/act/public/2008/0085/latest/DLM1130932.html>.

¹⁵ Ministry for the Environment (2008). *Emissions Trading Scheme Fact Sheet*. Available at: <http://www.climatechange.govt.nz/emissions-trading-scheme/index.html>.

two years before their unit obligations commence, and mandatory reporting starting one year before their unit obligations commence.

The newly elected Government has commissioned a select committee review of the emissions trading scheme proposed in the legislation passed by Parliament, and related climate change matters, in order to build a broader consensus on how to make more effective progress on climate change issues.¹⁶

2.4 Critique

2.4.1 Strategies

The review team found that the overall programme design methodology (as presented in the NZEECS) is well crafted and oriented to achieve the intended goals. EECA has developed a systematic process to track the performance indicators for each programme. The NZEECS includes a consistent framework applied with uniform criteria while considering all the unique characteristics of the specific projects and their respective sectors. The monitoring of the NZEEC goals' is an integrated part of the NZEECS and the design of energy efficiency programmes to achieve the NZEECS goals. Both quantitative and qualitative aspects are covered.

While the NZEECS successfully expanded the base of accountable agencies and coverage of sectors including residential, industry, commercial, transport and renewable energy, it has also increased uncertainties in terms of expected economy-wide outcomes (e.g. aggregate energy efficiency gains or reduction of national greenhouse gas emissions). For example, the former Government's in-principle decision to achieve emissions reductions by widely deploying electric vehicles is under review. It is unclear to what extent the electric vehicle target will lead to energy efficiency improvement in transport in a cost-effective manner. Clearly integrating the contribution of different interventions targeting different drivers into clear outcome objectives is challenging.

The review team believes that clarity among stakeholders in New Zealand would be improved by the Government issuing a short additional statement which sets out its overall direction and priorities in relation to energy efficiency.

The Emissions Trading Scheme, as proposed in the legislation passed by Parliament, is an example of a strong national climate change policy which could encourage New Zealanders to develop and apply low emission techniques and technologies. However, it is uncertain whether policy makers have also considered the carbon abatement benefits to be gained from increases in energy efficiency throughout the economy.

¹⁶ New Zealand Parliament. Select Committee Details. Emissions Trading Scheme Review. Available at: <http://www.parliament.nz/en-NZ/SC/Details/EmissionsTrading/>

2.4.2 Goals

Setting measurable sectoral-based targets enables the Government of New Zealand to track progress in energy efficiency improvements and to identify the areas for further improvements. In addition to the sectoral-based targets, it would be useful for the Government to set a reasonable overall energy efficiency improvement goal. This will enable the Government to identify and prioritize areas for energy efficiency improvements. This goal should be evidence based, taking into consideration the data and analysis of energy efficiency trends, relevant research and pilot studies and international best practices. We note that, in 2001, such an economy wide energy efficiency goal was established in the previous *National Energy Efficiency and Conservation Strategy*. This goal sought a 20 percent improvement in energy efficiency by 2012.¹⁷

2.5 Recommendations

Recommendation 3: The Ministry of Economic Development should ensure that sectoral-based energy efficiency targets are consistent with overall economy-wide targets.

Recommendation 4: The New Zealand Government should review existing sector-based targets to clearly identify the expected outcomes in terms of energy saving and reduction of GHG emission.

Recommendation 5: The New Zealand Government should issue a short statement which sets out its overall direction and priorities in relation to energy efficiency.

3. ENERGY DATA COLLECTION AND MONITORING

3.1 Methods of Data Collection and Monitoring

New Zealand maintains a number of datasets¹⁸ of energy information; the following is an overview of the most frequently utilized in energy efficiency.

3.1.1 Energy Domain Plan 2006-2016¹⁹

The Energy Domain Plan is an initiative led by Statistics New Zealand in conjunction with the Ministry of Economic Development and the Energy Efficiency and Conservation Authority (EECA) to evaluate the current state of energy data and propose priority initiatives for filling energy data gaps. The Energy Domain Plan provides a comprehensive work programme across responsible agencies consisting of a range of

¹⁷ Energy Efficiency and Conservation Authority (2001). *National Energy Efficiency and Conservation Strategy: Towards a Sustainable Energy Future*. Wellington, EECA.

¹⁸ See MED's Energy Data Analysis Centre for a full listing of energy information and modelling capability in NZ. Available at:

http://www.med.govt.nz/templates/StandardSummary_36.aspx

¹⁹ Ministry of Economic Development, Energy Efficiency and Conservation Authority and Statistics New Zealand (2006). *Domain Plan for Energy Sector 2006 – 2016*. Wellington, Statistics New Zealand. Available at:

http://www.med.govt.nz/templates/MultipageDocumentTOC_21841.aspx

activities to further improve the quality, comprehensiveness and usefulness of this energy data. The Plan itself aims to:

- identify the key enduring topic areas that need to be informed by official statistics;
- identify the data sources that currently inform these topics;
- identify the topic areas that are most in need of enhancement; and
- propose a set of priority initiatives to be undertaken to strengthen official statistics in the energy sector.

The leading Domain Plan priority is a rolling cycle of energy use surveys across all sectors. Currently the primary sector is being surveyed and the commercial sector will follow in 2010.

3.1.2 Energy Data File²⁰

The New Zealand Energy Data File provides annual data and information on New Zealand's energy sector statistics including supply and demand by fuel types, energy balance tables, energy prices and international comparisons.

3.1.3 Energy End-Use Database²¹

Concerted efforts in end use data collection and advanced analytical techniques have allowed EECA to develop the Energy End Use Database (EEUD) as a world class database of disaggregated energy end-use statistics for New Zealand. The EEUD provides a detailed sectoral and regional breakdown of use of all energy sources. EECA utilises the Divisia decomposition methodology to isolate factors driving energy use in the economy in the various sectors, i.e., transport, industry, commercial and residential. The database is currently being updated to incorporate 2007 energy end-use data.

3.1.4 Energy Efficiency Potentials Modelling to 2030

New Zealand's current energy use profile offers significant potential for large-scale reduction of energy use. To best achieve that potential, it is necessary to identify and strategically select the most effective opportunities and measures from the range of potential options that exist today and over the medium term. The objective of the project is to provide a purpose-built integrated set of five energy savings potential estimation models – one each for the residential, industrial, commercial, primary production and transport sectors of the New Zealand economy with time horizon to 2030. This project aims to be completed by July 2009.

3.1.5 Energy Efficiency Trends and Monitoring

EECA monitors and reviews the state of energy efficiency, energy conservation, and the use of renewable sources of energy in New Zealand on an annual basis. The annual reporting is carried out by the Monitoring and Research Group of EECA and the latest report (currently being finalized and titled *Energy Efficiency and Renewable Energy in*

²⁰ Ministry of Economic Development (2008a). New Zealand Energy Data File. Wellington, MED. Available at: <http://www.med.govt.energy/info/>

²¹ EECA End Use Database. Available at: <http://www.eeca.govt.nz/enduse/index.aspx>

*New Zealand Year-6 report: March 2001 to 2007*²²) contains a world leading and insightful examination of economy-wide and sector level trends and drivers in energy use efficiency and renewable energy performance to most recent year data is available.

3.2 Critique

The Energy Domain Plan is a comprehensive assessment and prioritization of the areas that need to be informed by official statistics. It is a well organized and honest report of the level of achievement of this effort. Its internal structure has a good logic, which makes it very practical and accessible. The Plan is a heavily statistics-oriented document, however it is well focused on providing the necessarily information required for policy development.

The Energy Data File, as a primary report of energy flows, is well organized, follows international recommendations and provides all the necessary data coming from the supply side. Even though demand and consumption information for different sectors is included (and we recognize this is not a primary role of this document) further development would increase its usefulness. For example, the information collected in the Energy End Use Database (EEUD) appears to provide greater reliability of data because of its impressive algorithm design. The information contained in the Energy Data File, could be expanded to included disaggregated end-use statistics as calculated in the EEUD.

The EEUD provides EECA with in-depth views and knowledge on energy use and enables the development of indicators to monitor energy efficiency improvement efforts closely and accurately. EECA's indicators' construction process using the Divisia method is very sound and supported with comprehensive data. Although EECA operates the EEUD with open access, there seems to be a need for increased use of the EEUD by decision makers across departments with accountabilities under NZEECS. Our concern is that policy and programme decisions are not responsive to the evidence base that the EEUD provides.

In conclusion, the statistical work developed by EECA, MED and Statistics New Zealand seems to cover the energy end-use of all sectors of the economy in a very detailed and systematic manner. However, the review team found room for improvement in the application of evidence-based decision making by policy makers in government.

3.3 Recommendations

Recommendation 6: The Energy Efficiency and Conservation Authority should ensure that the design and development of energy efficiency programmes is based on relevant information from the Energy End Use Database.

Recommendation 7: The Energy Efficiency and Conservation Authority should promote the use of the Energy End Use Database to inform other New Zealand Government functions, particularly energy policy decision making and forecasting by the Ministry for Economic Development.

²² Energy Efficiency and Conservation Authority (2009). *Op. cit.*

4. POLICY MEASURES – SECTORAL ANALYSIS

4.1 Transport Sector

The Ministry of Transport (MoT) and the New Zealand Transport Agency are primarily responsible for developing and implementing energy efficiency improvements in the transport sector. However, EECA collaborates with MoT on new and used vehicle fuel economy labelling, database management and marketing.

Transport agencies face a particular challenge in New Zealand because of the rugged terrain and scattered population divided in two long thin islands. The light passenger vehicle fleet is relatively old at about 12 years on average. There is no vehicle manufacturing and two thirds of the vehicles are second hand imports, mostly coming from Japan, but also from Korea and Europe. The latter two factors limit the government's options in creating a public policy directed to improving the energy efficiency of vehicles. While other industrialized nations with vehicle manufacturing capacity can set a corporate average fuel efficiency standard or set standards for individual models at the manufacturing level, the Government of New Zealand recognizes that trying to do the same at the importing level is difficult to manage, given the large number of models and the differing age profile of vehicles available in the market.

The *New Zealand Transport Strategy 2008*²³, released by the former Government has the following targets for the transport sector:

- halve the per capita transport emissions by the year 2040;
- improve the fuel efficiency standards for new and used imported vehicles by 25% by the year 2015; and
- fast adoption of electric vehicles.

The NZEECS specifies a role for MoT to investigate a Mandatory Energy Performance Standard (MEPS) for light passenger vehicles.

Current energy efficiency programmes in the transport sector include:

- mandatory new and used vehicle fuel consumption labelling;
- information dissemination websites <http://www.fuelsaver.govt.nz/> and <http://www.rightcar.govt.nz/>; and
- eliminating road-user charges on electric vehicles

4.1.1 Critique

The review team believes that the geographical and population situation makes large urban and transport policy changes typical of other economies a particular challenge in New Zealand. At the same time, the specific goals and targets that the government is currently working on are appropriate and achievable.

²³ Ministry of Transport (2008). *Op. cit.*

About half of the New Zealand vehicle fleet has been imported as used vehicles from the Japanese domestic fleet. Gaining consistent fuel consumption information for vehicles entering the fleet presented a challenge to officials who were faced with information based principally from two inconsistent fuel consumption test standards (European and Japanese). The government adopted an innovative approximation for the conversion of fuel consumption data obtained from Japan into data consistent with the European standard. This information is provided to consumers in a 12 band rating system. We know of few economies that have been confronted with this problem and New Zealand's unique solution to the issue is to be commended.

New Zealand has a clear understanding of the many advantages that electric vehicles would have for the economy with its significant renewable electricity resources, e.g. reduction of greenhouse gas emissions and local pollution, and better electricity load management due to the energy storage capacity of the vehicles. However, the review team wishes to see further evidence of studies and analysis of what needs to be done in order to harmonise the incorporation of electric vehicles into the fleet with the goal of achieving 90% of electric generation using renewable energies. The Ministry of Transport recognizes that the government has limited leverage to steer the market towards the adoption of electric vehicles while the market is supply constrained.

Central and local governments could incentivise the use of intra-urban public transportation in order to reduce the use of single-passenger vehicles by:

- increasing charges for single-passenger vehicles (e.g. increasing car parking fees in central business districts or reducing car parking capacity);
- extending existing incentives to the usage of bus and rail systems by reducing passenger ticket prices – this would require financial support from the central government;
- implementing land use/urban planning and design practices which encourage and promote transportation behaviour shifts to walking, car pooling, cycling and transit use.

5.1.2 Recommendations:

Recommendation 8: The Ministry of Transport and the Energy Efficiency and Conservation Authority should work together to develop and implement programmes to improve the fuel economy of petrol- and diesel-powered vehicles.

Recommendation 9: The Ministry for the Environment should develop and implement urban land use planning and design that enables and promotes energy efficient behaviour.

4.2 Residential Sector

4.2.1 Trends in the Residential Sector

The residential sector consumes 12.3% of total energy used in New Zealand (20% is the IEA average), 72% of which is electricity. Between 2001 and 2007, the sector's total energy use increased by 9.3% or 1.5% per annum from 59 PJ to 64.5 PJ. This increase can be attributed to rapid growth in floor areas, population and appliances as more New

Zealanders are living in bigger and better heated homes. The NZEECS goal for the residential sector is 1.55 PJ or 429 GWh savings per annum by 2025.

When compared with other economies, New Zealand has a relatively low residential energy use. This is the direct result of low levels of space heating. With correction for climate, New Zealand has the lowest energy use for space heating within the OECD.²⁴ Although this may be seen as a positive trend for managing residential energy use, New Zealand's average indoor home temperature (18°C) is below World Health Organization recommended limits and places occupants' health at risk, particularly those with respiratory related illness.

4.2.2 Home Insulation and Retrofits

There is a low penetration of adequate insulation in New Zealand homes. House insulation in New Zealand became mandatory in 1978 and the majority of houses built prior to 1978 were not insulated. The number of houses with inadequate or no insulation is estimated at 900,000 (64% of total housing stock) and of these approximately 300,000 are occupied by low-income families.²⁵

A recent New Zealand study of housing, insulation and health found that New Zealand households with adequate insulation (in comparison with a control group) had 19% less visits to the doctor, 23% less hospitalisations, children had a 23% reduction sick days from school and adults had 39% less sick days from work.²⁶

To address this issue, government agencies including EECA, Ministry for the Environment and the Ministry of Health have implemented retrofit programmes to install insulation in inadequately insulated homes. EECA manages funding for programmes under the *EnergyWise™ Homes* Programme to assist lower-income and middle-income families to insulate their homes and to install clean efficient heating appliances:

- The *EnergyWise™ Home Grants* are available for low income households to insulate their houses- including ceiling and under-floor insulation, draught proofing of doors and windows, hot water cylinder wraps and low flow shower heads.
- The *EnergyWise™ Interest Subsidy* is available for middle-income homeowners for an insulation retrofit and or a clean heat heating upgrade to their property.

Since its establishment in 2005, *EnergyWise™ Homes* has completed over 54,000 home insulation retrofits.

²⁴ International Energy Agency (2006). *Energy Policies of IEA Countries: New Zealand Review 2006*. Paris, IEA. Available at: <http://www.eeca.govt.nz/eeca-library/products/standards/report/energy-efficiency-energy-usi-ng-products-regulations-04.pdf>

²⁵ Isaacs, N., Camilleri, M, French, L., Pollard, A., Saville-Smith, A., Fraser, R., Rossouw, P. and Jowett, J. (2006). *Energy Use in New Zealand Households – HEEP Year 10 Report*. Porirua, BRANZ Ltd. Available at: http://www.branz.co.nz/cms_show_download.php?id=97

²⁶ Chapman, R., Howden-Chapman, P. and O'Dea D. (2004). *A Cost Benefit Evaluation of Housing Insulation: Results from the New Zealand Housing Insulation and Health Study*. Wellington School of Medicine and Health Sciences, University of Otago.

In addition to EECA's managed programmes, the Ministry for the Environment funds the Clean Heat Programme, which is available to low income households in areas with local air quality constraints and involves removing inefficient heaters and replacing them with clean, efficient and sufficiently sized heating appliances.

4.2.3 Building Code and Home Energy Ratings

To further improve the energy performance of residential buildings, the New Zealand Government amended the Building Code in 2007/08 so new homes require more insulation (in ceilings, walls and floors) and double glazed windows. These new requirements apply to all new houses, major extensions to existing houses, to new multi-unit residential apartments, and to new small buildings with a floor area up to 300 square metres (e.g. small shops). It is estimated that houses built to the new Code requirements will consume about 30% less energy than houses built to the old Code requirements.

The Government has piloted a voluntary Home Energy Rating Scheme (HERS) and discussions are continuing on how to progress this. The modelling tool that underpins the HERS (AccuRate) has been aligned with the Building Code so that it can be used as a means of compliance to meet regulatory energy efficiency requirements.

4.2.4 Home Electronics and Appliances

In New Zealand, Mandatory Energy Performance Standards (MEPS) establish standards for energy performance that products must meet or exceed before they can be sold to consumers. MEPS are regularly reviewed in consultation with industry to ensure they keep pace with advances in technology. Along with energy rating labelling, MEPS give industry the impetus to constantly improve the energy efficiency of products. Currently, seven classes of products are covered by MEPS and energy rating labels appear on five standard appliances. EECA also promotes a voluntary, international endorsement programme, Energy Star®. Energy Star® is the global mark of energy efficiency; awarded to the top 25% most energy efficient appliances, home electronics and office equipment in each category.

New Zealand aligns its energy-related product standards with Australia through the Equipment Energy Efficiency programme (E3) under an agreed policy framework and funding mechanism, which jointly funds:

- profiling of products and technologies on the market and assessments of their energy efficiency potential;
- cost benefit analysis of options for intervention;
- consultation documents and regulatory impact statements;
- development and publication of joint Australia/New Zealand Standards;
- compliance (check-testing) of products; and
- a common foundation for regulation.

Working with Australia through the E3 allows NZ to fulfil its obligations under the Australia-New Zealand Closer Economic Relations Treaty Agreement (ANZCERTA) and the Trans-Tasman Mutual Recognition Arrangement (TTRMA). These are open market agreements that facilitate trade in goods between the two economies.

The combined programmes target the adoption of ‘best regulatory practice’ among our major trading partners in order to minimise trade problems and ensure alignment with best international practice in standards for energy efficiency testing, performance and labelling.

4.2.5 Critique

The direct financial incentives given by the New Zealand Government in the form of grants and interest subsidies are the best and most effective ways to promote energy efficiency improvement in inadequately insulated lower income homes. At the same time, the well defined benefits; energy savings, health benefits and social benefits, have managed to bring various agencies to work together. However, most of the residential energy efficiency improvement programmes are focused at lower and middle incomes homes. Higher income households, with typically larger floor areas and more energy consuming appliances are given limited consideration. More focus should be given to evaluate energy use trends for higher income households.

The existence of a large quantity of inadequately insulated houses with clear welfare and economic benefits from upgrading needs a persisting and large scale financial resource from the government to underpin private sector and local government efforts. The existing funding mechanism successfully uses public-private co-funding partnerships but its short term funding uncertainty is preventing the necessary market transformation that stems from energy service companies being able to make medium term business commitments.

The residential sector energy demand has a significant role in electricity load-shifting or peak-shaving. Generally, this sector’s peak demand is the hardest to manage. Residential energy demand management activities would complement energy efficiency measures and could be developed concurrently. The review team visited Arc Innovations, a power company owned producer of smart meters. Arc Innovations are rolling out smart meters in Christchurch indicative of industry movements toward smart metering. It is not yet clear how customers will respond to improved metering systems and what benefits will accrue to customers, but there are clear load management options for power retailers. If possible, benefits from peak demand management should be channelled to support energy efficiency improvement measures, e.g., residential energy audits, inefficient product retirement, etc.

There appears to be no current effort in New Zealand to develop a future low or zero energy housing stock.

The latest amendments on the Building Code provide significant energy savings in new homes. Linking the HERS tool to the Building Code improves the design of new houses by enabling improved design rather than component performance to shape energy performance.

EECA has established a good monitoring system for tracking the penetration of efficient appliances which is based on reporting of appliances sales data. The monitoring system provides good feed-back to evaluate the level of market transformation and inform the progress of decision making on further intervention. A fridge retirement programme targeting older domestic fridges has been trialled expediting the retirement of old, inefficient fridges.

4.2.6 Recommendations

Recommendation 10: The New Zealand Government should establish a long term sustainable funding mechanism to support the EnergyWise™ Homes programme.

Recommendation 11: The New Zealand Government should explore ways to synergise the residential sector's energy efficiency improvement with peak demand management measures.

Recommendation 12: The New Zealand Government should monitor residential sector energy end-use.

Recommendation 13: The New Zealand Government should enhance and expand the inefficient appliances retirement programme by improving the resource allocation and establishing innovative ways to induce more participation.

4.3 Industrial Sector

4.3.1 Energy Trends in Industry

New Zealand's industrial sector is the second largest energy consuming sector with a 32.4% share. Between 2001 and 2007, this sector's energy use increased by about 19.8% from 160.3 PJ to 192.1 PJ, an average increase of 3.1% per annum. During the same period, this sector's output (measured in constant NZD terms) increased by 10.8%. The sector's energy use increases have been driven by energy-intensive heavy manufacturing and export oriented manufacturing. The industrial sector contributes around 28% of New Zealand's GDP and around one-third of the sector's output is exported. The sector's energy use is dominated by wood, pulp, and paper, and by basic metal products, which account for 50% of sector's energy use. These two, together with chemicals, are the largest growing sub-sectors.

4.3.2 Energy Efficiency Programmes in Industry

Industrial energy efficiency improvement efforts are organised under the business programme which includes commercial, primary production, tourism, and central and local government sectors. EECA manages three business programmes:

- ***Emprove*** is an energy management tool to help businesses create energy plans and cut energy costs. The programme includes grants for energy audits, best practice guidelines, training workshops and interest free Crown loans. Between 2001 and 2008, the programme produced reported cumulative energy savings of 5.75 PJ.
- ***Energy Intensive Businesses*** provides cash grants to help large business with a high energy spend to adopt energy saving technologies with an emphasis on energy efficiency, reliability and greenhouse gas emissions reductions. The grants provide for

feasibility studies, capital projects, and technology demonstration. Since its establishment in 2004, 81 projects have been granted NZD2.9 million and have saved 268,000 tonnes of CO₂-equivalent. Since 2004, the project has contributed to a cumulative estimated energy savings of 90,695 MWh.

- **Forest Bioenergy** is a wood energy grant scheme designed to increase the use of woody biomass. Grants provide funding for feasibility studies and demonstration projects, and information is distributed to sawmills, forestry owners and general public on the use of wood residues via the bioenergy knowledge centre (www.bioenergy-gateway.org.nz).

4.3.3 Electricity Commission Programmes

The Electricity Commission (EC) is funded by a levy on participants in the New Zealand wholesale electricity market. Total Electricity Efficiency Appropriation of levy funds for 2008/09 is NZD12.0 million. In 2007-2008, the EC invested NZD4.6 million implementing a range of programmes (excluding establishment costs) directed at lighting, commercial buildings, compressed air and electric motors. The programmes saved an estimated 198GWh (0.71PJ) per year and new programmes are planned to achieve 3PJ of annual energy saving by 2012.

Guided by a Memorandum of Understanding, EECA and the EC work together on energy efficiency programmes. A good example of policy following research was detected when energy intensive sectors, such as compressed air systems, were addressed early.

4.3.4 Critique

The review team found that the programmes implemented for the industrial sector by both EECA and the EC were well researched, designed and deployed. Their objectives are clear, their goals achievable and they are aimed to contribute accomplishing the expected savings targeted in NZEECS and the vision of NZES. However, the review team had some questions about the reliance by the EC in designing their programmes on a single consultant's report that used mainly United States data to recommend the priorities for programme development.

Nevertheless and despite the existence of an MoU between EECA and the EC, there seems to be some overlapping in the implementation of their respective programmes. Closer coordination on their efforts should bring better results at a lower cost.

The review team met with representatives from the industrial sector who critiqued the government's policies and implementation of programmes in this sector. Given the short amount of time, it is hard for the team to verify some of these claims.

Creating areas of dialogue and cooperation, such as working roundtables with industry associations, small and medium enterprises and large consumers, might create a more collegiate and cooperative environment for the public and private sectors, as well as the regulators and consumers. At the same time, these roundtables could generate more focused and effective voluntary agreements for sectors where regulation is hard to implement.

4.3.5 Recommendation

Recommendation 14: The New Zealand Government should review the Electricity Commission's energy efficiency obligation, funding and activities to determine whether these would be better transferred to the Energy Efficiency and Conservation Authority.

4.4 Commercial Sector

The commercial sector²⁷ consumes around 9% of national energy, 63% of which is electricity. Between 2001 and 2007, the sector's total energy use dropped from 48.4 PJ to 47.4 PJ. There has been rapid growth in the floor area of commercial sector buildings, full time equivalent employment and economic activities. Energy efficiency improvement activities in the commercial sector are coordinated among government agencies including EECA, the Electricity Commission, Department of Building and Housing, and the Building Research Association of New Zealand (BRANZ Ltd). Projects currently underway include:

- energy performance requirements for lighting in commercial buildings were made more stringent in 2007;
- implementation of the Building Energy End Use Study (BEES), a cross-government project to develop an understanding of how and where commercial buildings use energy;
- investigation of a building energy rating scheme proposed for implementation by the end of 2009. This will provide information about possible energy costs to prospective tenants and landlords will have an incentive to make improvements and realise better value from high-performing buildings.

4.4.1 Critique

The NZEECS sets high performance objectives for energy efficiency and energy saving for commercial buildings but does not set an annual integrated goal of energy efficiency and energy conservation for commercial enterprises. The review team considers that New Zealand should pursue the development of a building code for commercial buildings that requires the implementation of cost-effective energy efficiency measures in new and existing commercial buildings while ensuring flexibility for diverse building applications and regular reviews. New Zealand should also pursue a goal of reducing the energy consumption of the commercial sector and raise public awareness regarding energy efficiency based on cost-effective interventions.

²⁷ The commercial sector includes: activities related to trade, finance, government and local government services, health, education, real estate, commercial services and tourism.

4.4.2 Recommendation

Recommendation 15: *The Energy Efficiency and Conservation Authority should consider initiating energy efficiency programmes directed towards:*

- *increasing the efficiency of energy use in commercial buildings;*
- *increasing the efficiency of energy use by small and medium enterprises in the commercial and industrial sectors.*

4.5 Electricity Sector

New Zealand has relatively large indigenous energy resources, including coal, oil natural gas, hydro and geothermal. Fossil fuels and renewable energy sources are mostly used to generate electricity. In 2007, New Zealand reported an installed electricity capacity 9132.8 MW of installed electricity generation capacity and generated about 42.373 TWh. In the same year, hydro-electricity comprised 54.9% of total production, thermal power 33.3% (gas 26.4%, coal 6.9%), geothermal 7.7%, wind power 2.2% and others 1.8%. The consumption of electricity by the industrial, residential and commercial sectors is 43.6%, 33% and 23.3% respectively. The national loss ratio for electricity is 7.7%.²⁸

New Zealand's electricity sector is largely deregulated and operates with a competitive wholesale market. Electricity is sold by generators in the wholesale market and bought by retailers and large industrial users. This process is overseen by the *Electricity Governance Regulations 2003*, the *Electricity Governance Rules 2003*, and the Electricity Commission which regulates the electricity industry. There are five main generating companies which provided 92% of New Zealand's electricity generation. Of these five, two are independently owned and three are state-owned enterprises (SOEs).²⁹ SOEs in New Zealand aim to operate successfully as businesses including striving to be as profitable as those not owned by the Crown. The operations of New Zealand's SOEs are independent and separated from political considerations.

Distribution and retailing of electricity is carried out by a variety of businesses including commercial stand-alone electricity retailers, combined distributors/retailers and generators/retailers and local community-owned trusts.

Meridian Energy, a government-owned generation and electricity retailing company owns a smart metering company, Arc-Innovations, which is in the process of rolling out a radio frequency network in Christchurch as part of an advanced electricity meter management or 'smart metering' system. Smart metering is being introduced around the world to achieve more innovative electricity management, including the ability to enable consumers to control their household energy use to coincide with lower cost off-peak periods. The power company benefits by being able to maximise its use of generated electricity through load-shifting.

²⁸ Ministry of Economic Development (2008a). *Op.cit.*

²⁹ *Ibid.*

4.5.1 Critique

Given New Zealand's heavy reliance on hydro-electricity, the economy's electricity supplies are at risk during drought periods, originally estimated as a 1-in-60 dry year. However, climate change may have an effect on this estimate. Further, this reliance means that power shortages are typically the result of energy constraints caused by lack of water for hydro-electricity generation, rather than capacity constraints.

The implementation of smart metering in Christchurch and other centres is indication that New Zealand energy companies are taking advantage of new demand side management technologies for the benefits of consumers and for the efficiency of their business. However, noticeably absent from New Zealand's electricity sector is the establishment of energy service companies (ESCOS). There are a few ESCOS operating in the economy, but the ESCO industry has not established a foothold in New Zealand's electricity sector like it has in other developed economies. ESCOs have the potential to provide New Zealand energy consumers with more options for saving on their electricity bill and becoming more energy efficient. Importantly, ESCOs would be able to expand and build upon EECA's established business sector programmes, and assist in the transformation of New Zealand to an energy efficient economy.

4.5.2 Recommendations:

Recommendation 16: The New Zealand Government should encourage electricity businesses to play an active role in funding and delivering demand-side energy efficiency and conservation improvements among their customers.

Recommendation 17: The Energy Efficiency and Conservation Authority should consider initiating activities to support the development of an industry that provides energy efficiency services in New Zealand.

5. ROLE OF LOCAL GOVERNMENTS AND NON-GOVERNMENTAL ORGANISATIONS

In general, local governments and non-governmental organisations/community energy groups in New Zealand have good knowledge and awareness of energy efficiency improvement programmes implemented by the central government under NZEECS. Currently, they have established partnerships with central agencies in realizing the strategy's goals in certain areas. Central government agencies have been providing financial and technical support to local governments in implementing energy efficiency and renewable programmes. Currently, local governments are focused on energy efficiency improvement efforts to lower/maintain their energy expenditures, while NGOs are focused on alleviation of fuel poverty among the lower-income families. Through EECA, NGOs/community energy groups are implementing the *EnergyWise™ Homes* programmes and are able to use local networks to assist in reaching more participants.

5.1 Critique

The review team found that existing efforts on energy efficiency improvements by local governments and NGOs have proved their great ability to contribute effectively to the central government energy efficiency strategy. To enhance their existing efforts and to expand their contribution to all areas of the 2007 NZEECS, more direct and clear partnerships are needed.

The major challenge faced by local governments in their energy efficiency improvement efforts is their limited financial resources or inability to meet up-front investment cost. In many cases, high level investments made by local governments on energy efficiency and renewable energy have been sourced from central government agencies. Furthermore, their existing investment criteria means local governments are not in the position to acquire funding from commercial funding sources.

The review team applauds the effort by NGOs/community energy groups to alleviate fuel poverty in society through energy efficiency improvements. Their effort not only provides energy savings but also other benefits to society such as health and air quality improvements. Since a large quantity of inadequately insulated homes occupied by low incomes families still exist, this effort should be expanded. However, NGOs' and community energy groups' effort to expand their service coverage is impeded by uncertainty in obtaining long term funding to support their operating cost and human resource development.

Both local governments' and NGOs' financial resources must be enhanced to sustain their efforts in energy efficiency improvements. The New Zealand Government should ensure that local government legislation enables local governments to fund energy efficiency programmes. An appropriately scaled central government funding scheme should be established to support local governments and NGOs to implement energy efficiency and renewable energy development.

The central agencies could further harness the good network established by NGOs/community energy groups to promote and market their energy efficiency products and programme.

5.2 Recommendations

Recommendation 18: The Energy Efficiency and Conservation Authority should take action to provide ongoing financial support for energy efficiency programmes implemented by NGOs and community groups to alleviate fuel poverty.

6. RESEARCH AND DEVELOPMENT

The New Zealand Government carries out research and development (R&D) activities through two Crown agencies. The Ministry of Research, Science and Technology (MORST) carries out research and develops science related policy. The Foundation for Research, Science and Technology (FRST) distributes public sector investments to public and private sector institutions such as Universities. The FRST 2008 annual spend on

energy research was NZD18 million (0.4% of total FRST R&D investment).³⁰ Of the NZD18 million, approximately NZD1.5 million is devoted to energy efficiency investments.³¹

The National Energy Research Institute (NERI) is a non-government initiative to provide better coordination and access to energy research in New Zealand and enhanced teaching about energy related research.

Energy related research is undertaken by university, private research institutions and Crown research institutes. EECA undertakes a small proportion of energy efficiency and renewable energy research (total spend NZD1.8 million in 2008). EECA operates an internal process using Stagegate™ assessment of proposals to ensure prioritization and quality of research at EECA.

6.1 Critique

Technology innovation and end user research are one of the most important components in improving energy efficiency in an economy. Successful market diffusion of energy efficiency technologies is dependent on several key factors:

- strong leadership and buy-in to a long-term vision;
- collaborative governance of energy (efficiency) policy and the innovation system;
- significant investment along the innovation chain (research, development, demonstration, deployment, diffusion, demand);
- multi-disciplinary, whole-system R&DD with government and industry investment to create demand for new energy efficiency innovations and improvements;
- capability-building and collaboration of whole-systems researchers;
- international collaboration, especially where New Zealand will be a fast-follower rather than a leader in innovation.

Although New Zealand has some expert energy R&D capability, it is arguably lacking in several of the above points and thus does not benefit from its world-class energy resources and energy efficiency potential to the fullest extent.

A positive aspect of EECA's research effort is its consistent methodology. However, the review team was not able to detect much evidence of a logical decision making process from research, data collection to the policy making decision. This disconnect tends to be found at the agency (EECA/MED) and national levels and is caused by a diversity of factors.

³⁰ Foundation for Research, Science and Technology (2008). *Annual Report 2007-2008*. Wellington, FRST. Available at:

http://www.frst.govt.nz/files/Annual%20Report%202007-08_0.pdf

³¹ Ministry of Economic Development (2008b). *First (Interim) Progress Report For the Minister of Energy on the New Zealand Energy Strategy including the New Zealand Energy Efficiency and Conservation Strategy*. Wellington, MED. Available at: <http://www.med.govt.nz/upload/64325/Progress-Report.pdf>

At the **agency level**, analyzed data does not reach and inform the decision making levels due to:

- poor transferring of the analyzed data within and across government agencies; and
- changes in the structure of Crown agencies involved.

Policy makers also lack understanding of the role of research in decision making due to:

- an underestimation of the importance of the analyzed data; and
- cyclical changes in the political views at the decision-maker level due to changes in the government/

At the **national level**, as tends to be the norm all over the world, further improvements in energy research quality and quantity are hindered by funding restrictions. Long term strategic energy research is not well coordinated across government and although there are efforts to address research strategy we have no evidence that this situation will change for energy research in New Zealand in the near future.

6.2 Recommendations

Recommendation 19: The New Zealand Government should develop high level research governance, strategies and coordination of existing energy research and development to support the New Zealand National Energy Efficiency and Conservation Strategy.

Recommendation 20: The New Zealand Government should continuously assess overall research and development priorities with a view to improve targeting and reallocation of available funds to increase funding for energy efficiency research and development.

Recommendation 21: The New Zealand Government should improve the conditions for commercialization of the results of energy research and development activities through collaboration of industry and research institutes to develop the knowledge base and technologies of strategic importance.

Recommendation 22: The New Zealand Government should review the policy decision-making process to ensure that decisions are properly informed by the evidence and research that have been developed by Crown agencies, private sector institutions and universities.

7. STRENGTHS, WEAKNESSES, OPPORTUNITIES

7.1 Strengths

7.1.1 Energy Efficiency Strategy

The review team identified the development of a comprehensive energy efficiency strategy with public consultation, broad application and clear targets and indicators as a key strength in New Zealand.

The current version of the *New Zealand Energy Efficiency and Conservation Strategy* (NZECS) is the second to be produced under the *Energy Efficiency and Conservation*

Act 2000. The document is subtitled “Action plan to maximise energy efficiency and renewable energy” and it includes quantitative targets and descriptions of actions to be taken in four main areas: the residential sector, the business sector (industry and commerce); the transport sector; the government sector; and the electricity generation sector.

NZEECS is one of the most comprehensive national energy efficiency and conservation strategies seen by members of the review team. The team was particularly impressed by the legislative requirements that the strategy must be in force at all times and must be regularly reviewed and updated.

7.1.2 Establishment of EECA

The *Energy Efficiency and Conservation Act 2000* also established the Energy Efficiency and Conservation Authority (EECA) to assist the Minister in the preparing and administering NZEECS and to carry out various related functions. In effect, EECA is a dedicated government agency focussed on the delivery of energy efficiency programmes.

The review team recognised that the status of EECA as a Crown entity established by legislation: emphasised the importance ascribed to energy efficiency by the New Zealand Government; ensured that a significant level of resources will be devoted to energy efficiency programmes; and supported capacity building in relation to the development and implementation of energy efficiency programmes.

7.1.3 Policy and Strategy Development

In New Zealand, energy policy development takes place within the Ministry of Economic Development (MED) and is specifically informed by EECA’s energy efficiency programme and delivery experience. The review team strongly supported this linkage of policy development with practical experience.

The development and implementation of both energy policy and NZEECS is undertaken to achieve multiple objectives, not just reducing petajoules and/or achieving greenhouse gas emissions. In New Zealand, all energy efficiency programmes make significant contributions to maintaining national energy security, improving productivity and energy efficiency programmes in the residential sector realise significant health and social benefits. The review team considers that this recognition of multiple benefits assists in developing effective energy efficiency policy and strategy in New Zealand.

7.1.4 Programme Development and Monitoring

The review team was impressed by the comprehensive cost benefit analysis carried out during the design of EECA energy efficiency programmes and the subsequent extensive monitoring of quantitative programme results.

The review team also recognised that the EECA Research and Monitoring team has developed a world class database of disaggregated energy end-use statistics for New Zealand.

7.1.5 Programme Delivery

The review team was also impressed by EECA's use of NGOs and community groups to deliver energy efficiency programmes to low income households to alleviate fuel poverty. The team accepted the claims made by Community Energy Action in Christchurch that the group added significant value to the delivery of EECA's home insulation programmes through their contacts in the local community and by the bundling of additional services with EECA's programme.

7.1.6 Particularly Effective EECA Programmes

The review team selected the following EECA programmes as being particularly effective in achieving policy objectives:

- the implementation of energy labelling and MEPS in conjunction with Australia;
- the development of the fuel economy labelling scheme for all models of cars sold in New Zealand, including imported used cars.

7.2 Weaknesses

7.2.1 The Government's Overall Direction and Priorities

While the recognition that energy efficiency can achieve multiple benefits is a strength, it can also lead to a certain lack of clarity about the overall direction and priorities of the New Zealand Government in relation to energy efficiency. The NZEECS is very detailed for a strategy document and is better described by its subtitle "Action plan to maximise energy efficiency and renewable energy". The NZEECS document does not make clear, for example, whether the Government is primarily concerned with mitigating climate change, increasing economic efficiency, ensuring energy security or alleviating fuel poverty and improving respiratory health.

The review team believes that clarity among stakeholders in New Zealand would be improved by the Government issuing a short additional statement which sets out its overall direction and priorities in relation to energy efficiency.

7.2.2 Programme Development and Implementation

The review team identified some lack of flexibility in the ability of EECA to design, develop and implement energy efficiency programmes. This lack of flexibility may be resulting in the development and implementation of programmes that are not optimal in relation to achieving their established objectives. In particular, EECA may be prevented from subsequently modifying a programme after it has been implemented if experience shows that the design of the programme can be improved. EECA may also be prevented from reallocating funds between existing programmes or to new programmes if experience shows that this would result in a more optimal achievement of specified objectives.

7.2.3 Lack of Market Transformation Objectives

Market transformation occurs when a particular behaviour or the use of a specific technology becomes the norm and no longer requires support from market interventions such as EECA energy efficiency programmes. The classic case in many developed

economies is mobile phones which initially had to be bundled in contracts for lengthy periods to build market share but which are now universally available without contracts.

Most EECA energy efficiency programmes are designed to achieve specific quantitative targets, such as a specific number of houses insulated, or a specific quantity of energy saved. The review team believes that this emphasis on quantitative targets may be preventing more strategic consideration of actions that EECA could take to facilitate market transformation in relation to a specific energy efficient technology or behaviour.

7.2.4 Under-utilisation of End-use Statistics

The review team believes that the world class database of disaggregated energy end-use statistics and related analysis and monitoring for New Zealand developed by the EECA Research and Monitoring team may be under-utilised in the development of energy efficiency programmes by EECA and in energy policy development by MED.

The review team is also concerned that the extraordinary work being done by the research team has not been translated into lasting strategy. Instead of a systematic process of research development, EECA appears to develop the research based on the capacity and experience of its personnel. Even though the results are world class, their application is subject to the quality of wider decision makers.

7.2.5 Areas Requiring Greater Attention

The review team identified the following areas as requiring further policy and programme development in New Zealand:

- increasing the efficiency of energy use in commercial buildings;
- increasing the efficiency of energy use by small and medium enterprises in the commercial and industrial sectors;
- improving the fuel economy of petrol- and diesel-powered vehicles;
- supporting the development of an industry that provides energy efficiency services in New Zealand;
- providing certainty in ongoing financial support for energy efficiency programmes implemented by NGOs and community groups to alleviate fuel poverty;
- developing and implementing urban land use planning and design that enables and promotes energy efficient behaviour;
- securing a permanent and adequate source of funding for research, and enabling collaboration with other research centres such as academic institutions and private consultants. It is also important to address the issues of work duplication and unnecessary research competition.

7.3 Opportunities

7.3.1 EECA Funding

The practice of tagging the Crown funds provided to EECA to specific programmes and expenditure items has severely limited EECA's flexibility in optimising the design, development and implementation of energy efficiency programmes. There is an

opportunity to improve the effectiveness of energy efficiency programmes by removing restrictions on the expenditure of EECA funding.

7.3.2 Duplication between the Electricity Commission and EECA

There is a significant potential for duplication and overlap between the Electricity Commission and EECA in the development and implementation of programmes directed to improving the efficiency of utilisation of electricity. There is an opportunity to improve the allocation of resources to energy efficiency programmes by consolidating the development and implementation of energy efficiency programmes in one specialist agency.

7.3.3 Utilisation of End-use Database

The comprehensive database of disaggregated energy end-use statistics and monitoring analysis developed by the EECA Research and Monitoring team is currently under-utilised. There is an opportunity to utilise this work more intensively to inform New Zealand Government functions.

8. CONCLUSION

The review team was impressed with the level of attention and resources allocated to energy efficiency policy and programmes by the New Zealand Government. Most of the work on energy efficiency carried out by New Zealand Government agencies is high quality and some is world class. The recommendations made by the review team are intended to apply slight corrections to a regime of energy efficiency policy and programmes which essentially is in good shape.

However, the review team did have some concerns that there is currently some lack of clarity about the New Zealand Government's overall direction and priorities in relation to energy efficiency. In particular, there is no clear statement by the Government about its desired policy priorities between saving petajoules, reducing greenhouse gas emission, increasing energy security, improving health outcomes in the residential sector, and achieving other social benefits. Given that the current Government came to power only recently, it is understandable that these questions are currently unresolved and they will no doubt be resolved over time.

APPENDIX A: MEMBERS OF THE REVIEW TEAM

David Crossley, Managing Director at the consultancy firm Energy Futures Australia Pty Ltd in Australia

Ignacio Fernandez, International Affairs Coordinator at the National Energy Commission in Chile

Yi-Hsieh Huang, Team Leader at the Asia Pacific Energy Research Centre in Japan

Kenji Kobayashi, President of the Asia Pacific Energy Research Centre in Japan

Chandran Sundaraj, Researcher at the Asia Pacific Energy Research Centre in Japan

APPENDIX B: ORGANISATIONS AND OFFICIALS CONSULTED

Government Officials

Ministry of Economic Development

- Bruce Parkes, Deputy Secretary, Energy and Communications
- Richard Hawke, Manager, Energy and the Environment Group
- Mark Walkington, Senior Analyst, Energy Information and Modelling Team
- Caroline Ryder, Senior Analyst, Energy and the Environment Group
- Rob Reid, Policy Analyst, Energy and the Environment Group
- Sebastian Bishop, Policy Analyst, Energy and the Environment Group

Energy Efficiency and Conservation Authority

- Roger Sutton, Chairman of the Board
- Mike Underhill, Chief Executive
- Bill Brander, Manager, Strategy
- Walt Friedel, Manager, Government and Local Government
- Terry Collins, Manager, Products Programme
- Robert Linterman, Acting Manager, Residential
- Murray Bell, Manager, Business Programmes
- Anita King, Marion Pahalwatta, Harbans Aulakh, Monitoring
- Martin Garood, Research
- Nathan Ross, Team Manager, Solar and Efficient Water Heating

Ministry of Transport

Leah Murphy, Acting Manager, Environmental Sustainability

Jörn Scherzer, Advisor, Environmental Sustainability

The Electricity Commission

- Rod Treder, Programme Manager, Industrial Electricity Efficiency

Christchurch City Council

- Leonid Itskovich, Energy Manager
- Sally Buck, Councillor

Environment Canterbury

- Linda Kirk, Programme Manager, Air and Energy
- Mike O'Connell, Energy Policy Analyst, Energy Portfolio Convenor
- Bill Simpson, Communications Manager

Private Sector and Industry Associations

Business New Zealand

- George Riddell, Manager, Energy, Environment & Infrastructure

Major Energy Users Group

- Ralph Matthes, Executive Director

Arc Innovations

- Helen Bremner, Chief Executive
- Mark Figgitt, GM Commercial Delivery

Academics and Non-Profit Organizations

Otago University

- Professor Gerry Carrington

Community Energy Action, Christchurch

- Ian McChesney, Chair
- Bede Martin, Chief Executive

APPENDIX C: REFERENCES

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