



# Possible Energy Use Trends for New Zealand — 2000/2010

## Executive Summary

This document presents the Executive Summary of a report that describes preliminary studies commissioned by the Energy Efficiency and Conservation Authority (EECA) to examine possible energy use trends within the New Zealand economy over the next ten years. The full report is available directly from CAE (see page 5 for address details).

In order to focus on the overall picture the work undertaken examined the likely use trends for four broad sector groups, namely; energy production; the transport sector; the communities and household sector; and, the industrial and commercial sector.

Characteristically the sectors: energy production, communities and household, and industrial and commercial, all have a high inertia to change largely due to long-lived physical structures requiring long-term investment. Furthermore, economic growth and demand within all these sectors impact on energy use patterns within the transport sector. At best, these pre-conditions and their inter-relationships can only lead to incremental change in New Zealand's overall pattern of energy use. To achieve significant change, therefore, will require long-term, sustained effort across all sectors of the economy.

### Work Plan

The study work was undertaken in three phases:

Firstly, in order to provide a baseline projection of what might be expected if there were no further stimulus or major initiatory measures over the next decade, a "business as usual" (BAU) energy projection for the time period was estimated using the energy analysis tool, EERA (Energy Efficiency Resource Assessment) model\*. Results from this analysis then formed the basis of expert commentary of likely future energy efficiency gains for each of the identified sectors.

Secondly, and in order to ensure a wide coverage of the topic area, an independent expert commentator for each sector was invited to bring together preliminary views and insight into the possible energy efficiency measures which might be expected to become available over the decade.

In addition each specialist was able to share this commentary in its early development phase with a widely-drawn interest group (50 - 80 people) as part of the consultative process undertaken during development of the National Energy

Efficiency and Conservation Strategy (NEECS).

Thirdly, from the above analysis and commentary individual sector reports were prepared and these were then drawn together into a final summary that forms the body of the main report. The methodology adopted for this phase sought a total systems approach to analysis of the energy efficiency and conservation problem so as to better describe how components of the overall system interact with each other and to identify key drivers for change.

Using this approach, preliminary assessments have been made for each of the individual sectors as to the likely overall influence on energy use from changing technology trends and other possible energy efficiency responses. These opinions are drawn together in Table 1, which describes possible energy efficiency uptake rates over the next ten years.

### Overview of the Individual Sectors

As described, the findings of the full study presented an initial assessment of the possible improvements to energy efficiency uptake that might be made over the next ten years. More in-depth assessment is required before definitive conclusions can be drawn about likely future energy trends.

From review and analysis of the individual sector reports it was evident that the capital costs and lifetimes of existing infrastructure dominate current decision making. A significant finding of the study was the need for further analysis of the underlying social and economic factors that affect individual energy use choices. A good understanding of what influences decisions at a sectoral level is essential to fully realise energy efficiency potentials. A limiting factor at present is also the lack of good information on current energy use.

Clearly, however, decisions taken now can have a positive influence on the pattern of future energy efficiency investments. The following broad conclusions were reached for each of the four sectors studied.

### Energy Production

By most international comparisons New Zealand has a diverse range and scale of energy sources, both non-renewable (fossil) and renewable.

\* EERA database and investigative model is a computer analysis programme developed by Dr Pieter A Rossouw for a joint venture partnership of the Building Research Association of New Zealand (BRANZ), Coal Research Limited (CRL Energy), EECA, Ministry of Commerce, Natural Gas Corporation of New Zealand Ltd., Transpower New Zealand Ltd.

|                            | Transport   | Grad.   | Accel.  | Communities & Households   | Grad.   | Accel.  | Industrial & Commercial   | Grad.    | Accel.   |
|----------------------------|---|---------|---------|--|---------|---------|---|----------|----------|
| <b>Anticipated Actions</b> | Traffic demand management and ITS   | 1% pa   | 2% pa   | Introduction of new building design standards  | 10%     | 20%     | Introduction of new process technology & closed loop processing | 2.5%     | 7.5%     |
|                            | Replacements by advanced vehicle technology and rational downsizing             | 5%      | 10%     | Improving building services & appliances   | 1.0% pa | 2.5% pa | Improving energy management services                            | 0.75% pa | 1.25% pa |
|                            | Retrofits to the present vehicle fleet, improved maintenance and driving habits | 0.1% pa | 0.2% pa | Retrofitting & improvements to the present housing stock   | 1.5% pa | 4.0% pa | Retrofitting existing buildings & stocks                        | 0.25% pa | 0.75% pa |
|                            | Promote public transport, cycle, walk, pooling, teleworking                     | 0.2% pa | 0.5% pa | Urban design form changes  | 5%      | 10%     | Symbiotic process integration & societal change                 | 2.5%     | 7.5%     |
|                            | Changes to urban form and transport systems                                     | 0.5%    | 1%      | Grad. (Gradual) — normal industry initiatives and modest improvement<br>Accel. (Accelerated/Enhanced) — initiatives targeted to realise fullest possible potential<br>Note: improvement rates, expressed as an annual rate (pa), are progressive. Otherwise, improvements occur at step intervals over the ten year period. For details, see Appendix E. |         |         |   |          |          |

**Table 1: Projected uptake rates of new energy efficiency measures with and without explicit interventions**

However, the current structure of the energy supply industry and the nature of energy demand requirements means that within the timeframe of the study the opportunity for substituting fossil fuels by renewables is relatively small. Options for the increased use of renewable energy will require explicit interventions to change the current “least cost” paradigm that dominates decision-making.

### **Transport**

In assessing demand-side measures the transport sector is identified as the most critical in terms of further study and finding innovative solutions. Whilst there are considerable opportunities for technical efficiencies in vehicles and infrastructure, improved sustainability requires the establishment of a structure for transport decision-making that encourages desirable energy efficiency responses. There appears to be an essential role for government to encourage this approach.

Structural changes in urban form and interconnection of transport systems are worthwhile initiatives but their influence over the next 10 years will be limited.

### **Communities/ Households**

This sector is characterised by a large number of small units with a high longevity factor. Given the socio-economic realities in New Zealand, significant energy performance upgrades to existing homes, in most cases, do not represent a tangible benefit to the owner on energy cost savings grounds alone. The critical need in this sector is to ensure all participants in the design, construction and ownership of housing stock have access to the necessary information to improve energy efficiency performance. Improved standards for appliance energy efficiency are relatively easy to implement, and their effects are reasonably immediate, through legislative frameworks. However, the overall gains in energy efficiency terms are not likely to be

substantial.

### **Industrial/Commercial**

This sector displays similar characteristics to the communities/ households sector, with a predominance of large fixed investments with technological improvements dependent on stock and plant replacement lifetimes. Improving energy management services, as well as enhanced management awareness of environmental issues and a commitment to sustainable development, is critical to improved energy performance.

In the commercial buildings group the main opportunity for energy efficiency short term, is the replacement of the plant and appliances, although demands for higher comfort levels and services has tended to increase energy loads. Longer term, gains can be made with improvements in the design of new buildings and building refurbishments. Economic growth in the industry grouping will allow new investment in energy efficiency technologies comparable with best international practice.

### **Possible Energy Efficiency Gains**

Economic growth, increasing standards of living and lifestyle choices continue to place upward pressure on our total energy consumption. As a result of these pressures increasing energy consumption is occurring across all sectors of the New Zealand economy.

Analysis of the possible impact of certain key changes in each sector shows that quite aggressive energy efficiency measures will be required if New Zealand is to significantly reduce its overall energy growth rates. Projections of what the energy efficiency measures identified in Table 1 might achieve over the next decade are summarised in Table 2. More information is provided in Figures 1 - 4.

| Sector                   | Business as usual | "Gradual" introduction of measures | "Accelerated" introduction of measures |
|--------------------------|-------------------|------------------------------------|--|
| Transport                | (25.0)            | 19.9                               | 35.2                                   |
| Communities & Households | (17)              | 18.6                               | 38.5                                   |
| Industrial & Commercial  | (21.5)            | 25.5                               | 55.3                                   |
| Total                    | (63.5)            | 64                                 | 129                                    |

**Table 2: The possible energy savings (PJ) over the period 2000 - 2010 (increases shown in brackets)**

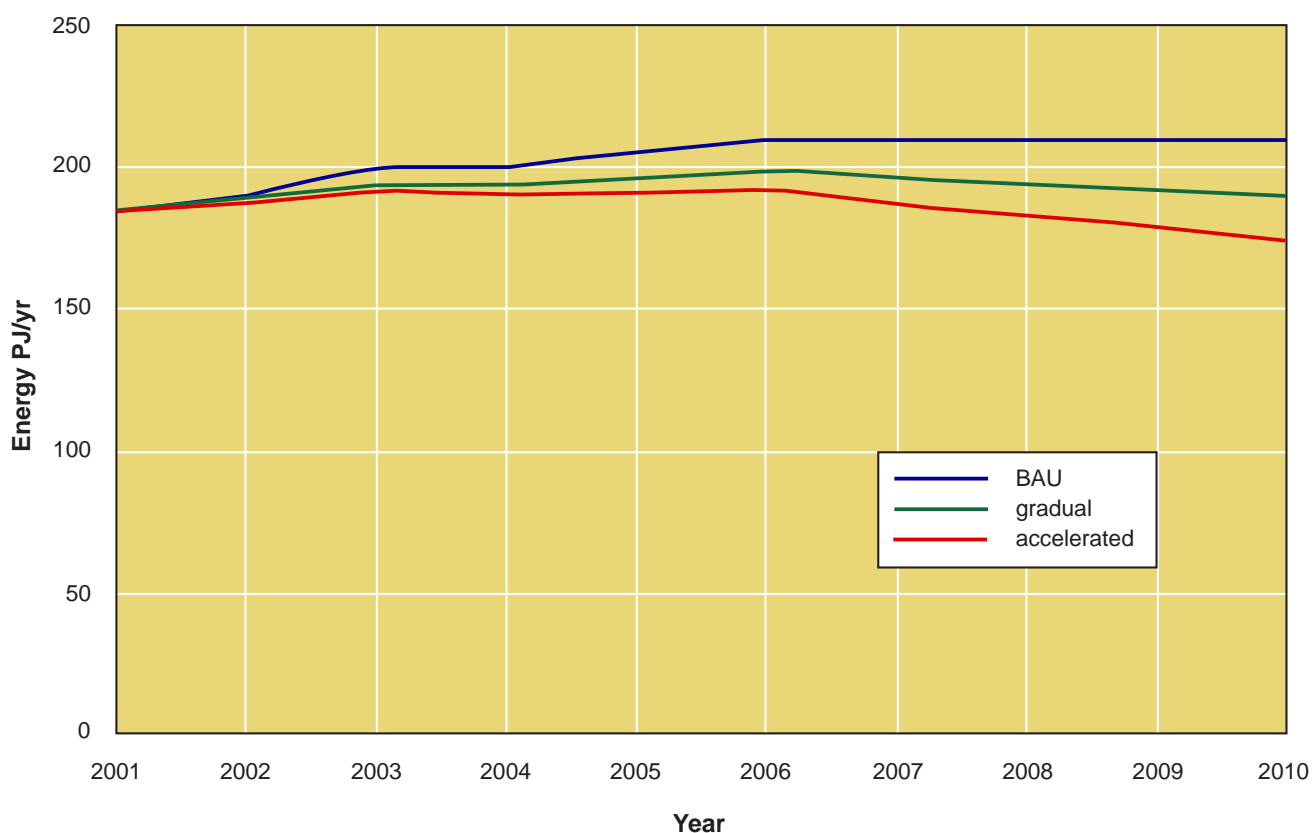
In the BAU scenario, total energy use is projected to steadily increase to the end of the decade to 530 PJ (up 15% on the year 2000). In other words, quite specific intervention will be required to reduce New Zealand's gradually increasing use of energy.

Applying further energy efficiency measures, over and above the presently expected attainments under BAU (the so-called "Gradual" introduction of measures identified by the sectoral analyses), has a projected impact of reducing all the expected growth by the end of the decade. The energy gains in the non-transport sectors of this scenario are balanced out by the increase in energy use of the transport sector. It would take other possible measures like fleet replacement by advanced vehicle technology, which has been dismissed as being too early to include in the present time-frame, to affect further improvement in the transport sector.

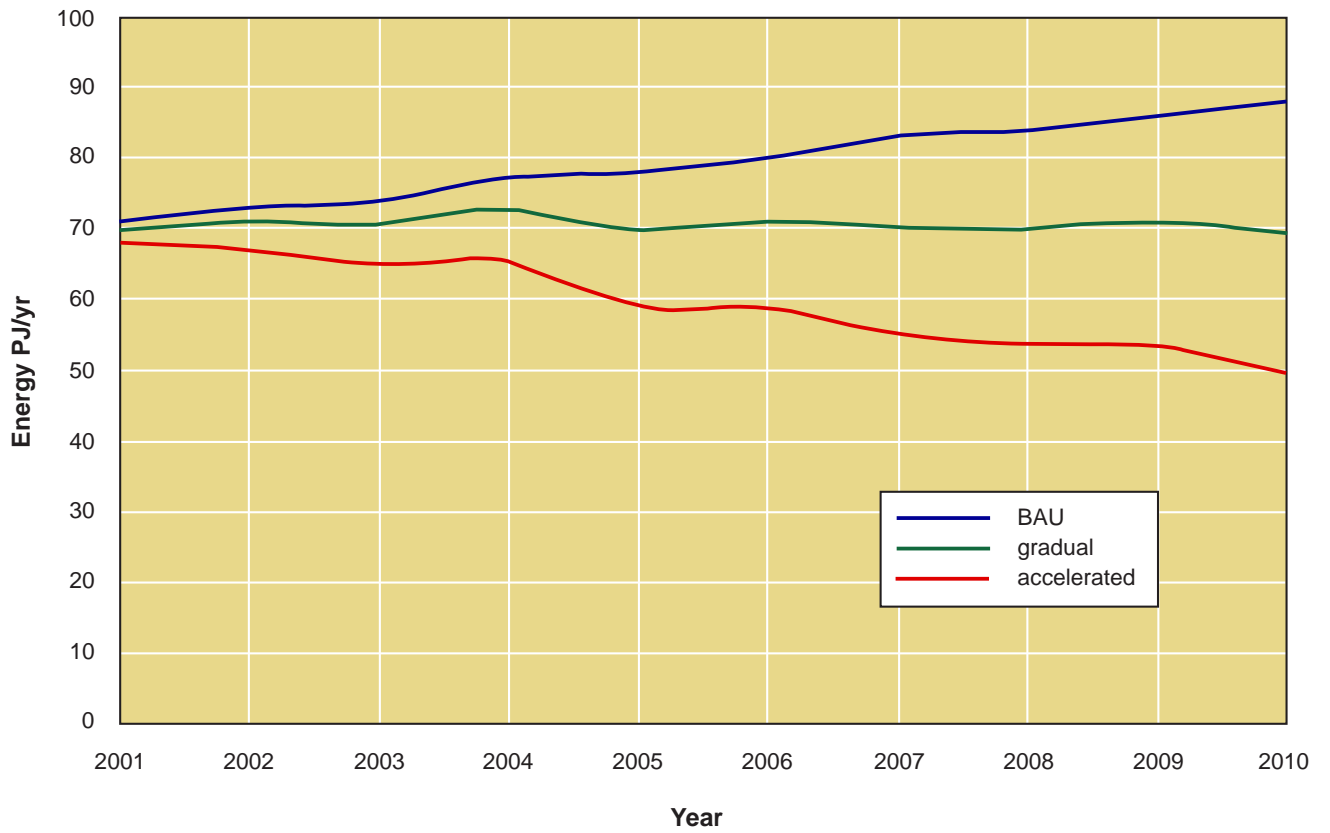
Only by applying quite dramatic energy efficiency

measures (the so-called "Accelerated" introduction of measures identified by the sectoral analyses), can enough significant gains be made across all sectors, leading to a reversal of increasing energy use to one of decline. Under this scenario, the analysis shows that quite dramatic energy savings of about 130 PJ in total might be possible, thereby reducing New Zealand's total energy consumption to around 400 PJ by the end of the decade.

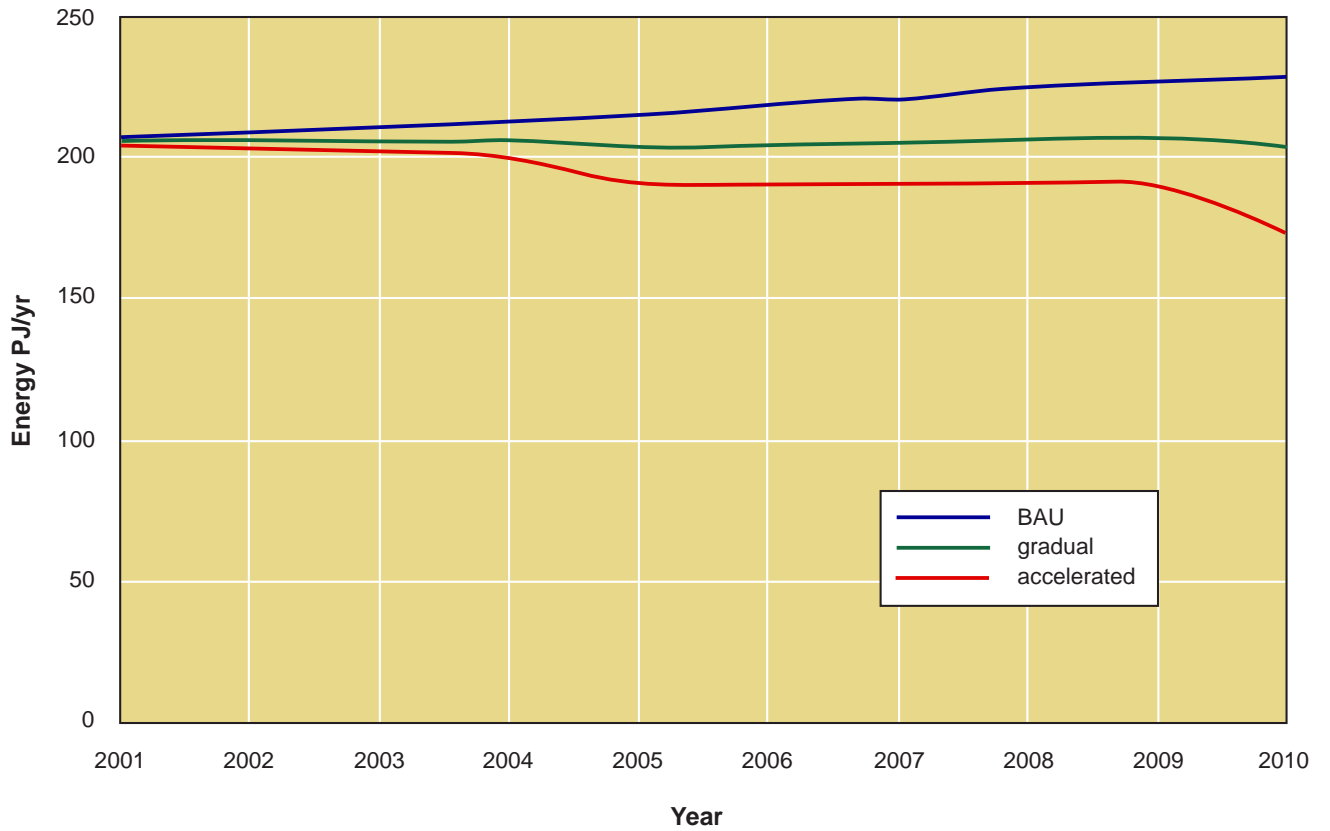
The study finally concluded that, whilst demand-side management can provide an effective means of delivering energy savings, major changes to New Zealand's energy consumption will require explicit interventions in the market place. This early work also suggested the need for a broader systems approach to analysing the impacts of such interventions for successful strategies to be formulated.



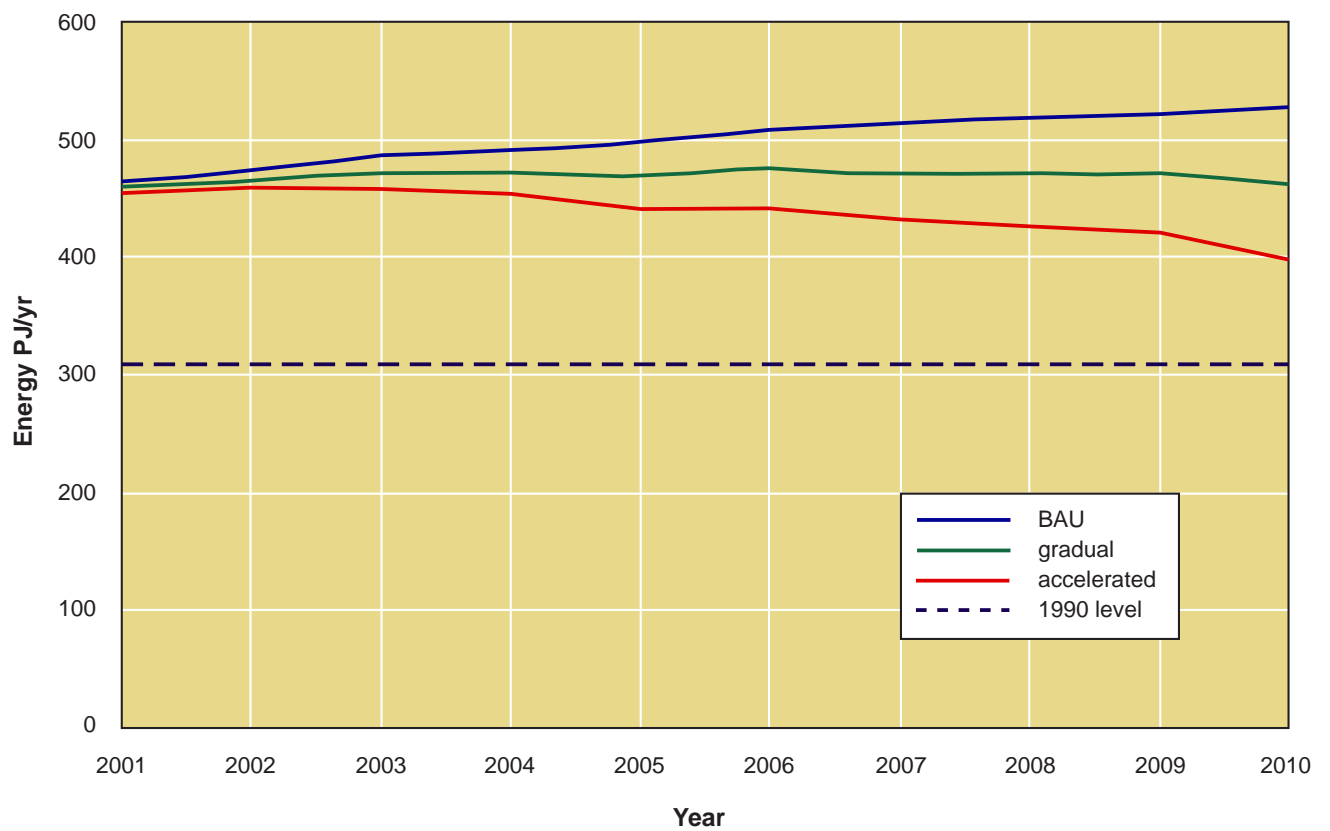
**Figure 1: Likely improvements in energy use within the transport sector for assumed energy efficiency interactions**



**Figure 2: Likely improvements in energy use within the communities and households sector for assumed energy efficiency interactions**



**Figure 3: Likely improvements in energy use within the industrial and commercial sector for assumed energy efficiency interactions**



**Figure 4: Future energy demand projections compared against 1990 energy consumption**

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The full report *Possible Energy Use Trends for New Zealand — 2000/2010* is available by contacting CAE

**CONTACT**

**Centre for Advanced Engineering • University of Canterbury Campus • Christchurch**

Mail Address: CAE, University of Canterbury, Private Bag 4800, Christchurch  
 Street Address: 39 Creyke Road, Ilam  
 Phone: 03 364 2478  
 Fax: 03 364 2069  
 e-mail: cae@cae.canterbury.ac.nz  
 website: www.caenz.com