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Manufacturing Energy Use Survey

Year ended March 2006 – Revised 3 March 2009
(see Highlights, commentary and tables)

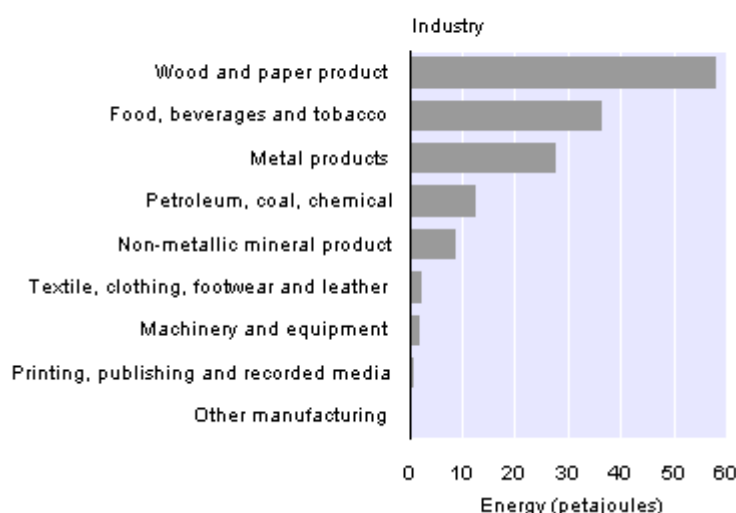
Highlights

- **New energy use statistics are available** from the Manufacturing Energy Use Survey.
- **The total amount of energy used by the manufacturing industry was 149.19 petajoules (PJ).**
- **The wood and paper product manufacturing industry was the largest user of energy**, with 39 percent of the total.
- **Electricity was the energy type used in greatest quantity**, at almost 33 percent of total energy use. Wood and wood waste, and natural gas, were 20 percent each.
- **Fifty-seven percent of businesses actively recorded and monitored energy use** for the March 2006 year.

Total Manufacturing Energy Use

By industry group

Year ended March 2006



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There is a companion Media Release published – [Manufacturing Energy Use Survey: Year ended March 2006](#).

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Commentary

Overview

This Hot Off The Press presents the results of the 2006 Manufacturing Energy Use Survey (MEUS). The survey was carried out by Statistics New Zealand, in collaboration with the Ministry for Economic Development and the Energy Efficiency and Conservation Authority, with the aim of enhancing energy use information in New Zealand. The survey delivers newly available statistics on energy use by the New Zealand manufacturing industry.

The MEUS collected information on energy use and energy management practices in the manufacturing industry for the 12-month period ending 31 March 2006. The main unit of measurement for this publication is the petajoule (PJ). A petajoule of energy is roughly equivalent to all the petrol in a coastal tanker with a load of 25 million litres or the total electricity used by 35,000 households in one year.

Total energy use

In the year ending March 2006, the manufacturing industry used 149.19 petajoules of energy. The table below shows energy use by manufacturing industry group.

Energy Use by Manufacturing Industry Group

Industry group	Energy use (PJ)
Wood and paper product manufacturing	57.83
Food, beverage and tobacco	36.47
Metal product manufacturing	27.65
Petroleum, coal, chemical and associated product	12.70
Non-metallic mineral product manufacturing	8.93
Textile, clothing, footwear and leather manufacturing	2.46
Machinery and equipment manufacturing	1.90
Printing, publishing and recorded media	0.81
Other manufacturing	0.45
Total manufacturing industry	149.19

Note: Data may not sum to stated totals due to rounding.

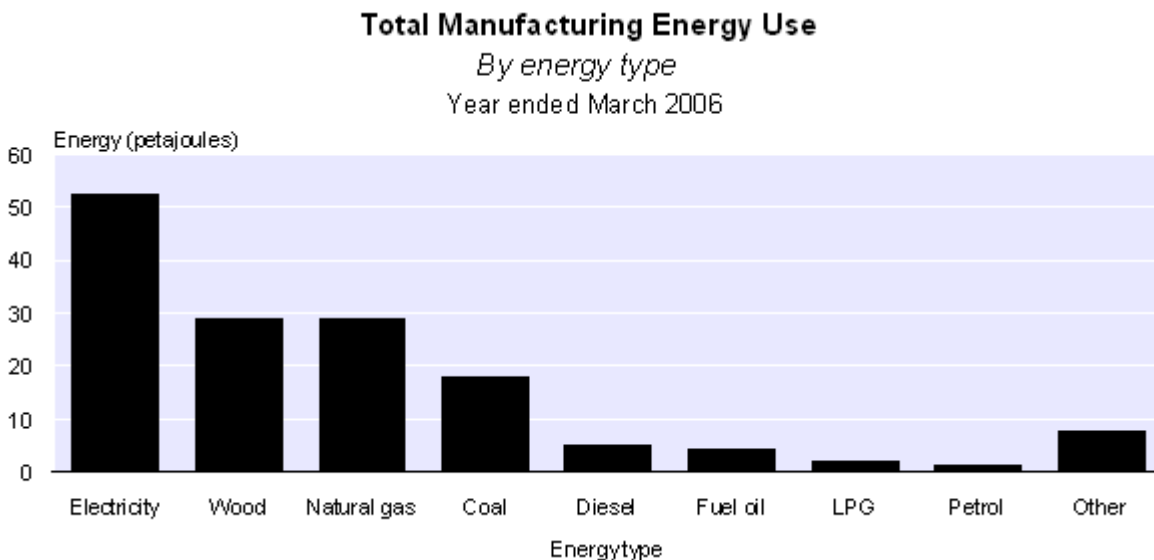
In the March 2006 year the wood and paper product industry was the largest user of energy within the manufacturing industry, accounting for 39 percent of the total energy used. Half the energy used by this industry group was sourced from wood and wood-waste products.

The food, beverage and tobacco industry was the second-largest user of energy, accounting for just over 24 percent of the total energy used by the manufacturing industry. The metal product manufacturing industry used 19 percent of the total energy, at 27.65PJ. The metal product manufacturing industry includes the manufacture of iron and steel, basic non-ferrous metals, sheet metal products and fabricated metal products.

The remaining industry groups collectively used 27.25PJ, just over 18 percent of the total. The printing, publishing and recorded media manufacturing industry and the 'other' manufacturing industry collectively accounted for less than 1 percent of total energy used. These industries are less energy intensive as their production processes generally do not require heavy machinery or process heat. The 'other' manufacturing industry includes the manufacture of prefabricated buildings, furniture and other manufacturing not elsewhere classified.

Energy types used

The manufacturing industry used a range of energy types in the March 2006 year, reflecting the diverse nature of manufacturing processes. The graph below shows the amount of each energy type used for this period.



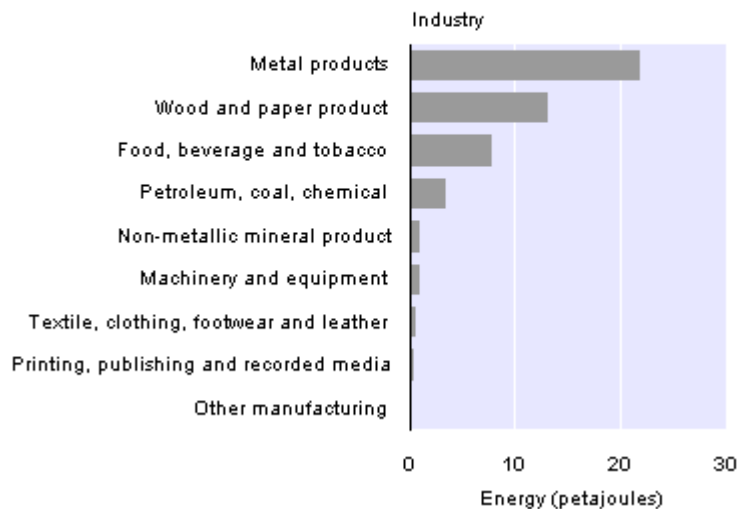
Electricity

Electricity was the energy type used in greatest quantity, with just over 33 percent of total energy use. The metal product manufacturing industry was the largest electricity user, at 44 percent of the total. The second-largest electricity user was the wood and paper product industry (just over 26 percent) followed by the food, beverage and tobacco industry (almost 16 percent).

Total Electricity Energy Use

By industry group

Year ended March 2006



Wood and wood waste

Wood and wood waste was the second-largest energy type used for the March 2006 year, at 20 percent of total energy use (29.25PJ). Wood and wood waste, as an energy type, includes shavings, sawdust, bark and black liquor. The wood and paper product industry was the largest user of this energy type, accounting for 20 percent of the total.

Natural gas

Natural gas also accounted for 20 percent of total energy use (at 29.20PJ).

Coal

Coal used for the year ending March 2006 was 18.26PJ or 12 percent of total energy. The largest user of this energy type was the food, beverage and tobacco industry, at 66 percent of the total.

Petroleum products

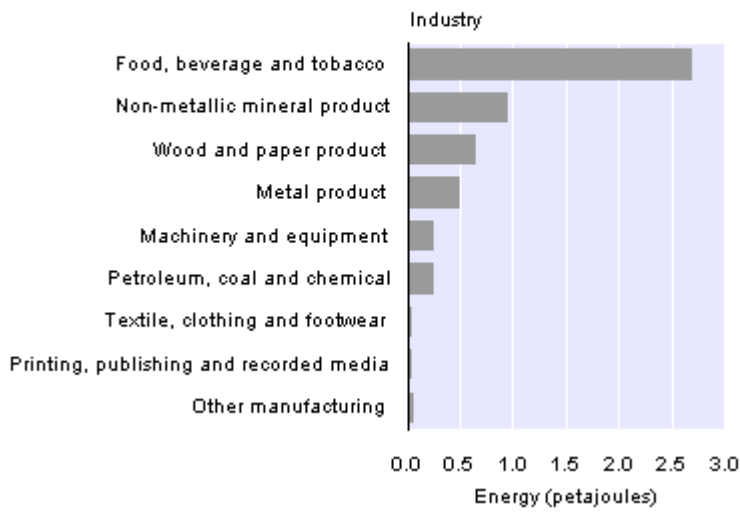
Information was collected by MEUS on the following petroleum products: diesel, fuel oil, liquefied petroleum gas (LPG) and petrol. Petroleum products as a whole accounted for just under 10 percent of the total energy used.

The total amount of diesel used by the manufacturing industry for the March 2006 year was 5.47PJ. Until now, there have been limited statistics on diesel use, particularly in regards to who uses diesel and how it is used. The graph below shows diesel use across the manufacturing industries for the March 2006 year.

Total Diesel Energy Use

By industry group

Year ended March 2006

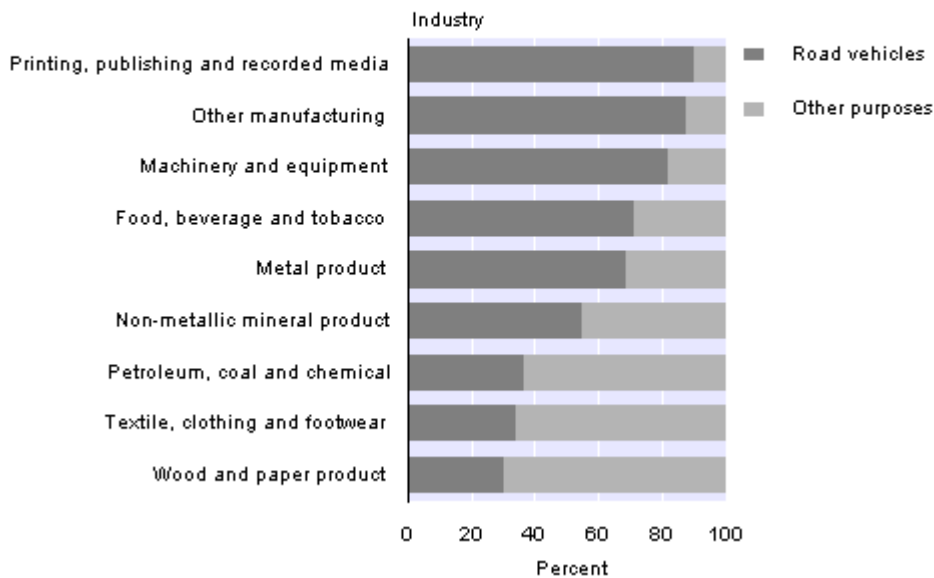


In the March 2006 year, over 62 percent of the total diesel used by the manufacturing industry was for road vehicles. The remaining 38 percent was used for other purposes, such as stationary industrial processes or operating off-road machinery including forklifts.

Purpose of Diesel Energy Use

By industry group

Year ended March 2006



Fuel oil use for the March 2006 year was 4.82PJ, or just over 3 percent of the total energy used. The largest user of fuel oil was the petroleum, coal, chemical and associated product manufacturing industry, which used half the total.

The total amount of liquefied petroleum gas (LPG) used by the manufacturing industry for the March 2006 year was 2.59PJ, just under 2 percent of the total energy used. Almost all LPG use was for purposes other than the operation of road vehicles, being mainly for forklifts and process heat (around 99 percent).

Petrol was the energy type used in the smallest amount by the manufacturing industry, at 1.77PJ or just over 1 percent of total energy. This reflects the nature of the manufacturing industry; the main energy requirements are for machinery and processing, rather than for road transport.

Of businesses that used petroleum products, 89 percent reported having a fuel card or fleet-management system to account for transport vehicles and consumption of transport fuels.

Other energy types

Other energy types used by the manufacturing industry included geothermal steam, waste heat, and steam purchased from third parties. These energy types accounted for just over 5 percent of the total energy used (8.01PJ).

On-site electricity generation

Just over 1 percent of industrial sites in New Zealand reported electricity generation occurring on-site. In many cases the generation plant was owned and operated by a third party, often an energy company.

In the year ending March 2006, electricity generated on these manufacturing sites totalled just over 6 PJ. Although the generation plants were often owned by third parties, information is reported here because it was embedded into the manufacturing sites and often the processes. However, the quantity of electricity generated was not included in the total energy use figure to avoid double counting as the energy types used for the generation were already accounted for.

The nature of the generation varied, from electricity generation such as transforming one fuel source into electricity, through to cogeneration – the simultaneous production of electricity and a useful form of heat from a common fuel source. The majority of this electricity was used on-site although a number of respondents noted that surplus electricity was exported to the national grid.

The most common fuel source used as an input into the generation process was natural gas, followed by wood and wood waste. Other inputs for electricity generation included coal, diesel, and residual process heat.

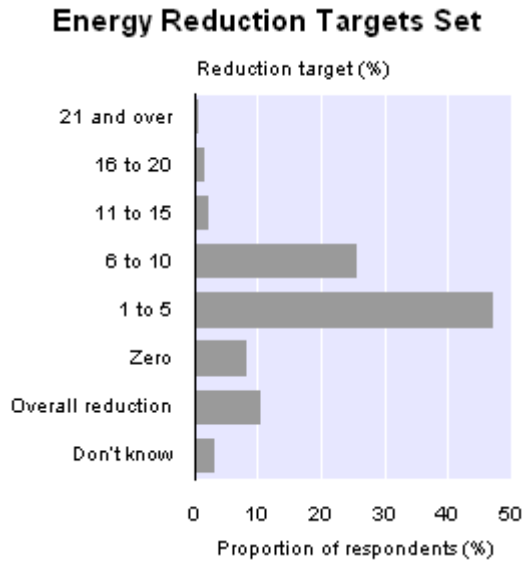
Around 1 percent of businesses reported they have considered on-site electricity generation within the past 12 months.

Energy management

Energy monitoring

Fifty-seven percent of businesses reported that they actively recorded and monitored their energy use in the March 2006 year.

Energy reduction targets were set by 21 percent of businesses. Of these businesses, 55 percent reported having successfully met their previous energy reduction targets. The graph below shows the range of energy reduction targets as set for the next 12 months.



Energy management practices

Nine percent of businesses reported having a formal energy policy in place. A formal policy was defined as one that was documented and signed-off by senior management. Thirty-seven percent of businesses reported having an informal energy policy.

In 31 percent of manufacturing businesses, a staff member was assigned responsibility for energy management. Of this group, 64 percent reported that this person worked one to four hours per week on energy management, and a further 12 percent reported five to nine hours per week. Just over 1 percent reported 40 or more hours per week.

There were 63 percent of businesses which had at least one of the following staff awareness programmes in place to encourage energy reduction:

- Recognition of energy-reduction initiatives
- Signs or stickers to encourage staff to turn off lights or equipment when safe to do so
- Providing information to staff on how energy use can be reduced
- Other initiatives.

Other initiatives reported included:

- Energy-use audits
- Capital expenditure on energy-efficient technology
- Investment in energy-saving applications such as motion sensors, daylight switches, and car maintenance
- Environment management systems.

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Technical notes

Background to the survey

The 2006 Manufacturing Energy Use Survey (MEUS) was carried out by Statistics New Zealand, in collaboration with the Ministry for Economic Development (MED) and the Energy Efficiency and Conservation Authority (EECA). The survey was designed to collect statistics about the use of energy in the manufacturing industry of New Zealand for the year ending 31 March 2006.

Population

The target population for this survey is all enterprises that operate in New Zealand, classified to Australian and New Zealand Standard Industrial Classification Version 1996 (ANZSIC96) Division C (Manufacturing) on Statistics NZ's Business Frame.

The survey population was selected by taking all enterprises that met the following criteria:

- rolling mean employment (RME) greater than 10
- economically significant (annual GST turnover figure of greater than \$30,000)
- classified to ANZSIC96 Division C
- only live businesses are in the survey population.

For this survey the selection unit was the enterprise, and the collection unit was the geographic unit. There were approximately 3,900 enterprises on the Business Frame that met the criteria. All corresponding geographic units within an enterprise were included in the survey population if they met the same selection criteria. The geographic unit was chosen as the collection unit as initial conceptual testing indicated that the data was more readily available at the site than at the 'head office' level. There were approximately 5,500 geographic units on the Business Frame that met the criteria.

The manufacturing industry

The manufacturing industry, as defined by the Australia New Zealand Standard Industrial Classification (ANZSIC 1996) Division C, includes the physical or chemical transformation of materials, substances or components into new products (except agriculture and construction). In accordance with the ANZSIC96 Division C, the manufacturing industry is subdivided into the following industry groups:

- C21. Food, Beverage and Tobacco Manufacturing
- C22. Textile, Clothing, Footwear and Leather Manufacturing
- C23. Wood and Paper Product Manufacturing
- C24. Printing, Publishing and Recorded Media Manufacturing
- C25. Petroleum, Coal, Chemical and Associated Product Manufacturing
- C26. Non-Metallic Mineral Product Manufacturing
- C27. Metal Product Manufacturing
- C28. Machinery and Equipment Manufacturing
- C29. Other Manufacturing

Reference period

The survey collected data for the year ending 31 March 2006. When full-year figures were not provided, the yearly quantity was estimated through extrapolation of the partial-year figures provided, taking into account seasonal variation where possible.

Information collected

The information delivered by MEUS will help fill gaps in current energy statistics and provide a benchmark of energy use information for the manufacturing industry. It will also provide data to feed into current modelling systems that provide current energy-use estimations and future demand forecasts (eg MED's Energy Data File). This new data will enable the update of modelling assumptions, and subsequent improvement in the accuracy of modelled information.

The following information was collected for the manufacturing industry:

- Electricity. This included all electricity purchased from the national grid and energy sources used for input into electricity generation and cogeneration. This did not include electricity generated on manufacturing sites, to avoid double counting.
- Natural gas, coal and wood and wood waste.
- Electricity generated on-site. This included electricity generated within the confines of the manufacturing site but not necessarily owned by the manufacturer. This figure was not included in total energy used, to avoid double counting.
- Petroleum products. This included the energy products derived from the refining process of crude oil. The following petroleum products were included:
 - Petrol – an aggregated figure of 96 and 91 octane petrol
 - Fuel oil – an aggregated figure of the major intermediate products, notably light fuel oil and heavy fuel oil
 - Diesel
 - Liquefied petroleum gas (LPG).

Survey design

The MEUS was a postal survey conducted by Statistics NZ. The survey was a sample survey; one-stage stratified design was used. The stratification variables were ANZSIC96 and RME. The survey was sent to 1,576 manufacturing sites. The response rate was just over the targeted rate of 80 percent.

Units Joules

The unit of measurement used to report the energy statistics produced from MEUS is the joule. The abbreviations and magnitudes of the joule are as follows:

Unit	Abbreviation	Magnitude
Megajoule	MJ	1,000,000 J
Gigajoule	GJ	1,000,000,000 J
Terajoule	TJ	1,000,000,000,000 J
Petajoule	PJ	1,000,000,000,000,000 J

Calorific values

The energy types were converted to a standard unit (joules) for reporting purposes. This enables the direct comparison of the energy contained in different forms. The conversions were carried out by applying a calorific value (enthalpy value) to each energy type and form. See the table below for the calorific values used for each energy type.

Energy type	Technical notes	Calorific value
Electricity	Electricity's standard universal unit, the watt, is defined as one joule per second.	3.60 megajoules per kilowatt hour
Coal	The conversion factor for coal is a weighted average of the values for lignite, sub-bituminous and bituminous coal, depending on their prevalence in the market place.	22,380 megajoules per tonne
Diesel	The value used is that of regular diesel.	38.31 megajoules per litre
Fuel oil	There are two major types of fuel oil: light fuel oil and heavy fuel oil. The conversion factor used in MEUS was derived using a weighted average of the two according their current prevalence in the market.	40.30 megajoules per litre
LPG	Liquefied petroleum gas.	26.54 megajoules per litre
Natural gas	The majority of natural gas figures were provided in joules. However, in some cases the figure was provided in kilowatt hours.	3.60 megajoules per kilowatt hour
Petrol	There are two main forms of petrol in the market, regular and premium; each has a slightly different conversion factor. The conversion factor used in MEUS is a weighted average of the two values, according to their current prevalence in the market.	34.97 megajoules per litre
Steam	The calorific value of steam can vary, depending on the temperature and pressure of the steam resource.	2.70 megajoules per kilogram
Wood and wood waste	This fuel is an aggregation of a number of wood products that are used as fuel. The majority of this category is composed of residual products from the wood and paper manufacturing industry such as shavings, sawdust, bark, black liquor. The conversion factor used in MEUS was based on available information on the use of wood products as a fuel.	12,000 megajoules per tonne

LPG units

During data collection, figures were provided in kilograms and litres although litres were requested. Based on follow up with respondents, a threshold of 25,000 units of LPG use was set and quantities under that amount were treated as kilograms, quantities over it were treated as litres.

Sampling error

Sampling error is a measure of the variability that occurs by chance because a sample, rather than the entire population, is surveyed. Given a certain sample size, the level of sampling error for any given estimate depends on the number of sampled individuals in the category of interest, and the variability of the estimate due to the random nature of the sample selection.

Sampling errors for this survey were calculated using the relative sample error (RSE) measure. RSEs are the sampling error as a percentage of the estimate. The sampling methodology for MEUS was designed with the main objective of producing estimates of total energy use by the manufacturing industry with an RSE of less than or equal to 10 percent, and by industry group (two-digit ANZSIC96) with RSEs of less than or equal to 15 percent. The overall RSE achieved by MEUS was 4 percent. The following table portrays the RSE for each industry group.

Manufacturing industry group	RSE (percent)
Food, beverage and tobacco	10.9
Textile, clothing, footwear and leather manufacturing	11.2
Wood and paper product manufacturing	6.3
Printing, publishing and recorded media	36.5
Petroleum, coal, chemical and associated product	2.4
Non-metallic mineral product manufacturing	1.8
Metal product manufacturing	8.2
Machinery and equipment manufacturing	23.5
Other manufacturing	9.2
Total manufacturing industry	4.0

Non-sampling error

Non-sampling errors are present in both sample surveys and censuses, and can occur at any stage of the survey process. Non-sampling errors include errors arising from biases in the pattern of response and non-response, inaccuracies in reporting by respondents and errors in the recording and coding of the data. The size of these errors is difficult to quantify. Statistics NZ endeavours to minimise the impact of these errors through the application of international best practice, where applicable and quality management.

Methodology used to derive aggregates

The data was weighted to represent the entire population (ie businesses of ANZSIC Division C, of RME equal or greater than 10). The data was put through a rigorous quality management programme to minimise the effects of non-sampling biases.

Definitions

ANZSIC

Australian and New Zealand Standard Industrial Classification system

Business Frame

A register of all economically significant businesses operating in New Zealand. The population of the MEUS is drawn from the Business Frame.

Enterprise

A business entity operating in New Zealand either as a legally constituted body such as a company, partnership, trust, local or central government trading organisation, or as a self-employed individual (eg a head office).

Geographic unit

A 'location' entity at which economic activity is carried out (eg a factory).

Rolling mean employment (RME)

RME is a 12-month moving average of the monthly employee count (EC) figure which replaces the numbers of full-time and part-time employees.

More information

For more information, follow the [link](#) from the Technical notes of this release on the Statistics New Zealand website.

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Tables

The following tables can be downloaded from the Statistics New Zealand website in Excel 97 format. If you do not have access to Excel 97 or higher, you may use the [Excel file viewer](#) to view, print and export the contents of the file.

List of tables

Table 1. Energy use by industry group and energy type, in petajoules

Table 2. Diesel use by industry group

Table 3. Energy use by industry group and energy type, by reported units

[Manufacturing Energy Use Survey: Year ended March 2006 - All tables – Revised \(Excel, 33KB\) \(xls\)](#)