

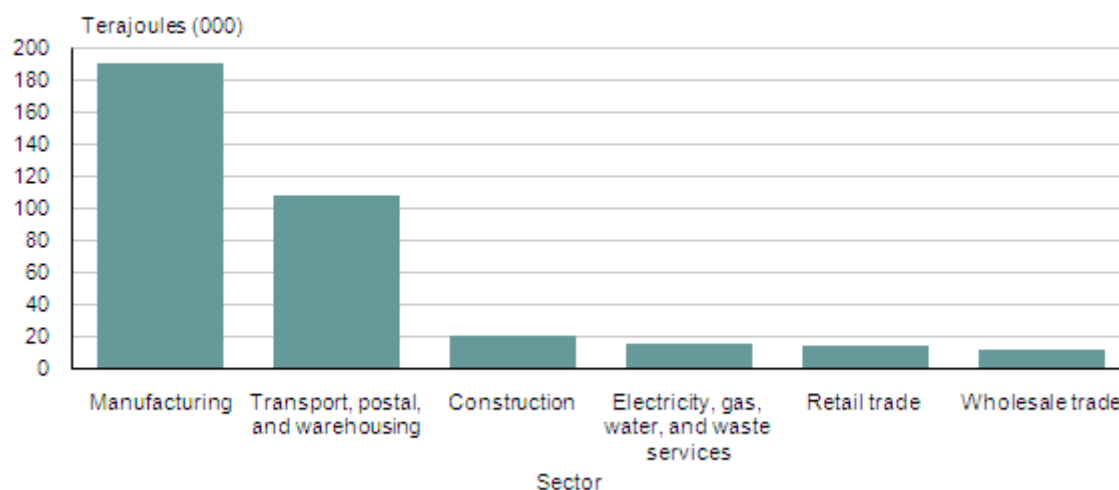
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## Energy Use Survey: Industrial and trade sectors 2009

### Highlights

- The industrial and trade sectors used 358,000 terajoules of energy in 2009, almost two-thirds of New Zealand's total estimated energy use for the same period.
- Manufacturing businesses used 191,000 terajoules of energy in 2009. Transport, postal, and warehousing businesses used 107,000 terajoules.

Energy use by sector  
2009



Source: Statistics New Zealand

- 57 percent of businesses surveyed reported that they were monitoring energy use or cost as an energy saving initiative.
- This survey is the second in a three-year economy wide collection of energy use by businesses in New Zealand.

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# Commentary

## Overview

This release presents the results for the second year of the New Zealand Energy Use Survey (NZEUS) which was carried out in early 2010 to collect information for the 2009 financial year. This survey aims to show energy use across the entire New Zealand economy. To do this, a three-year cycle was designed to cover the three sections of the economy, at one section in each year. The 2009 financial year is the second year in the three-year cycle. For 2009, the industries surveyed were:

- manufacturing
- electricity, gas, water, and waste services
- construction
- retail trade
- wholesale trade
- transport.

This survey was first run in 2008, covering businesses in the primary industries (agriculture, forestry and fishing; and mining; for more information see [Energy Use Survey: Primary industries 2008](#) Hot Off the Press). In 2010 the final section of the economy, the service industries, will be surveyed.

The NZEUS collects information on the amount of energy used by businesses in each industry group. Energy commodities include electricity; oil products, like diesel and petrol; and other types, like natural gas, coal, and wood. The survey also includes questions on energy saving practices, the areas in which businesses could use less energy, and the use of biofuel.

## Guide to interpreting the data

For this release, the main unit of measurement used is the terajoule (TJ). A terajoule of energy is roughly equivalent to filling a 40-litre petrol tank 700 times, or the total electricity used by 35 households in one year.

The businesses surveyed were grouped to aid with processing and results. At the highest level, the total group of businesses in the population are split into the industrial sector and the trade sector. For more information on the businesses surveyed, see the 'Technical notes' of this release.

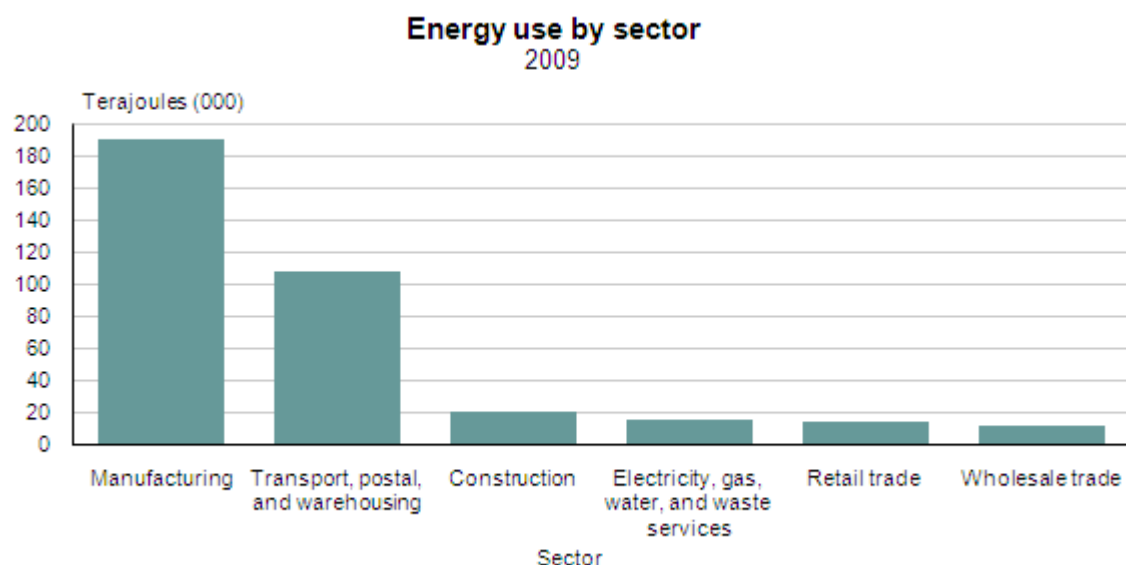
The reference period for this survey is the last financial year for which the business had results available at May 2010. The majority of respondents indicated a 31 March 2010 balance date. There were also a significant number of respondents that indicated either a June 2009 balance date or a December 2009 balance date. A relatively small number of respondents stated other dates. No adjustment has been made to produce figures for a single consistent time period for all units.

## Data collection

The NZEUS data was collected from businesses via a paper questionnaire, posted out to a random sample of businesses in the industrial and trade section of the economy. Further information on the selection and size of the sample can be found in the 'Technical notes' of this release.

## Energy use by industrial and trade sectors

Each industry uses energy in different ways and in various quantities, as the activities they undertake vary. During the 2009 year, businesses in New Zealand's industrial and trade sectors used 358,000TJ of energy. This represents nearly two-thirds of the total energy use estimated for New Zealand (Ministry of Economic Development, 2009).



Source: Statistics New Zealand

Within the industrial and trade sectors, manufacturing businesses used 191,000TJ, which is about half of the energy used by the industrial and trade sectors. The transport industry used 107, 000TJ.

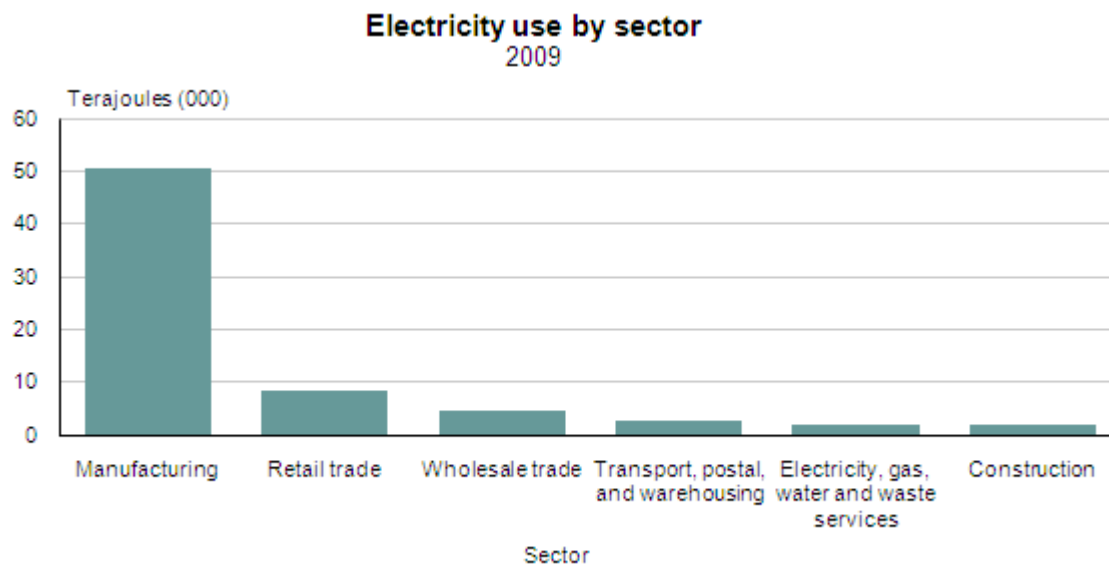
The table below shows energy use by each industry group surveyed.

<b>Energy use by the industrial and trade sectors</b>		
Industry	Energy use (TJ)	Percent of total energy use in the industrial and trade sectors
Manufacturing	190,659	53
Transport, postal, and warehousing	107,495	30
Construction	19,789	6
Electricity, gas, water, and waste services	15,017	4
Retail trade	13,661	4
Wholesale trade	11,268	3
Total of industries surveyed in 2010	357,890	100
<b>Note:</b> Data may not sum to stated totals due to rounding.		

## Energy use by fuel type

The other fuel type category which includes coal, wood products and steam had the highest reported use (94,000 TJ), followed by other petroleum products (fuel oil, LPG, aviation fuel) with 76,000 TJ. Electricity was the fuel type with the next highest reported use with 70,000 TJ, slightly ahead of diesel (66,000 TJ). The remaining fuel types are natural gas (36,000 TJ) and petrol (16,000 TJ). The single energy type with the largest use was electricity.

## Electricity use



Source: Statistics New Zealand

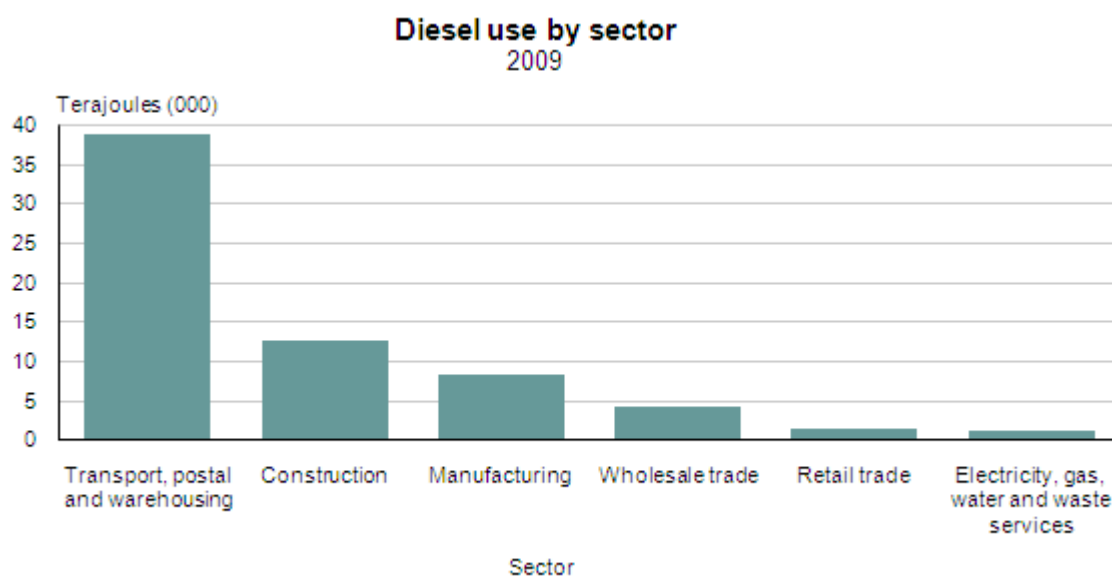
Electricity was used by all business groups to some degree, and totalled 70,000TJ across all surveyed industries. The manufacturing industry accounted for 50,000TJ of electricity usage. Within manufacturing, primary metal, and metal product manufacturing businesses were the largest user of electricity. With 20,000TJ they accounted for 30 percent of the total industrial and trade sectors electricity use.

## Petroleum fuels end use

While all petroleum fuels have similarities and have a degree of substitutability, particular uses tended to use specific fuels. There are many reasons for this tendency, including economic, environmental, and fuel quality requirements. Knowing how energy is used is important as it allows the assessment of the impacts of energy related initiatives. Information on how energy is used also enables businesses to benchmark themselves, and make more informed choices on the fuels they use.

## Diesel use

The transport industry accounted for 39,000TJ of the 66,000TJ total of diesel use in the industrial and trade sectors. Within the transport industry the major user of diesel was the road, freight, postal, and courier group, accounting for 29,000TJ.



Source: Statistics New Zealand

The main use of diesel was for mobile on-road purposes, accounting for 80 percent of total diesel use in the industrial and trade sectors. Mobile off-road diesel use accounted for 13 percent, and other, which includes marine and stationary use of diesel, accounted for 7 percent.

### Petrol use

Two major groups contributed to the 16,000TJ total of petrol used by the surveyed industries. These were construction of buildings and retail trade, both using 4,000TJ worth of petrol.

In the industrial and trade sectors, 94 percent of petrol use was by vehicles on public roads. Almost all (98 percent) of the petrol used in the industrial and trade sectors was purchased from a petrol station or truck stop.

### Natural gas use

Overall, natural gas made up one-tenth of the total energy use by the industrial and trade sectors. Three quarters of all natural gas used in the industrial and trade sectors was by the manufacturing industry, which used 28,000TJ.

## Energy management

The survey asked businesses to indicate what energy saving initiatives they currently had in place and the areas of the business where they could reduce energy usage, as well as priorities relating to energy management. The most common initiative was monitoring energy use or cost, with over half of respondents stating this. One-third of respondents stated they had no energy saving initiatives in place. Almost one-third of businesses reported they had no possibility for further energy savings. One-quarter saw transport as the greatest opportunity for energy saving. The other common areas where people saw opportunity for savings were electronics, appliances, or lighting (13 percent), and space heating (10 percent).

### Next release ...

*Energy Use Survey: Services sector 2010* will be released in October 2011.

## Technical notes

### Survey background

The New Zealand Energy Use Statistics Programme is a product of the Energy Domain Plan that was published in 2006. The Energy Domain Plan was produced by Statistics NZ in collaboration with the Energy Efficiency and Conservation Authority, and the Ministry of Economic Development (MED). The domain plan identified energy use statistics as a key gap in energy information and prioritised a suite of energy use surveys.

The New Zealand Energy Use Survey (NZEUS) delivers information that helps fill gaps in current energy statistics and provides a benchmark of energy use information for New Zealand's industries. Data from the survey will also feed into modelling systems that give current energy-use estimations and future demand forecasts (eg MED's Energy Data File). Modelling assumptions can then be updated and that will improve the accuracy of modelled information.

### Target population

The 2009/10 collection covered the following industrial and trade sectors of New Zealand's economy:

- manufacturing
- electricity, gas, water, and waste services
- construction
- wholesale trade
- retail trade
- transport, postal, and warehousing.

The target population included all economically significant businesses in the Australian and New Zealand Standard Industrial Classification 2006 (ANZSIC06) categories C to G and I that were live at the time of selection. In the previous year's collection, the target population was the primary sector (ANZSIC06 A and B), and in 2010/2011, when the last stage of the economy is surveyed, the target population will be the services sector (ANZSIC06 H and J to S).

### Survey population

The selection unit for the programme is the kind-of-activity unit (KAU); the collection unit was also the KAU. Altogether, 128,000 enterprises had KAUs that met the requirements above. The KAU was chosen as the selection unit to allow the uses of energy to be associated with an activity as closely as possible. In this manner, the KAU allows the differentiation of energy use by activity from larger multi-activity conglomerates. This approach is similar to the method used in the system of National Accounts for calculating economic indicators such as gross domestic product (GDP).

The survey sample was designed to produce results for the following industry groupings, based on the ANZSIC06 groups indicated (in brackets):

- Manufacturing (C)
  - Food product manufacturing (C11)
  - Beverage and tobacco product manufacturing (C12)
  - Textile, leather, clothing, and footwear manufacturing (C13)

- Wood product manufacturing (C14)
- Pulp, paper, and converted paper product manufacturing (C15)
- Printing (C16)
- Petroleum and coal product manufacturing (C17)
- Basic chemical and chemical product manufacturing (C18)
- Polymer product and rubber product manufacturing (C19)
- Non-metallic mineral product manufacturing (C20)
- Primary metal and metal product manufacturing (C21)
- Fabricated metal product manufacturing (C22)
- Transport equipment manufacturing (C23)
- Machinery and equipment manufacturing (C24)
- Furniture and other manufacturing (C25)
- Electricity, gas, water, and waste services (D)
- Construction (E)
  - Construction of buildings (E301, E302, E322, E323, E324)
  - Construction of infrastructure (E310, E321, E329)
- Wholesale trade (F)
- Retail trade (G)
- Transport, postal, and warehousing (I)
  - Road freight, postal, and courier (I461, I510)
  - Road passenger (I462)
  - Other transport modes (I47, I48, I49, I50)
  - Warehousing and transport support (I52, I53)

## Sample design

The sample design was a one-stage stratified random sample. The stratification and design variables were GST sales and rolling mean employment (RME).

## Data collection

The survey was posted out in April 2010. The reference period for this survey is the last financial year for which the business had results available at May 2010. The majority of respondents indicated a 31 March 2010 balance date. There was also a significant number of respondents that indicated either a June 2009 balance date or a December 2009 balance date. A relatively small number of respondents stated other dates. No adjustment has been made to produce figures for a single consistent time period for all units.

The survey collected information on the following commodities:

- electricity – all electricity purchased from the national grid and energy sources used for input into electricity generation and cogeneration, but not electricity generated on-site (to avoid double counting)
- electricity generated in the business – electricity generated within the operations of the business (this figure is not included in total energy used to avoid double counting)
- petroleum products – energy products derived from the refining process of crude oil including:
  - 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)
- aviation fuel
- natural gas
- coal – including all ranks
- wood and wood waste – used for energy purposes.

The survey also collected information on energy management practices.

The survey was sent to 3,812 businesses and the response rate achieved was 81 percent. The required response rate was 80 percent.

## Units

Information on energy usage was collected in the applicable units in which each commodity is sold, for example, litres for petrol and kilowatt hours (kWh) for electricity. These units were converted to a standard unit (joules) for reporting purposes. This conversion enables the energy contained in different forms to be compared directly. The conversions were carried out by applying a calorific value (enthalpy value) to each energy type and form. The calorific values were sourced or derived from MED's Energy Data File 2009. See the table below for the calorific values used for each energy type.

<b>Energy types and their calorific values</b>		
Electricity	Electricity's standard universal unit, the watt, is defined as one joule per second.	3.60 megajoules per kilowatt hour
Coal	Bituminous coal	29,800 megajoules per tonne
	Sub-bituminous coal	21,760 megajoules per tonne
	Lignite	15,280 megajoules per tonne
	The conversion factor for coal where the type was not known was an average of the values for lignite, sub-bituminous and bituminous coal.	22,280 megajoules per tonne
Diesel	The value used is that of regular diesel.	35.93 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 NZEUS was derived using a weighted average of the two according to their current prevalence in the market.	40.665 megajoules per litre
LPG	Liquefied petroleum gas.	26.54 megajoules per litre
		49.51 megajoules per kg
Aviation fuel	There are two major forms: jet fuel and aviation gasoline. However, for the industries surveyed in this cycle it was expected that the majority would be jet fuel.	37.3 megajoules per litre
Natural gas	Most 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, and each has a slightly different conversion factor. The conversion factor used in the NZEUS is a weighted average of the	35.1 megajoules per litre



	two values, according to their current prevalence in the market.	
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	Hog fuel or bark	6,720 megajoules per cubic metre
	Sawmill residues or fuel wood	9,888 megajoules per cubic metre
	Black liquor	8,256 megajoules per cubic metre
	Joinery, building, or furniture residues	15,648 megajoules per cubic metre
	Oven-dried wood	18,432 megajoules per cubic metre
	The conversion factor where the wood type was not known was an average of the other types.	11,730 megajoules per cubic metre

## Measurement errors

The survey results are subject to measurement errors, including both non-sample and sample errors. These errors should be considered when analysing results.

### Non-sample errors

Non-sample errors include mistakes by respondents when completing questionnaires, variation in the respondents' interpretation of the questions asked, and errors made during the processing of the data. In addition, the survey applied imputation methodologies to cope with non-respondents. Statistics NZ has extensive procedures to minimise these types of error, but they may still occur and are not quantifiable.

Given the nature of the data collected, there are limitations on the level of accuracy that can be expected from the survey. Businesses' records may not be kept in the form required for the survey, and some estimation by the respondent may be required.

### 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 errors provided below are estimates at the 95 percent confidence level. The following table shows the actual RSEs for each industry.

Relative sample errors by industry	
Industry	RSE (%)
Food product manufacturing	20.5
Beverage and tobacco product manufacturing	10.4
Textile, leather, clothing, and footwear manufacturing	30.3
Wood product manufacturing	19.6
Pulp, paper, and converted paper product manufacturing	0.23
Printing	92.2
Petroleum and coal product manufacturing	0.03

Basic chemical and chemical product manufacturing	11.6
Polymer product and rubber product manufacturing	79.4
Non-metallic mineral product manufacturing	35.0
Primary metal and metal product manufacturing	52.5
Fabricated metal product manufacturing	25.8
Transport equipment manufacturing	29.1
Machinery and equipment manufacturing	26.8
Furniture and other manufacturing	8.07
Electricity, gas, water and waste services	64.8
Construction of buildings	20.6
Construction of infrastructure	34.3
Wholesale trade	50.2
Retail trade	28.3
Other transport modes	6.95
Road freight, postal, and courier	29.6
Road passenger	38.0
Warehousing and transport support	41.0
Total industrial and trade sectors	7.51

### **How to use the sampling errors:**

The RSE estimates are larger than the design RSE targets for some estimates. This is due to higher variability in the responses than was expected in the sample design process.

For example, the estimated energy use by the industrial and trade sectors for 2009 is 358,000TPJ. This estimate is subject to a relative sampling error estimate of approximately 8 percent. This means that 95 percent of the possible samples of the same size will produce an estimate between:  $358,000 - 28.6$  and  $358,000 + 28.6$ , that is, 329,400TJ and 386,600TJ.

## **Non-response and imputation**

### **Unit non-response**

Unit (or complete) non-response occurs when units in the sample do not return the questionnaire. The initial selection weight of the remaining units in the stratum was adjusted to account for the unit non-response (no item non-response imputation would occur for the units that did not return the questionnaire).

### **Item non-response**

Item (or partial) non-response is when units return the questionnaire but some questions are not answered. Item non-response was imputed for and the methods used are as follows:

#### **Imputation of numeric variables**

The imputation method used was donor imputation. In this method, the figures of a randomly selected donor from within the same imputation cell as the non-respondent are imputed in the recipient unit. Donor imputation was used so that the distribution was maintained.

#### **Imputation of categoric questions**

For categoric imputation, the method used was random donor imputation. The donor supplied responses for all categoric variables requiring imputation. If the donor unit did not respond to any

of the variables requiring a response, then the next best donor was selected to supply this information. This was continued until all of the variables had a response.

## **Definitions**

### **ANZSIC06**

Australian and New Zealand Standard Industrial Classification 2006.

### **Business Frame**

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

### **Economically significant**

An enterprise that meets at least one of the following criteria:

- has greater than \$30,000 annual GST expenses or sales
- has RME greater than two
- is in a GST-exempt industry (except residential property leasing and rental)
- is part of a group of enterprises
- is a new GST registration that is compulsory, special, or forced
- is registered for GST and involved in agriculture or forestry.

### **Enterprise**

A business or service entity operating in New Zealand. It can be a company, partnership, trust, estate, incorporated society, producer board, local or central government organisation, voluntary organisation, or self-employed individual.

### **Kind-of-activity unit (KAU)**

A subdivision of an enterprise engaged in predominantly one activity and for which a single set of accounting records is available. This is the statistical unit used in the NZEUS.

### **Rolling mean employment (RME)**

A 12-month moving average of the monthly employee count (EC) figure. The EC is obtained from taxation data.

### **Calorific value**

A measure of the amount of energy given out when a substance is burnt. Different values were used to convert different energy types into comparable units (MJ)

## Joule (J)

A unit for measuring energy. The multipliers to give orders of magnitude are shown below. The main unit used in the release is the terajoule where 1TJ is approximately equal to the total electricity used by 35 households in one year.

Units for measuring energy		
Name	Symbol	Multiple
Joule	J	1 J
Kilojoule	KJ	$10^3$ J
Megajoule	MJ	$10^6$ J
Gigajoule	GJ	$10^9$ J
Terajoule	TJ	$10^{12}$ J
Petajoule	PJ	$10^{15}$ J

## Tables

The following tables are printed with this Hot Off the Press and can be downloaded from the Statistics New Zealand website in Excel format. If you do not have access to Excel, you may use the [Excel file viewer](#) to view, print, and export the contents of the file.

1. Energy use by fuel type and industry, 2009
2. Petrol purchasing by industry, 2009
3. Petrol end use by industry, 2009
4. Diesel purchasing by industry, 2009
5. Diesel end use by industry, 2009
6. Energy saving initiatives, by industry, 2009
7. Areas where less energy could be used, by industry, 2009
8. Energy saving areas for priority, by industry, 2009