New Zealand Energy Use: Industrial and trade sector 2012

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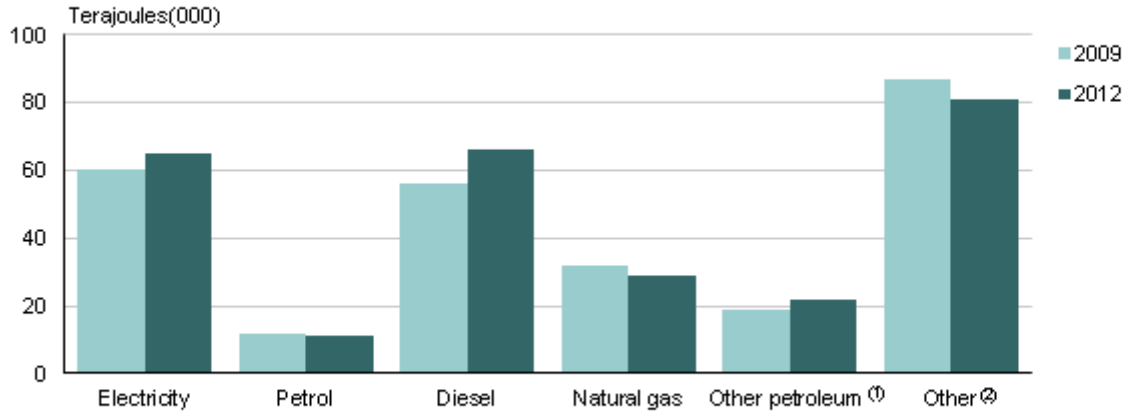
Key facts

- The industrial and trade sector used almost 275,000 terajoules of energy in 2012 – almost 75 percent of New Zealand's total estimated energy use for that year. This is similar to their usage in 2009.
- Manufacturing businesses used about 172,000 terajoules of energy in 2012. Transport, postal, and warehousing businesses used just under 54,000 terajoules.
- 60 percent of businesses surveyed were monitoring energy use or cost as an energy-saving initiative.
- Electricity, diesel, and coal were the most important energy sources for the industrial and trade sector, providing more than two-thirds of its energy needs.
- This is the second time we've collected information on energy use in the industrial and trade sector. It's part of a three-year economy-wide collection.

Industrial and trade sector energy use by energy type
2009–12



1. Includes other petroleum products not captured elsewhere; eg fuel oil, LPG, aviation fuel.
2. Includes other fuels not captured elsewhere; eg coal, wood, steam, waste oil.

Source: Statistics New Zealand

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Commentary

- Overview
- Industrial and trade businesses: the heavyweights in energy use
- Keeping energy efficiency in mind
- Diesel keeping industrial and trade traffic on road
- Manufacturing energy savings
- Diesel still the driving force for transport

Overview

This commentary presents information about energy use by the industrial and trade sector of New Zealand. Results come from the New Zealand Energy Use Survey (NZEUS), which was carried out in early 2013 to collect information for 2012.

We surveyed the industrial and trade sector as part of a three-year cycle aiming to cover all industries. This is the second year of the second cycle. This allows comparison between the reported energy use by the same sector three years ago, as well as comparisons with the other two sectors.

The table below shows how the collection is broken down.

	Primary sector	**Industrial and trade sector**	Services sector
Inaugural cycle	2008/09	2009/10	2010/11
Current cycle	2011/12	**2012/13**	2013/14

The industrial and trade sector consists of the following industries:

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

Industrial and trade businesses: the heavyweights in energy use

In 2012, businesses in the industrial and trade sector used almost 275,000 terajoules (TJs) of energy, an increase of about 3 percent from 2009. Total energy use is mainly driven by the manufacturing, construction, and transport industries using more energy.

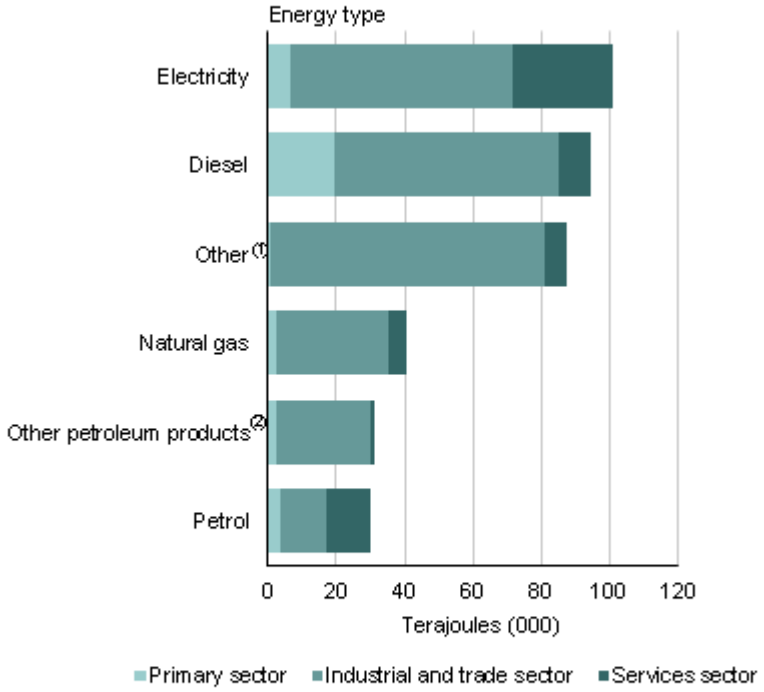
The industrial and trade sector makes up about 27 percent of the total number of New Zealand businesses. However, the sector uses three-quarters of the energy consumed by all businesses in New Zealand. This is because the industrial and trade sector includes many large businesses with industrial processes that use a lot of energy.

The three main fuel types used across all sectors are diesel, electricity, and coal. These energy types contributed to more than two-thirds of the industrial and trade sector's energy requirements.

Some large manufacturing businesses use coal as their primary energy source. Transport and construction businesses are the main diesel users, with a combined use of almost 50,000 TJs.

The proportion of different energy types varies across all three sectors. The primary sector, made up of agriculture, fishing, forestry, and mining businesses, uses a higher proportion of diesel on farms, fields, boats, and mines. The services sector uses higher amounts of petrol and electricity than any other energy types. This is because their primary needs are petrol for vehicles, and electricity for lighting and appliances in office buildings.

Estimated annual energy use by energy type across all sectors
2010–12



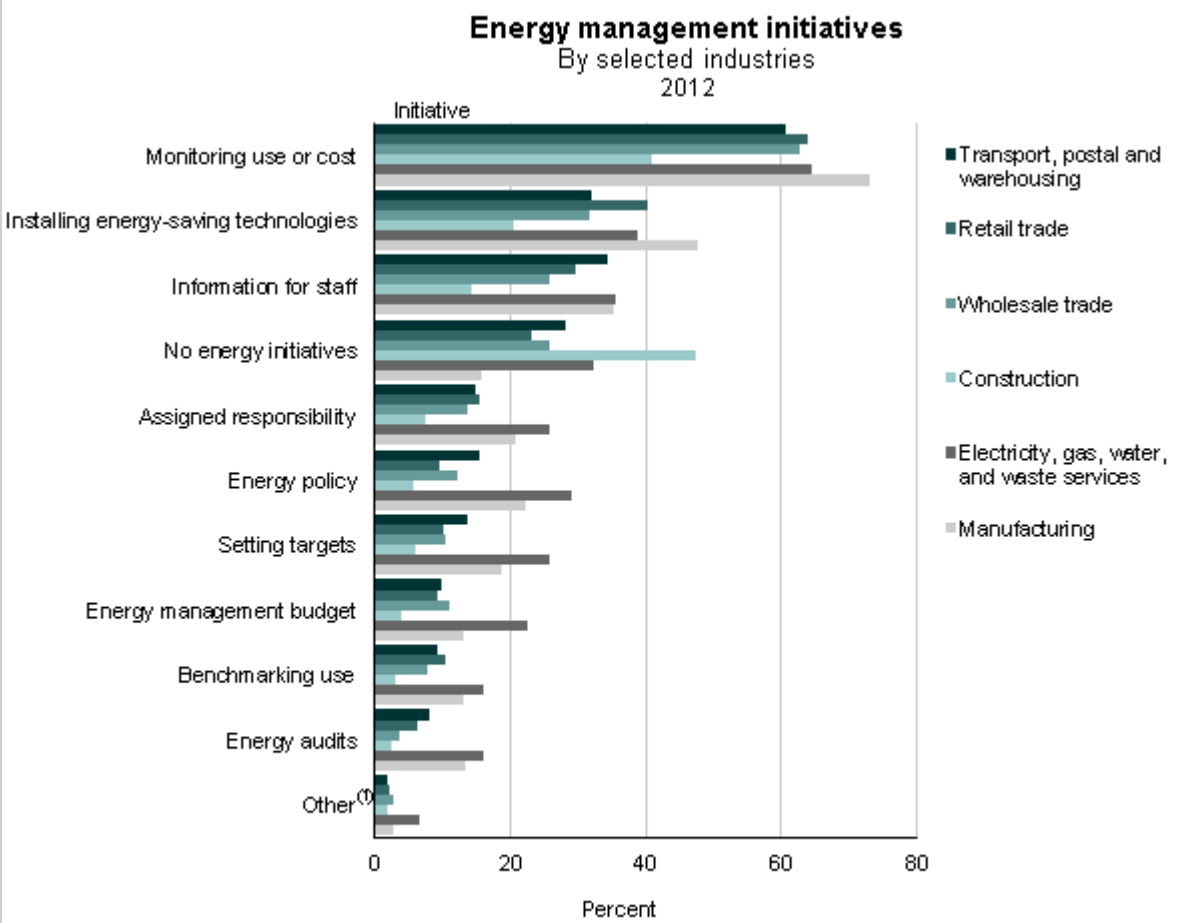
1. Includes other fuels not captured elsewhere; eg coal, wood, steam, and waste oil
2. Includes other petroleum products not captured elsewhere; eg fuel oil, LPG, and aviation fuel.

Source: Statistics New Zealand

Keeping energy efficiency in mind

Even though the industrial and trade sector's economic activity increased more than 6 percent over the past three years (see GDP: December 2012 quarter release), their energy use only increased 3 percent. This could be because the proportion of businesses with energy-management initiatives has grown.

In 2012, more than 70 percent of businesses said they had energy-management initiatives in place. Common initiatives included installing energy-saving technologies (35 percent), and informing staff about energy saving (27 percent). However, similar to previous years, monitoring energy use or cost remained the most common energy-management initiative (60 percent).



These initiatives may indeed be having an effect, as the industries with the highest rates of energy-management initiatives were the same ones that had decreases or smaller increases in energy use. The manufacturing industry had the highest rate of energy-management initiatives: 8 out of 10 businesses had initiatives in place, and their energy use remained constant over the past three years.

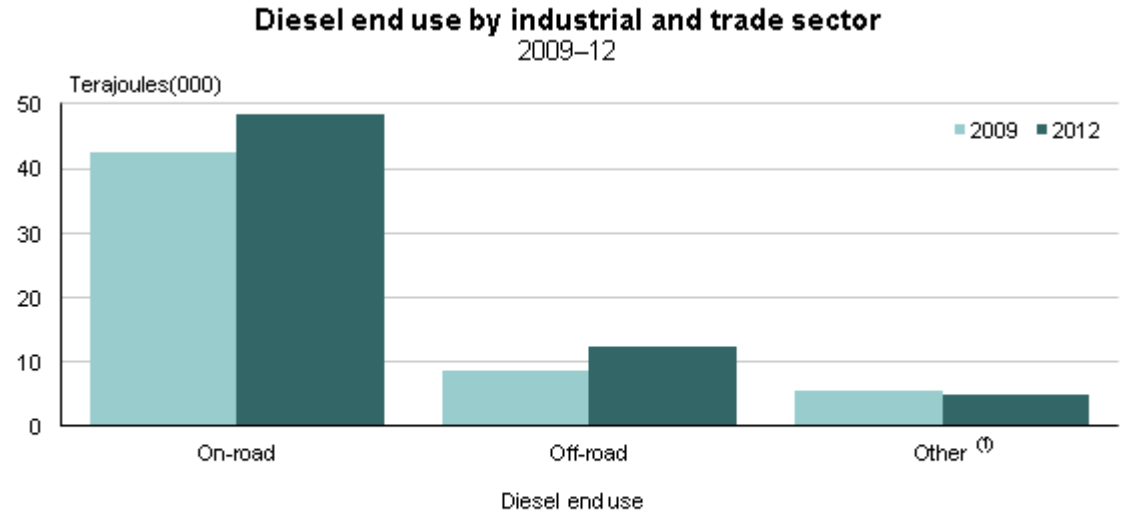
More than two-thirds of businesses said they had room for further energy savings. Most businesses said transport was the area where they could make the greatest savings. Results showed that businesses with energy-saving initiatives in place were most likely to see opportunities for further savings, while those that hadn't thought of energy savings before didn't see a place for them in the future.

Diesel keeping industrial and trade traffic on road

In 2012, the industrial and trade sector used more than 65,000 TJs of diesel, which is a 16 percent increase from 2009. This fuel type alone contributed to almost 24 percent of the total energy used by this sector.

The main use of diesel was by on-road vehicles, accounting for more than 70 percent of diesel use in the industrial and trade sector. However, the greatest percentage increase this year came from off-road use in the transport, postal, and warehousing industry (more than 50 percent

increase compared with 2009).



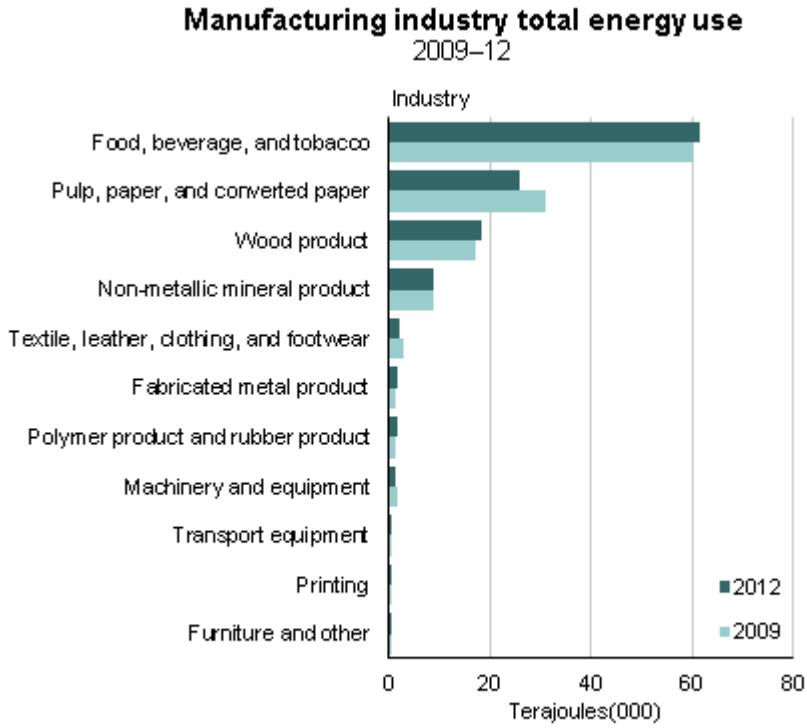
1. Includes stationary and marine use.

Source: Statistics New Zealand

Manufacturing energy savings

This year, manufacturing businesses used more than 170,000 TJs, which is more than half of the total energy use by the industrial and trade sector. However, this is a less than 1 percent increase from 2009, and could be driven by the increased proportion of businesses that use energy-management initiatives.

The largest contributors to this usage were food, beverage, and tobacco manufacturing and pulp, paper, and converted paper manufacturing. Food product manufacturing increased by almost 2 percent from 2009, and made up just over 35 percent of the industry's total energy use.



Note: petroleum and chemical product and primary metal and metal product removed due to confidentiality. Hence, totals sum to less than the total industry use for each year.

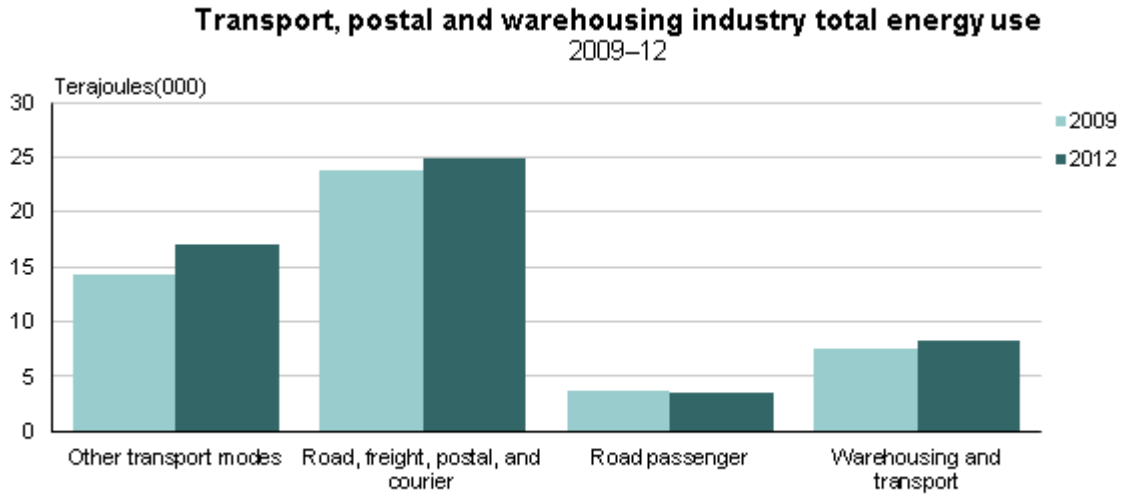
Source: Statistics New Zealand

The most common energy types for the manufacturing industry are electricity and other energy types (such as coal, wood, steam, and waste-oil used in their manufacturing processes). Other energy use in manufacturing contributed to more than 99 percent of the total other energy use in the sector.

Diesel still the driving force for transport

Unsurprisingly, more than 60 percent of the transport, postal, and warehousing industry's total usage came from diesel. Almost all of the remainder was from other petroleum products, which includes fuel oil, LPG, and aviation fuel. These together contributed to almost 30 percent of the industry total.

The industry contributed almost 20 percent of the sector's total energy use in 2012. These businesses used over 4,000 TJs more than in 2009. This is equivalent to the amount of aviation fuel used in flying more than 500 times between Christchurch and London.



Source: Statistics New Zealand

For more detailed data see the Excel tables in the ‘Downloads’ box.

Definitions

About the New Zealand Energy Use Survey

The Energy Use Survey collects and publishes statistics about the energy used by three sectors of the New Zealand economy – the primary, industrial and trade, and services sectors. Organisations provide information on how much energy they use, which allows us to publish data at industry and national levels for different energy types. The energy types include electricity, petrol, diesel, coal, natural gas, and renewable energy.

More definitions

ANZSIC06: Australian and New Zealand Standard Industrial Classification 2006.

Business Frame: A register of all economically significant units operating in New Zealand.

Calorific value: The energy contained in a fuel, determined by measuring the heat produced by the complete combustion of a specified quantity of the fuel. We converted all the different energy types into megajoules (MJ) to make them easily comparable.

Economically significant: An economically significant organisation meets at least one of these criteria:

- has greater than $30,000 annual GST expenses or sales
- has a 12-month rolling mean employee count of greater than three
- is part of a group of enterprises
- is registered for GST and involved in agriculture and forestry
- has over $40,000 of income recorded in the IR10 annual tax return (this includes some units in residential property leasing and rental).

Enterprise: A unit or business 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.

Joule (J): A unit for measuring energy. The main unit we use in this release is the terajoule (TJ). One terajoule is approximately equal to the total electricity used by 35 households in one year.

Name	Symbol	Multiple
Joule	J	1J
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

Kind-of-activity unit: A subdivision of an enterprise engaged in predominantly one activity and for which a single set of accounting records is available.

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

Related links

Upcoming releases

Energy Use Survey: 2013/14 figures will be released in October 2014.

Subscribe to information releases, including this one, by completing the online subscription form.

The release calendar lists all our upcoming information releases by date of release.

Past releases

See New Zealand Energy Use Survey – Information releases for our previous releases.

Related information

New Zealand energy use survey has detailed information about the survey.

Questionnaires and forms has the questionnaire we sent to respondents.

Energy Efficiency and Conservation Authority – information on understanding and overcoming the barriers to being more energy efficient and using renewable energy.

Ministry of Business, Innovation and Employment – Energy Data – information on supply and demand of energy by fuel types, pricing information, and energy balance tables.

BRANZ – Building Energy End-use Survey – the BEES study, undertaken by BRANZ, monitors and analyses energy (and water) use within entire non-residential buildings. This differs from the Energy Use Survey, which analyses energy use by entire organisations (which may be spread over several buildings, or may be sharing a building).

Christchurch Agency for Energy – CAfE was set up to analyse energy use in Christchurch, and introduce energy-saving and sustainability initiatives. CAfE has some data related to the 2010/11 Canterbury earthquakes and energy use through that time. Data collected for the Energy Use Survey does not provide accurate regional estimates, and due to the timing of the collection may not include energy use at the time of the earthquakes.

Data quality

The data quality section provides period-specific and general information about the data.

Period-specific information

This section has information about data that has changed since the last release.

- Relevance of the data
- Accuracy of the data
    - Target population
    - Survey population
    - Response rate
    - Sampling error for 2012 survey
    - How to read the sampling errors

General Information

This section contains information about data that does not change between releases.

- Data source
- Survey population
- Sample design
- Measurement errors
- Non-response and imputation
- Energy units standardised
- More information

Period-specific information

Relevance of the data

The survey was posted out in May 2013, with a reference period of the last financial year for which the unit had results available in May 2013. Most respondents had a 31 March 2013 balance date. However, several respondents had either a June 2012 or December 2012 balance date. A small number stated other dates. No adjustment has been made to produce figures for a single consistent time period for all units.

Accuracy of the data

Target population

The target population for the 2012 survey included all economically significant units in the Australian and New Zealand Standard Industrial Classification 2006 (ANZSIC06) categories C, D, E, F, G, and I that were live at the time of selection.

Survey population

The collection unit for the survey is the kind-of-activity (KAU). Altogether, 108,921 enterprises had KAUs that met the target population requirements for the 2012 collection.

The survey sample was designed to produce results for the industries listed under RSEs.

Response rate

The survey was sent to just over 5,000 units and the required overall response rate was 80 percent. The response rate achieved was 82.3 percent. The response rate target for key units was 100 percent, which was met.

Sampling error for 2012 survey

The sample design for the this survey aimed to control and reduce the relative sampling errors (RSEs), specifically for key energy types. These energy types were:

- electricity use in each industry
- diesel use in each industry.

How to read the sampling errors

Sampling errors for this survey were calculated using the RSE measures. RSEs are the sampling error as a percentage of the estimate. The sampling errors are estimates at the 95 percent confidence level. For example, the estimated energy use by the total industrial and trade sector for 2012 is 274,700 TJ. This estimate is subject to an RSE estimate of approximately 4.69. This means that 95 percent of the possible samples of the same size will produce an estimate between 274,700 - 12,900 and 274,000 + 12,900; that is, between 261,800 TJ and 287,600 TJ.

The following table shows the actual RSEs for each industry in the 2012 survey.

Relative sampling errors (RSEs) by industry		
Industry	Final RSE for total energy use (%)	
	2009	2012
Food, beverage, and tobacco manufacturing	4.20	15.35
Textile, leather, clothing, and footwear manufacturing	18.96	19.82
Wood product manufacturing	15.16	28.92
Pulp, paper, and converted paper manufacturing	1.16	0.26
Printing	48.94	5.04
Petroleum and chemical product manufacturing	0.67	0.86
Polymer product and rubber product manufacturing	20.11	20.03
Non-metallic mineral product manufacturing	3.45	3.57
Primary metal and metal product manufacturing	0.60	1.53
Fabricated metal product manufacturing	26.27	29.27
Transport equipment manufacturing	28.04	29.31
Machinery and equipment manufacturing	28.80	35.18
Furniture and other manufacturing	9.14	18.85
Electricity, gas, water, and waste services	6.85	42.84
Construction of buildings	18.21	27.12
Construction of infrastructure	16.99	15.53

Wholesale trade	15.98	14.15
Retail trade	14.35	9.05
Other transport modes	8.56	5.60
Road, freight, postal, and courier	26.96	18.42
Road passenger	30.50	14.10
Warehousing and transport	8.27	10.45
Total industrial and trade sector	3.08	4.69

General information

Data source

The New Zealand Energy Use Statistics Programme is a product of the Domain plan for energy sector 2006–2016 that was published in 2006. The energy domain plan was produced by Statistics NZ in collaboration with the Energy Efficiency and Conservation Authority (EECA), and the Ministry of Economic Development (now the Ministry of Business, Innovation and Employment). The domain plan identified energy use statistics as a key gap in energy information and prioritised a suite of energy use surveys.

The Energy Use Survey delivers information to help fill gaps in current energy statistics and provides a benchmark of energy use information for New Zealand's economy, excluding households. Data from the survey will also feed into modelling systems that give current energy-use estimations and future demand forecasts. Modelling assumptions can then be updated, which will improve the accuracy of modelled information.

Survey population

The KAU was chosen as the selection unit to allow the uses of energy to be associated with an activity as closely as possible. KAU data allows energy use to be separated for larger units with multiple branches involved in different activities (multi-KAU).

Sample design

The sample design was a two-way, one-stage stratified random sample. The stratification variables were ANZSIC06, GST sales, and rolling mean employment.

The 2012 survey collected information from New Zealand's industrial and trade sector on the following commodities:

- electricity – all electricity purchased from the national grid and energy sources used for input to electricity generation and cogeneration
- electricity generated in the unit – electricity generated within the operations of the unit (this figure is not included in the 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.

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.

Sampling error

Sampling error is a measure of the variability that occurs by chance because a sample, rather than the entire population, is surveyed. The level of sampling error for any given estimate depends on the number of sampled units, the variability of the estimate, and the sample size. Due to the random nature of the sample selection the error will differ for different samples.

Non-sampling errors

Given the nature of the data collected, there are limitations on the level of accuracy that can be expected from the survey. Records may not be kept in the form required for the survey, some estimation by the respondent may be required, and non-sampling error may occur. Non-sampling 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. Statistics NZ has extensive procedures to minimise these types of errors, but they may still occur and are not quantifiable.

Non-response and imputation

Unit non-response

Unit (or complete) non-response occurred when units in the sample did not return the questionnaire. The initial selection weight of the remaining units in the stratum 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 occurred when units return the questionnaire but some questions are not answered. Item non-response imputation was carried out for units that answered some but not all of the questions they were required to (based on questionnaire routing rules). Respondents who did not answer any of the questionnaire were classified as unit non-responses and the weights were adjusted accordingly. Item non-responses and the weights were adjusted accordingly. Item non-response was imputed for and the methods used are as follows.

Imputation of numeric variables

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

Imputation of categorical variables

The imputation method for categorical variables was random donor imputation. The donor supplied responses for all categorical 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.

Special treatment

In 2012, 0.68 percent of units in the sample were specially treated (had their weights reduced to one) because we found sufficient evidence that they were not representative of other units in the population.

In 2009, 1.10 percent of units in the sample were specially treated.

Energy units standardised

Information on energy usage was collected in the unit that applies to each commodity; for example, litres for petrol and kilowatt hours (kWh) for electricity. These units were converted to a standard unit (joules) for reporting. 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 Ministry of Business, Innovation and Employment's Energy Data File 2012. See the table below for the calorific values for each energy type.

Energy types and their calorific values

Energy type	Details	Calorific value
Electricity	Electricity's standard universal unit, the watt, is defined as one joule per second.	3.6 MJ per kWh
Petrol	Two main forms of petrol are in the market, regular and premium, and each has a slightly different conversion factor. The factor used in the Energy Use Survey is a weighted average of the two values, according to their current prevalence in the market.	35.08 MJ per L
Diesel	The value used is that of regular diesel.	38.45 MJ per L
Fuel oil	There are two types of fuel oil: light fuel oil and heavy fuel oil. The conversion factor used in the Energy Use Survey was derived using a weighted average of the two, according to their current prevalence in the market.	40.70 MJ per L
LPG	Liquid petroleum gas. LPG figures were provided in both litres and kilograms.	49.51 MJ per kg 26.44 MJ per L
Aviation fuel	There are two major forms: jet fuel and aviation gasoline.	34.55 MJ per L

Natural gas	Most natural gas figures were provided in joules, although some were in kilowatt hours.	3.6 MJ per kWh
Coal	Bituminous	29,250 MJ per tonne
	Sub-bituminous	20,120 MJ per tonne
	Lignite	15,340 MJ per tonne
	Where the type was not known, the conversion factor was an average of the lignite, sub-bituminous and bituminous coal values.	24,303 MJ per tonne
Wood and wood waste	Hog fuel or bark	9,060 MJ per tonne 7,701 MJ per cm^3
	Sawmill residues of fuel wood	12,080 MJ per tonne 10,268 MJ per cm^3
	Black liquor	10,500 MJ per tonne 8,925 MJ per cm^3
	Joinery, building, or furniture residues	17,790 MJ per tonne 15,122 MJ per cm^3
	Oven-dried wood	20,550 MJ per tonne 17,468 MJ per cm^3
	The conversion factor where the wood type was not known was an average of the other types.	13,996 MJ per tonne 11,897 MJ per cm^3
Other energy types	Steam	2,700 MJ per tonne
	Waste oil	40.84 MJ per L

More information

New Zealand energy use survey has more information.

Liability

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Revisions

We have revised the 2009 figures since releasing them in 2010. We made these revisions because now that we've run this survey twice, we have:

- obtained revised figures from respondents
- increased knowledge and information about energy use in the industrial and trade sector
- more robust and consistent procedures in applying special treatment.

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Tables

The following tables are available in Excel format from the 'Downloads' box. If you have problems viewing the files, see opening files and PDFs.

1	Energy use, by fuel type and industry, 2009–12
2	Energy use, by fuel type and industry, physical units, 2009–12
3	Petrol purchasing, by industry, 2009–12
4	Petrol end use, by industry, 2009–2012
5	Diesel purchasing, by industry, 2009–12
6	Diesel end use, by industry, 2009–2012
7	Energy management initiatives, by industry, 2009–12
8	Area where greatest energy saving could be made, by industry, 2009–12
9	Energy saving areas for priority, by industry, 2009–12
10	Total energy use across all sectors, by fuel type and industry, 2008–10
11	Total energy use across all sectors, by fuel type and industry, 2010–12