



**CHRISTCHURCH ENERGY DATABASE:
INITIAL DATA RELEASE**

**Prepared for:
Christchurch Agency for Energy (CAfE)**

**Prepared by:
Neo Leaf Global Ltd**

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1. INTRODUCTION

Neo Leaf Global Limited has been contracted by the Christchurch Agency for Energy (CAfE) to develop a database of ongoing energy supply and usage in Christchurch to assist in:

- the promotion of energy efficiency initiatives
- the increased use of renewable energy as a proportion of total energy usage
- the reduction of environmental problems caused by the use of fossil fuels
- the introduction of initiatives to address negative health and social impacts caused by fuel poverty and energy affordability issues

consistent with the *Sustainable Energy Strategy for Christchurch 2008 - 2018* published by the Christchurch City Council.

The data is provided to Neo Leaf Global by the various energy suppliers to Christchurch and agencies that collect energy information, such as the Christchurch City Council, the Electricity Authority, the Ministry of Economic Development, the Energy Efficiency and Conservation Authority (EECA) and Statistics New Zealand. Historical data, back to 2008, is included in the database where available to provide baseline data and historical trends, including seasonal variations.

Up-to-date energy data is received periodically, converted to consistent units of energy, aggregated as necessary to satisfy constraints relating to commercially sensitive information, compiled as an electronic database, and cross-checked with other available sources of energy data. The database is then provided to CAfE for inclusion in the CAfE website in a format permitting both tabular and graphical data interpretation.

The output of this database is to be used to monitor and record the ongoing amount of energy supplied and used in Christchurch by type, sector and proportion of renewable energy, so that comparisons can be made over time. This will also assist in a more accurate assessment of the effectiveness of various initiatives that will be undertaken by CAfE and others.

The database development program includes the establishment of an ongoing oversight mechanism to permit design modifications as necessary to ensure the information flows are fit for purpose, capable of future enhancements, and constrained in respect of establishment and ongoing cost structures.

2. DATABASE ASSUMPTIONS

Assumptions used in the development of the Christchurch Energy Database are as follows:

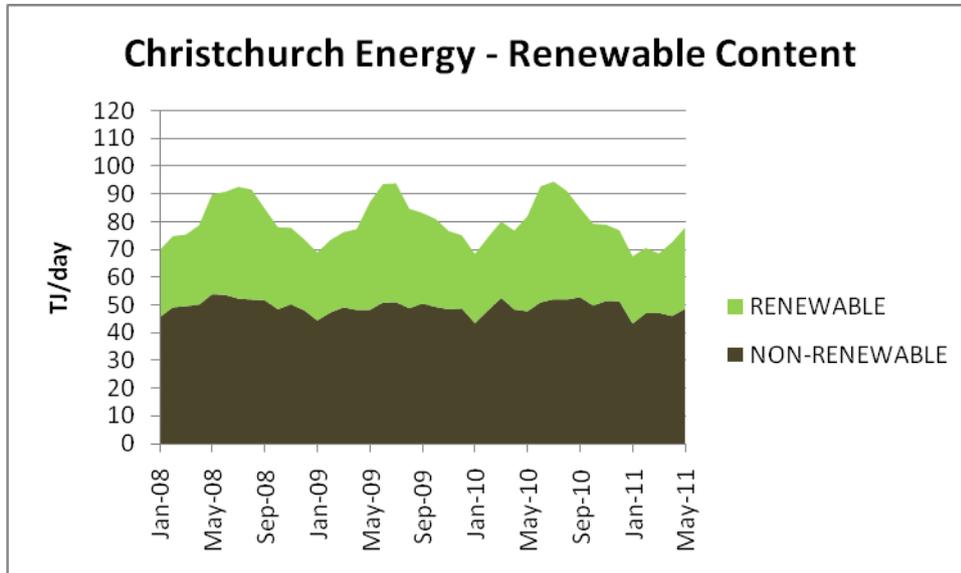
- The database is designed to present energy supply and usage data for Christchurch in monthly format from January 2008. Quarterly updates of the database will occur to ensure the data is as up to date as practically feasible.
- Christchurch is defined as the area under the jurisdiction of the Christchurch City Council, including Banks Peninsula. Where specific separation of energy data by local authority area is not possible, best estimates are applied based on available information.

- For consistency, the energy measures are reported in units of terajoules/day (TJ/day) rather than terajoules/month to remove the impact of differing days per month. The electricity data is also shown in gigawatt-hours per day (GWh/day) as GWh is a common measure of electricity use.
- Where appropriate and for consistency of measure, the Lower Heating Value (or nett energy) is used in the database, as this approach is generally considered a better basis for comparing various energy sources.
- The raw energy data has been provided by energy suppliers or existing collectors of energy information. Where this has not been provided, best estimates have been developed based on available information. In some instances, the raw energy data has been provided under confidentiality agreement due to the commercially sensitive nature of the data. In such cases, this has required the aggregation of the raw energy supply data into broader classifications of energy type, such as fossil fuel (coal, petroleum liquids, LPG) and biofuels (wood/wood pellets, biodiesel and landfill gas/effluent digester gas). Where possible, some permissible disaggregation of this data has enabled more defined energy use data to be presented.
- For simplicity, energy supply to Christchurch is assumed to equate to the energy usage.
- Christchurch's energy supply is presented in terms of
 - the primary energy source (fossil fuels, hydro energy, geothermal energy, wind energy, biofuels, solar energy)
 - key energy components (electricity, petrol, diesel, other fossil fuels, biofuels etc)
 - the proportion of non-renewable and renewable energy
- Christchurch's electricity composition is determined by accessing monthly data from the Electricity Authority's Centralised Dataset which includes specific generation, HVDC link and grid exit point data. This approach assumes separate South Island and North Island electricity networks connected by the HVDC link. For the vast majority of time, the flow of electricity across the HVDC link is from south to north. For simplicity, transmission losses are ignored.
- Aviation and marine fuels are specifically excluded from the database as these fuels sold in Christchurch are almost all used outside of Christchurch. Diesel sold in Christchurch for rail is currently included in the database despite much of it being used outside of Christchurch, but the impact is not considered significant.
- In respect of petroleum liquids, the usage of petrol and diesel in Christchurch is assumed to equate to the amount of those fuels sold in the same period in Christchurch. This approximation is considered valid, as sales in Christchurch not used in Christchurch will be offset to some degree by sales in other regions that are used in Christchurch.
- The Heating Degree Day approach (see www.degreedays.net) is used to convert sales data for heating fuels into usage data. For example, firewood sales data does not accurately reflect usage data as many residents purchase a winter's supply of firewood ahead of winter when it is used.

3. CHRISTCHURCH ENERGY DATABASE OUTPUTS

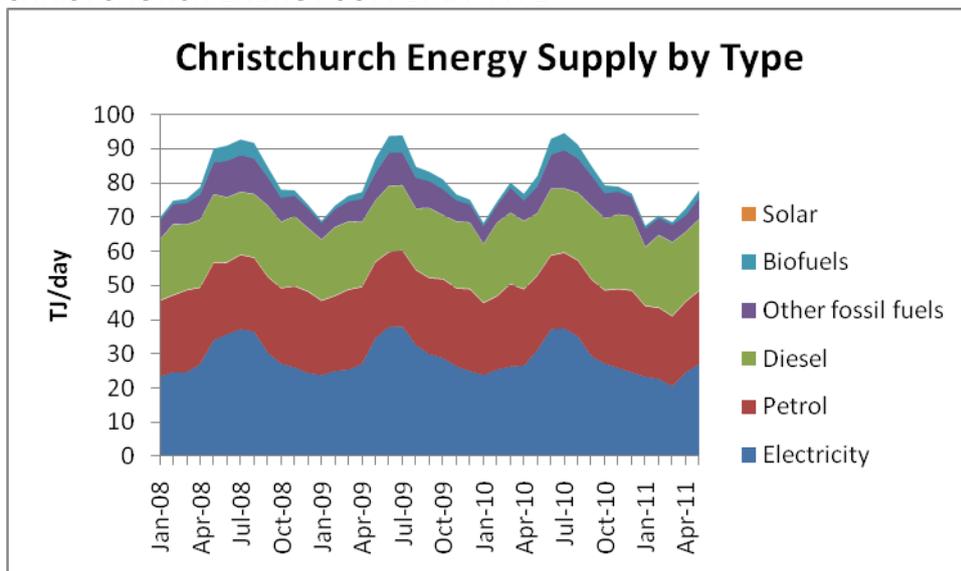
Outputs from the Christchurch Energy Database are many and varied based on the requirements of the database user. Some typical database outputs are given below.

CHRISTCHURCH PRIMARY ENERGY SOURCE



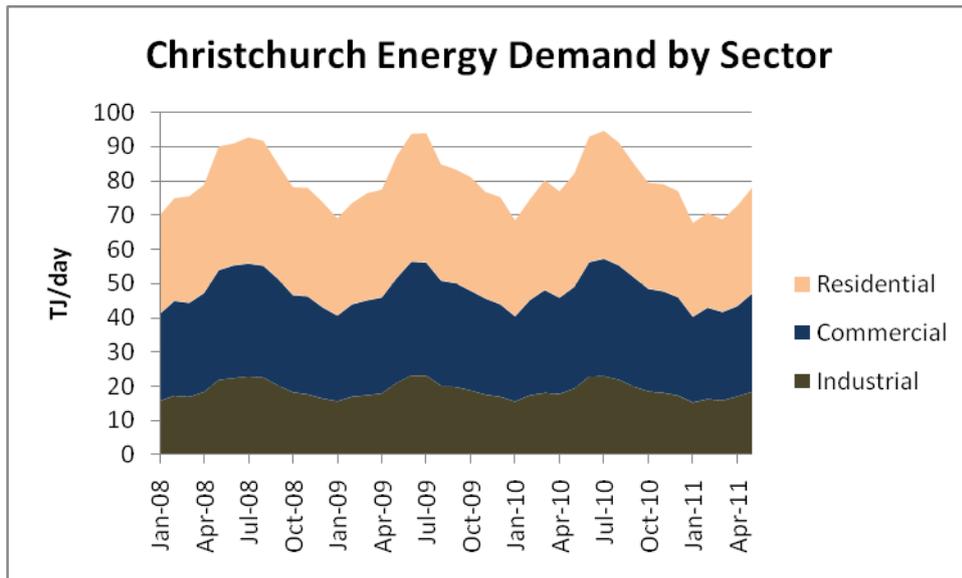
Christchurch renewable energy content was 38.1% in 2008, 39.6% in 2009 and 38.6% in 2010. The renewable energy component is highly seasonal, responding to the higher energy demands in winter.

CHRISTCHURCH ENERGY SUPPLY BY TYPE



Christchurch energy supply is predominantly comprised of electricity and the traditional fuels used for transportation, petrol and diesel. Whilst other fossil fuels and biofuels contribute significantly to the total, solar energy has no significant impact at this time.

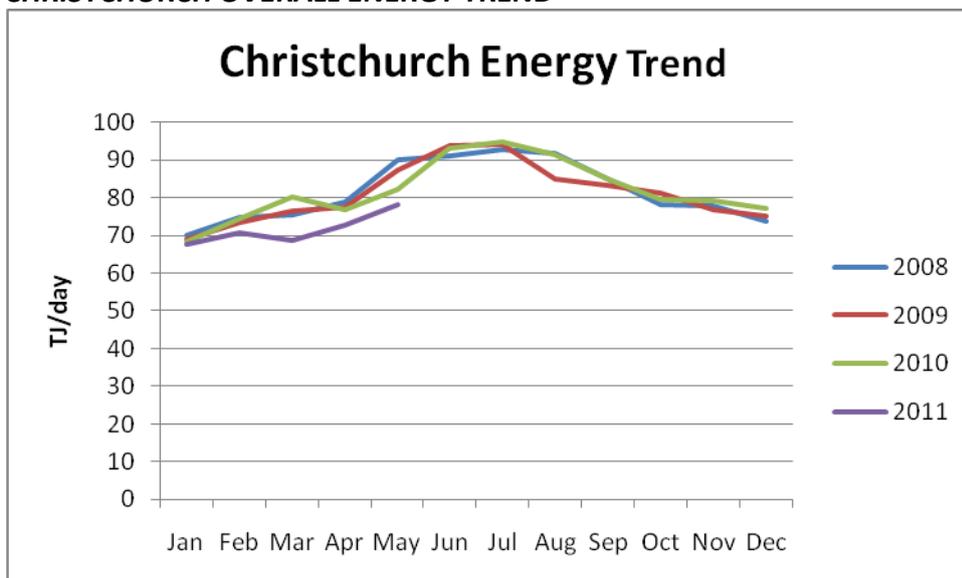
CHRISTCHURCH ENERGY DEMAND BY SECTOR



Christchurch’s energy demand by sector also reflects the increased heating requirement in winter. The commercial sector includes the institutional sector.

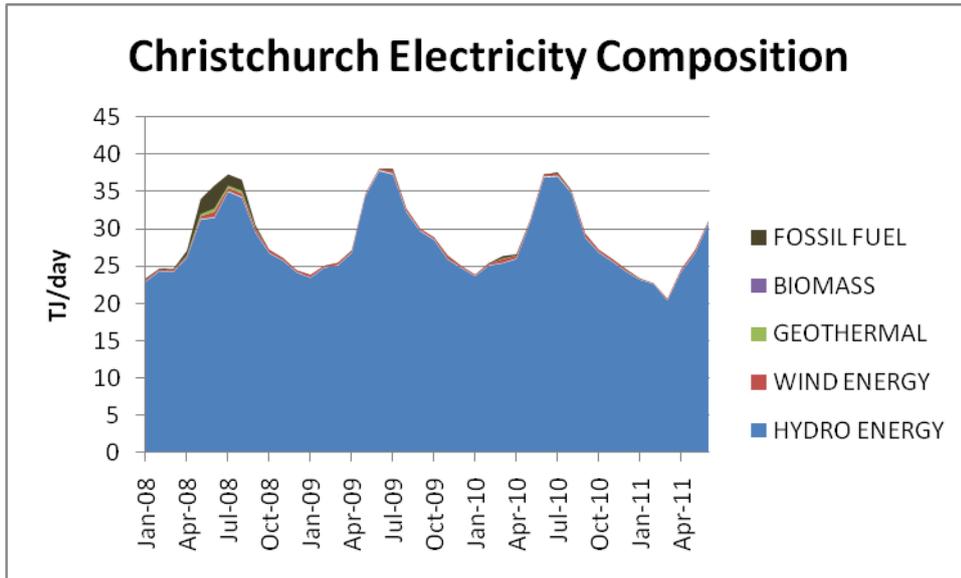
This data has been derived from the EECA End Use Database filtered by sector for Christchurch City, with adjustments made based on recent market data and intelligence. Enhancements to this methodology will be on-going as Statistics New Zealand progress their economy wide energy use surveys, EECA update their End Use Database, and access is gained to more detailed sector breakdowns.

CHRISTCHURCH OVERALL ENERGY TREND



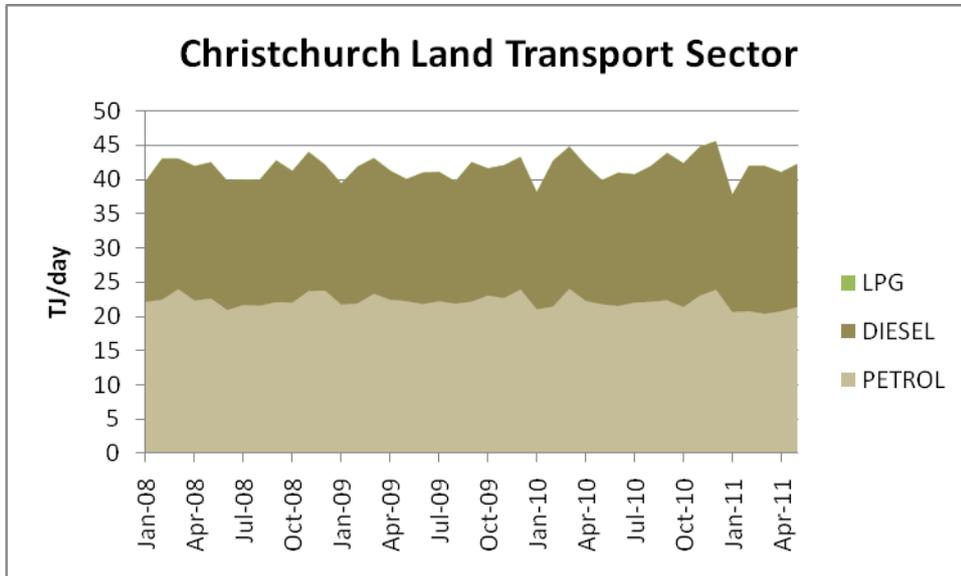
Christchurch’s total energy use has not grown substantially since 2008, but has reduced by 8.3% on average following the February earthquake.

CHRISTCHURCH ELECTRICITY COMPOSITION



Christchurch electricity is almost all from hydro energy sources, and hence substantially renewable. The only period in the database timeframe when the renewable content of Christchurch electricity reduced significantly was May to August 2008, resulting from reduced inflows to South Island hydro storage in autumn 2008 causing high electricity inflows to the South Island via the HVDC link.

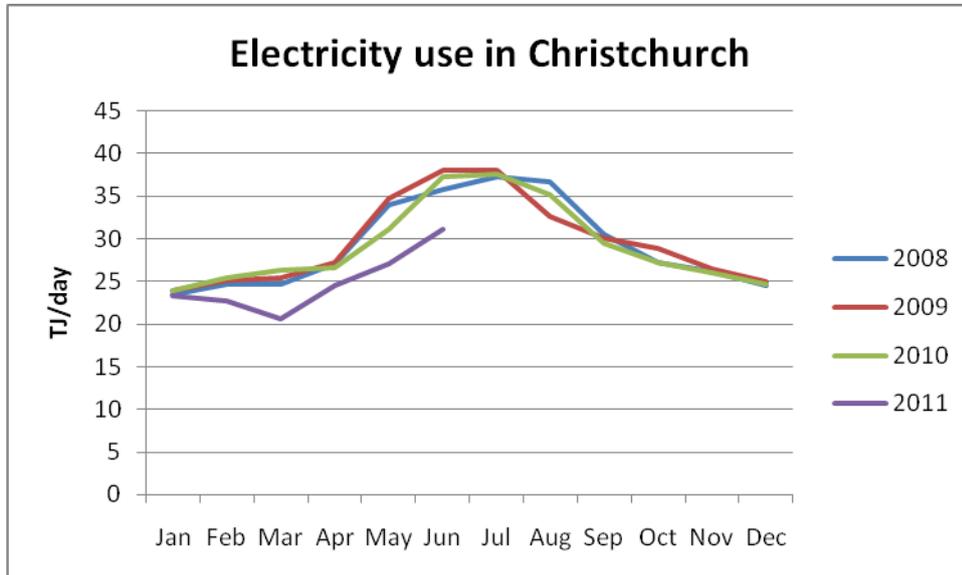
CHRISTCHURCH LAND TRANSPORTATION SECTOR



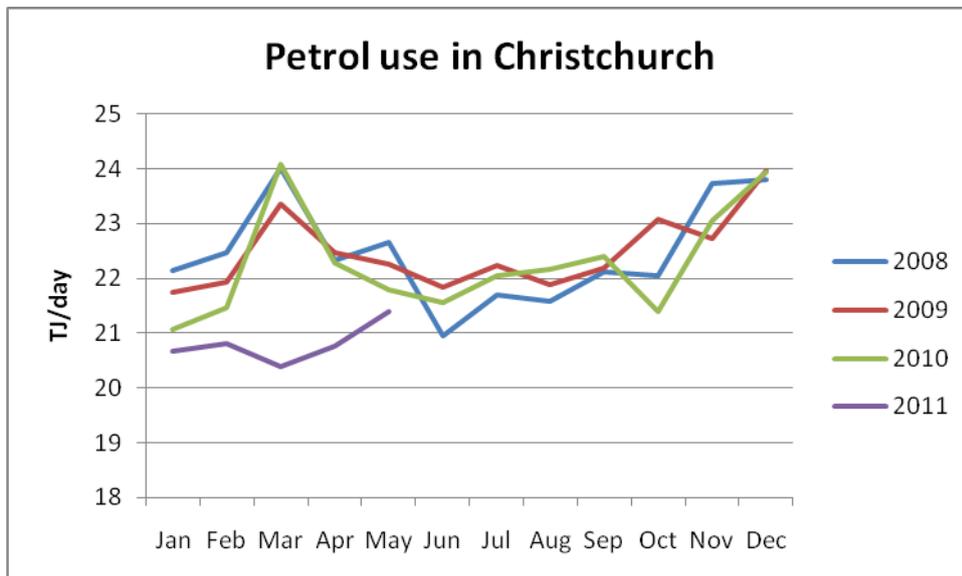
The energy used in Christchurch for land transportation is remarkably static across the database timeframe.

4. IMPACT OF EARTHQUAKES ON CHRISTCHURCH ENERGY USE

The impact of the September 2010 and February 2011 earthquakes on energy use in Christchurch is apparent when electricity, petrol and diesel use is compared to prior periods, as shown graphically below.

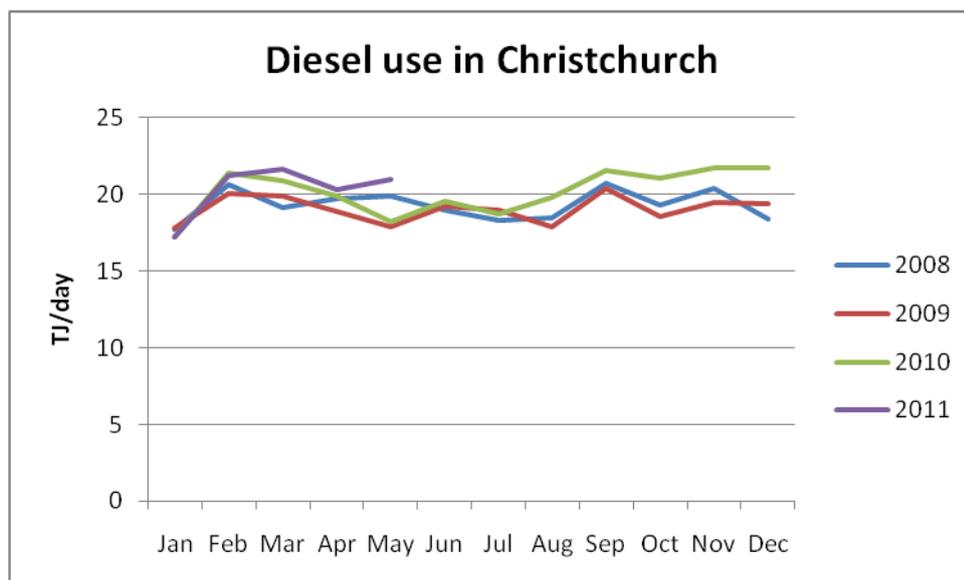


Electricity use in Christchurch was impacted minimally by the September earthquake but substantially as a result of the February earthquake. March to June electricity use in 2011 was 15% down on the same months in 2010.



Petrol use in Christchurch was impacted significantly by the September earthquake but exhibited a quick recovery. The February earthquake substantially impacted petrol use.

March to May petrol use in 2011 was 8% down on the same months in 2010, but is showing signs of recovery towards pre-earthquake levels.



Diesel use in Christchurch has been significantly impacted as a result of the September and February earthquakes. September 2010 to May 2011 diesel usage in Christchurch was almost 7% higher than the previous equivalent period, reflecting the effort applied to earthquake response and recovery work.