



Energy Efficiency and
Conservation Authority
Te Tari Tiaki Pūngao

New Zealand Government

Renewable energy in New Zealand



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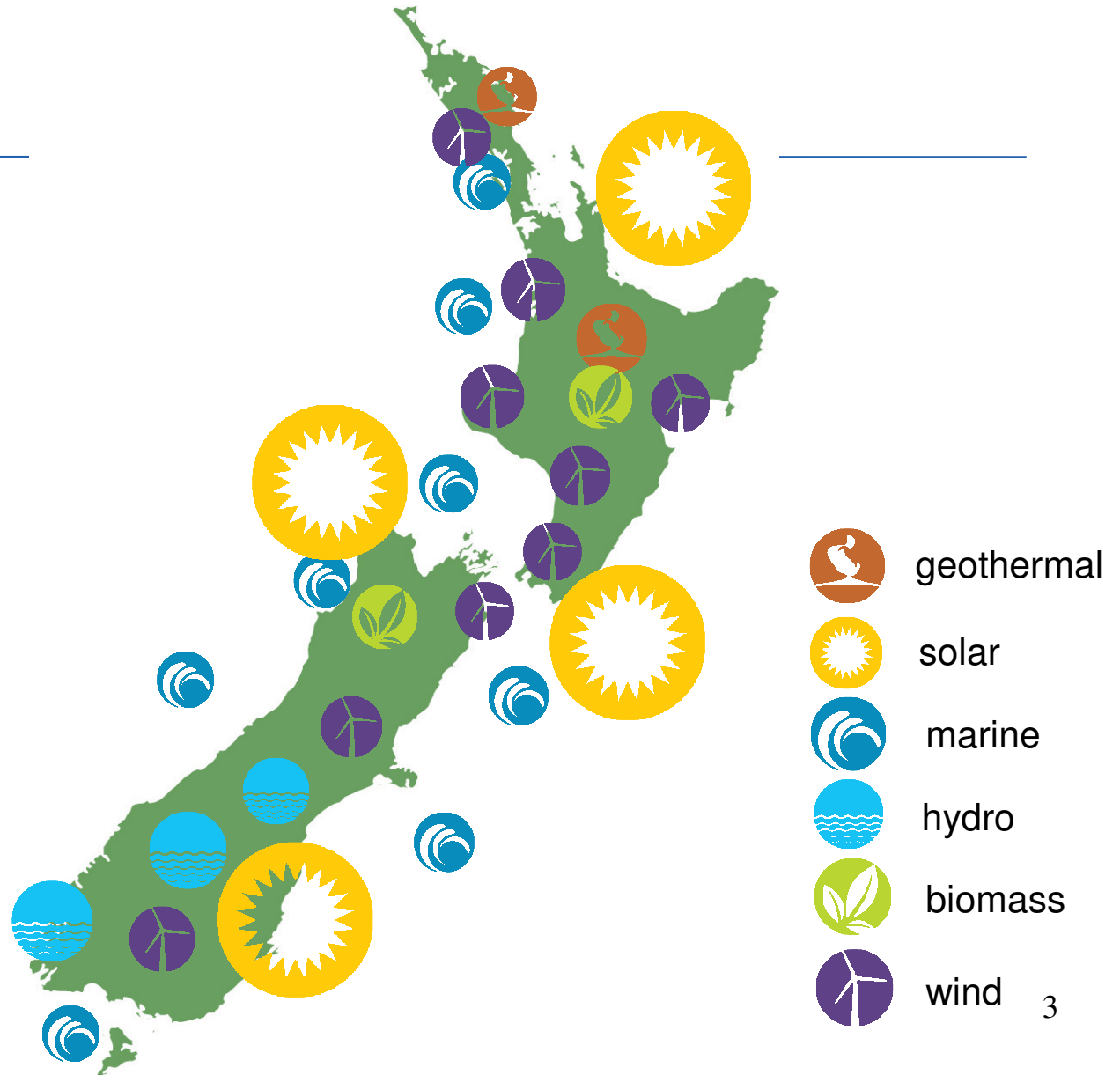
Overview

- New Zealand's long history of renewable energy use and development
- How renewable are we now?
- Where will future energy come from – for electricity, heat and transport
- Where electric vehicles fit in



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Renewable energy resources





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Hydroelectricity development

- Reefton, New Zealand was the first place in the southern hemisphere to have public supply of electricity – 1888
- This was supplied by hydroelectricity
- By the 1950s, over 1,000MW of installed capacity was hydroelectricity



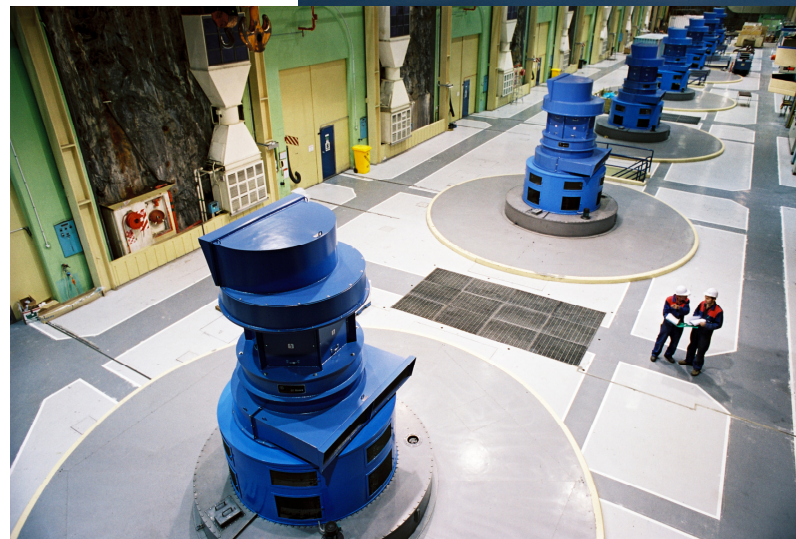
The electric light power house, Reefton



Waitaki dam workers, 1929

Manapouri power station

- Largest hydro station in New Zealand (850 MW)
- Civil engineering feat: machine hall and two 10km tailrace tunnels excavated under a mountain





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Early use of geothermal energy

- New Zealand
Maori used hot
pools for
cooking food

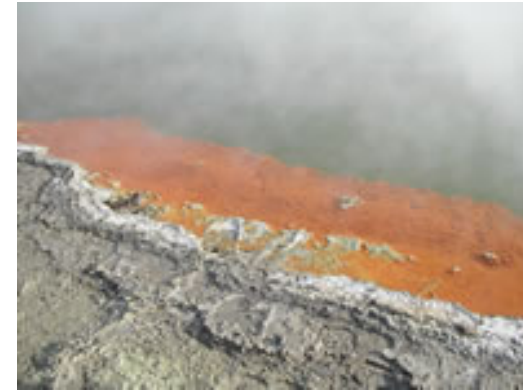




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Geothermal energy: New Zealand's cheapest generation option

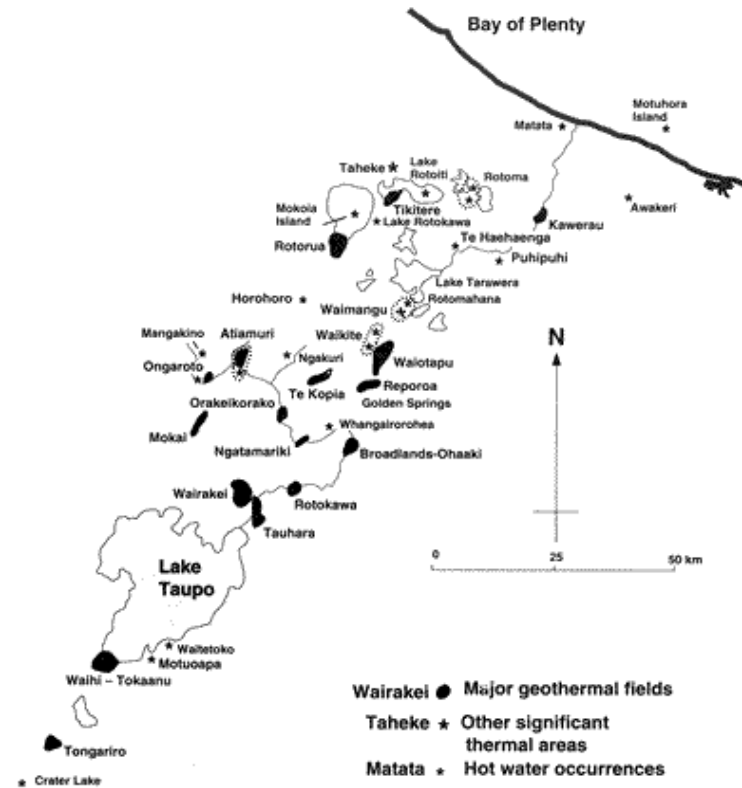
- Wairakei geothermal power station built 1958
- The oldest operating geothermal power station in the world
- Six fields used for geothermal electricity generation in New Zealand, mostly in central North Island
- Installed capacity of over 750 MW, or 13% of generation
- Geothermal considered one of the cheapest forms of new generation in New Zealand
- Two more plants underway – will make New Zealand the 4th largest geothermal energy producer in the world





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New Zealand's geothermal fields



Opportunities for APEC from geothermal growth

- Currently around 11,000 MW worldwide – could double in the next 10 years
- **Indonesia:** Installed capacity is 1,189MW (4% of total capacity).
- Holds 40% of the world's geothermal capacity (=29,000 MW), spread over 276 locations.
- Indonesia's Geothermal Road Map Target is 9,500 MW by 2025.
- **The Philippines:** 2011 National Renewable Energy Plan aims to increase geothermal capacity by 75% between 2011 and 2030.
- **Chile:** 16,000 MW of geothermal capacity.
- Government aims to generate 20% of Chile's electricity from non-conventional renewable energy, such as geothermal, by 2020.

Geothermal expertise

- New Zealand companies are internationally respected for geothermal expertise:
 - Mighty River Power
 - Contact Energy
 - GNS Science
 - Sinclair Knight Mertz
 - PB Power
 - Institute of Earth Science and Engineering at the University of Auckland
- Exploration contracts held in Kenya, Chile, Indonesia, the Philippines, and more
- Geothermal New Zealand is a group bringing New Zealand expertise to the world. GNZ recently signed a business to business MOU with Indonesia's Pertamina Geothermal Energy



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Wind energy

- Wind development since late 1990s
- Now 16 operating wind farms, totalling 620 MW or nearly 5% of electricity supply
- New Zealand considered the “Saudi Arabia” of wind – scope for much more

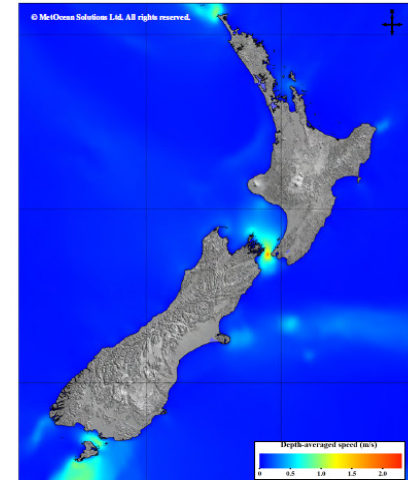




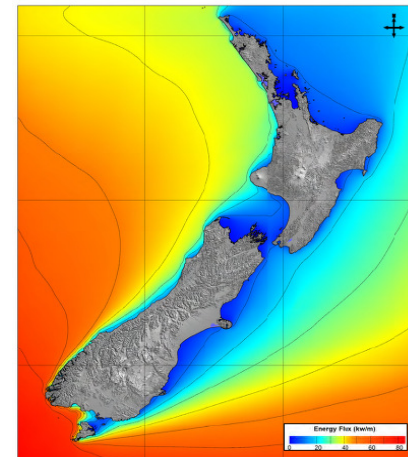
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Marine energy

- Potential for around 8,000 MW of marine energy (wave and tidal) in New Zealand waters
- But currently expensive compared to other renewables
- EECA's Marine Energy Deployment Fund has helped kickstart the industry
- Could assist off-shore islands to replace diesel generation
- More export potential than local use in the near term



Depth-average tidal current speeds (m/s)



Mean spectral wave power (1998-2007)

WET-NZ device

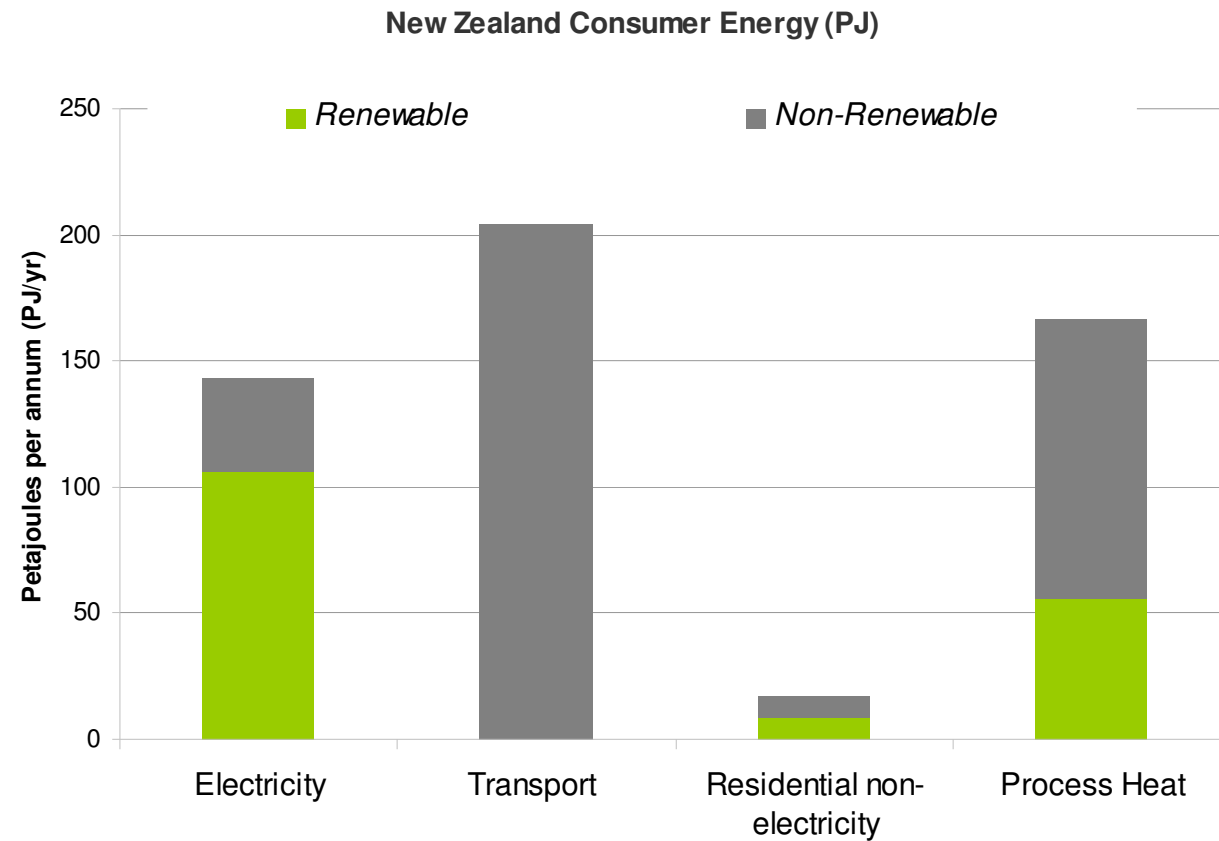
- Pre-commercial device in the water off Wellington's south coast
- Generates 20 kilowatts
- Innovative New Zealand design that converts the kinetic energy from several wave movements (pitch, heave and surge) into electricity.
- Assisted by the Marine Energy Deployment Fund
- Developed by Wave Energy Technology NZ (WET-NZ), a collaboration between Power Projects Ltd and Industrial Research Ltd.





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Renewable / fossil fuel mix



Policies to encourage renewables

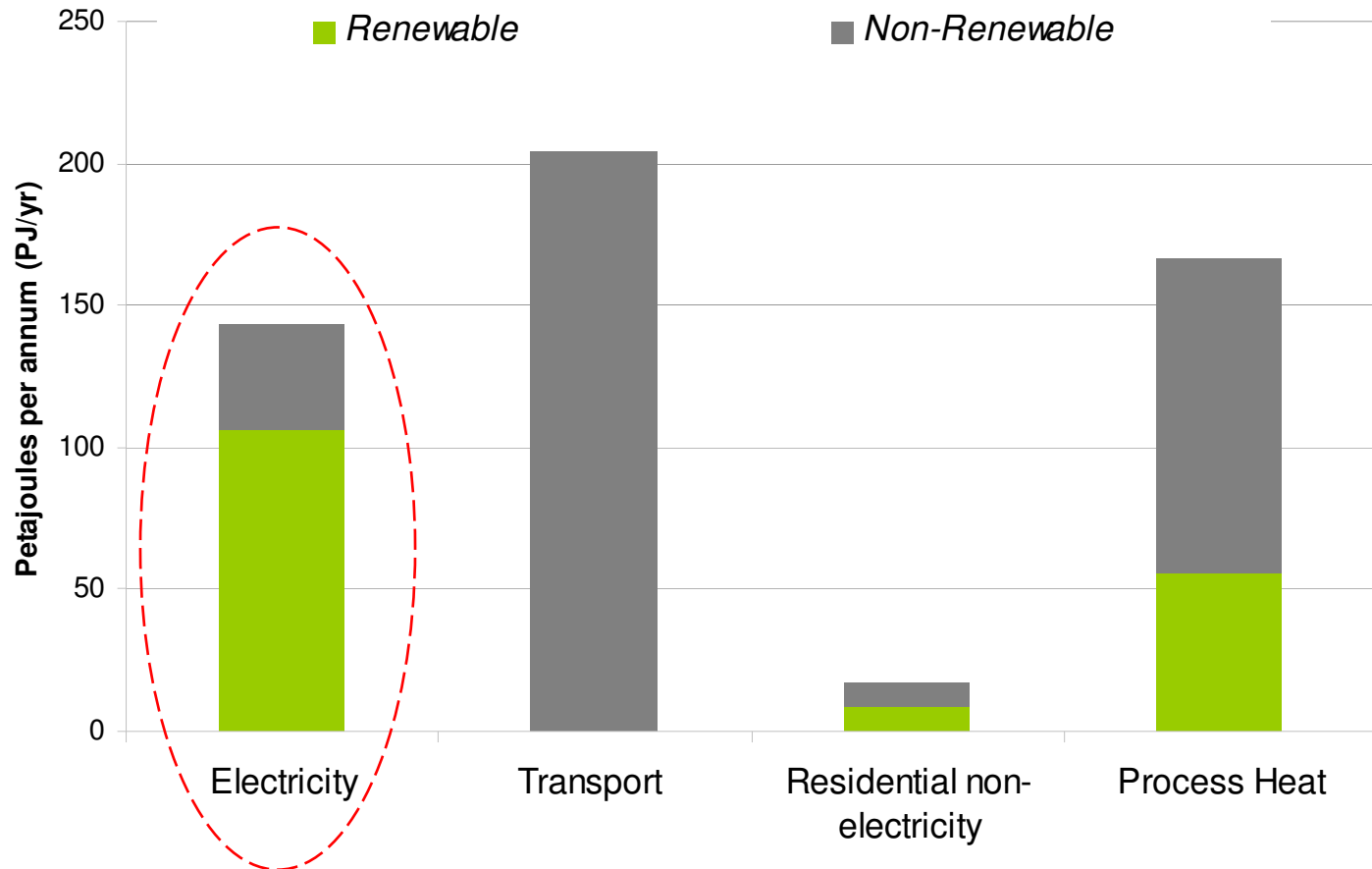
- Target for 90% renewable electricity generation by 2025 in National Energy Strategy (non-binding)
- Target for an additional 9.5 PJ of energy from woody biomass or direct geothermal use by 2025 in National Energy Efficiency and Conservation Strategy (non-binding)
- Emissions Trading Scheme raises the ranking of new renewable generation projects
- No feed-in tariffs or other subsidies for renewable electricity generation
- Biodiesel Grants Scheme has kick started biodiesel industry
- Ethanol excise duty exemption for blending with petrol
- Electric vehicles exempt from road user charges to 2020



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Future electricity generation

New Zealand Consumer Energy (PJ)



Electricity - future generation

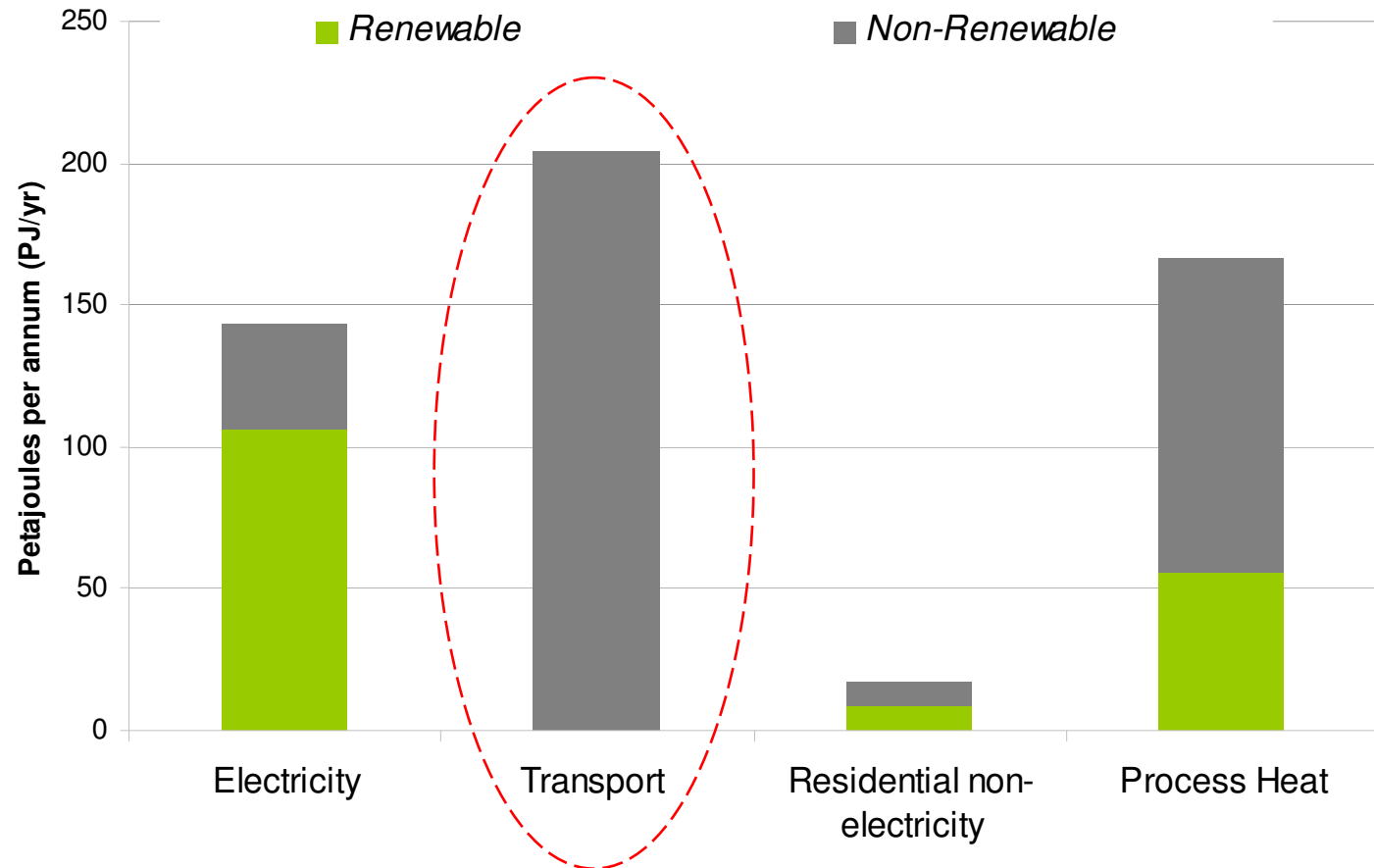
- Target for 90% renewable electricity by 2025
- Future generation dominated by renewables – the most affordable for New Zealand, and without subsidy but including carbon emissions trading scheme
- Around 20 consented renewable generation projects
- Equal to 3,000 MW capacity, or about 15 years demand growth (@ 1.5%pa)
- More renewable projects in consent process; 500 MW capacity
- More than 10,000 MW renewable generation being investigated



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Transport

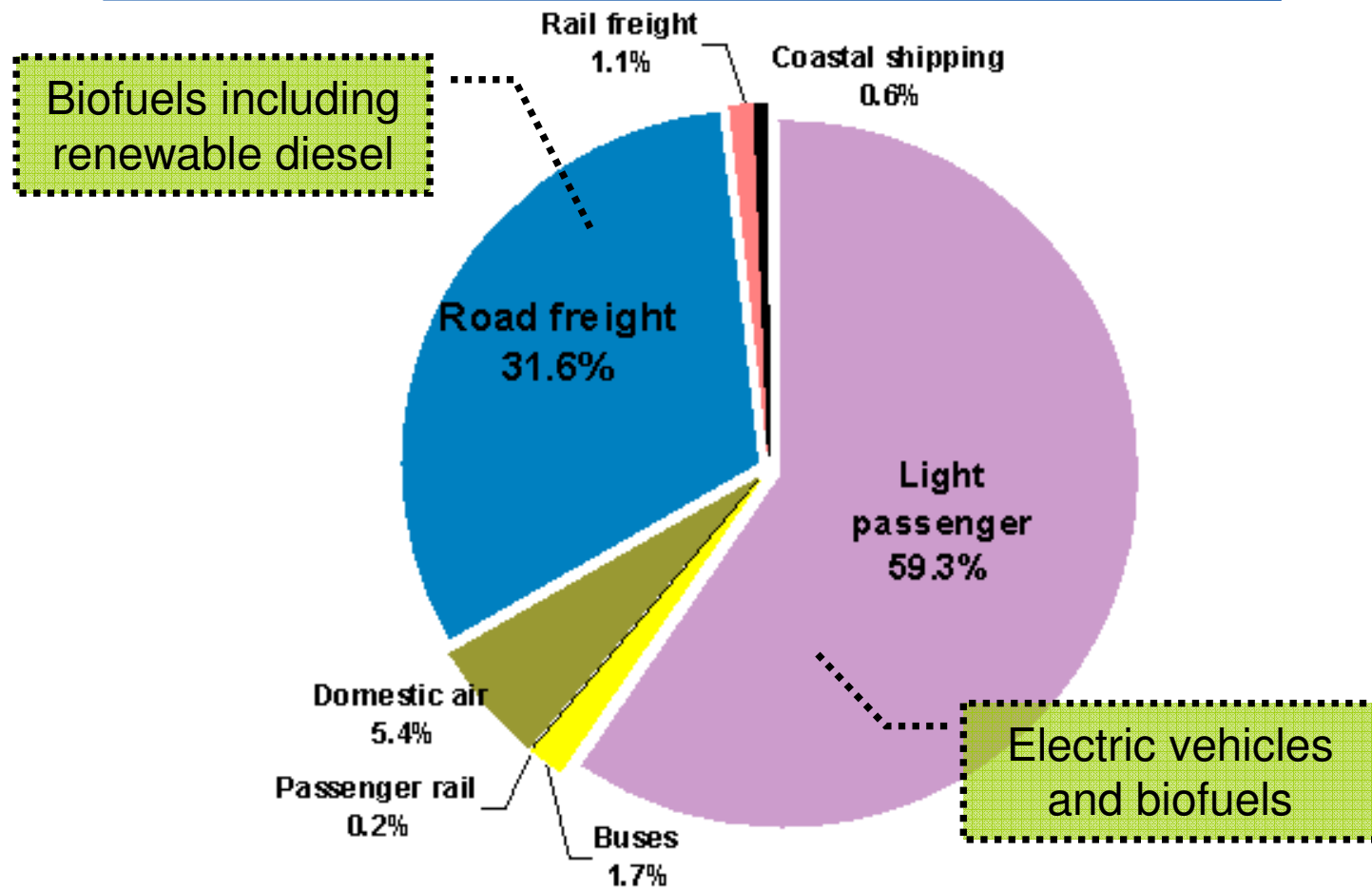
New Zealand Consumer Energy (PJ)





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Potential for future renewable transport energy





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Biofuels

- Biodiesel blends and ethanol petrol blends are already being used at the pump in some locations in New Zealand
- Biodiesel is made from used cooking oil and rapeseed grown as a rotation crop
- Ethanol is produced from whey, a by-product of the dairy industry and also imported from Brazil
- Voluntary biofuels sustainability reporting scheme in place



**THIS FUEL IS BETTER
FOR THE ENVIRONMENT**

FIND OUT HOW
eeca.govt.nz/biofuels

 **EECA**
energywise.

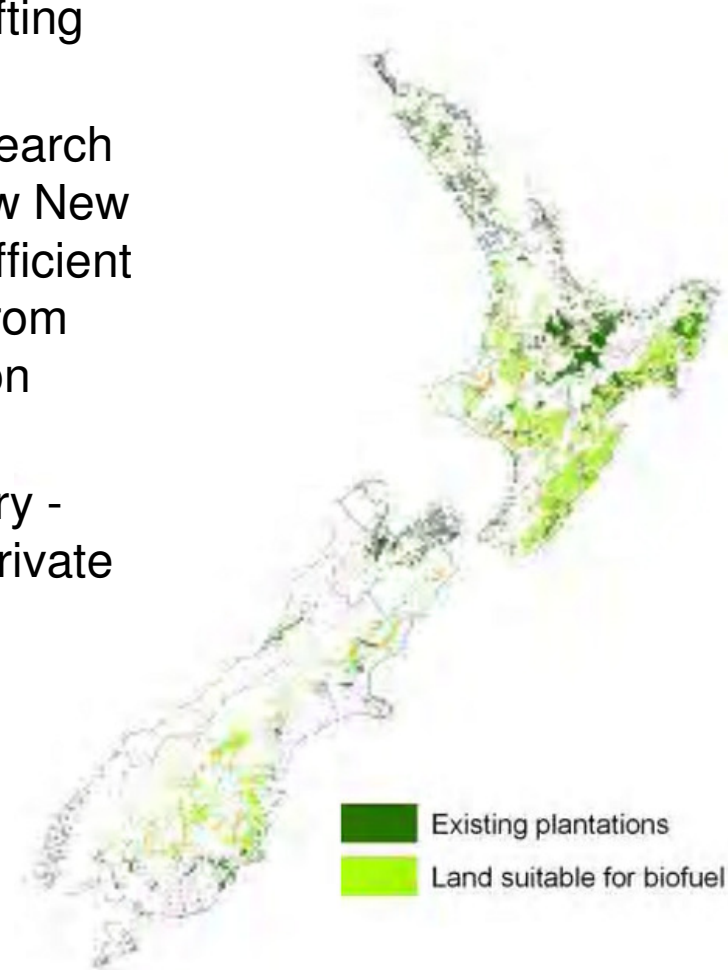
**bio
FUEL**



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Advanced biofuels – drop in fuels

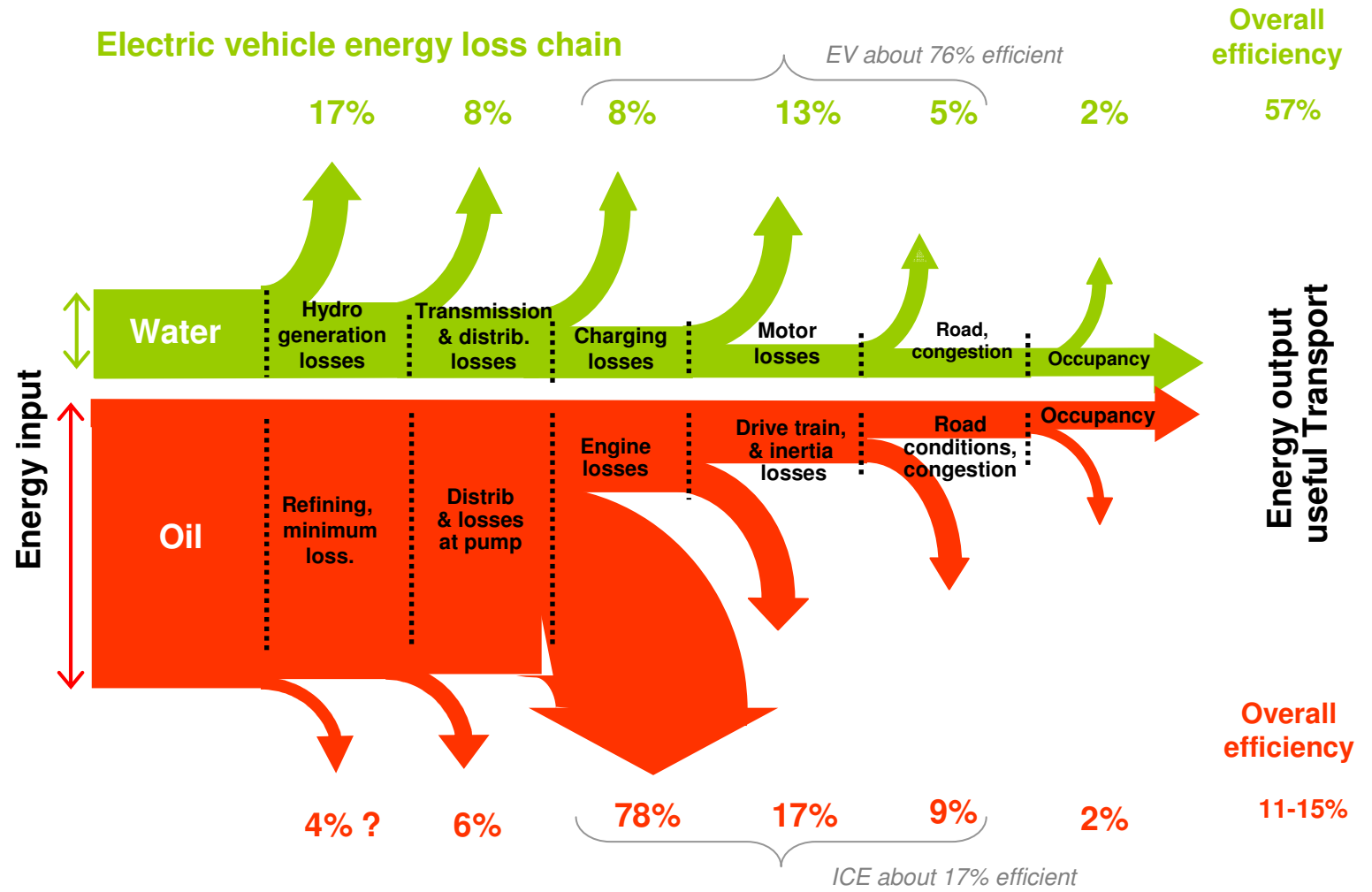
- Biofuels focus is now shifting to advanced biofuels
- Research by forestry research institute Scion shows how New Zealand could be self-sufficient in transport fuels made from purpose-grown forestry on marginal land
- A potentially huge industry - may require public and private sector collaboration.





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Efficiency & use of renewables - EV vs ICE



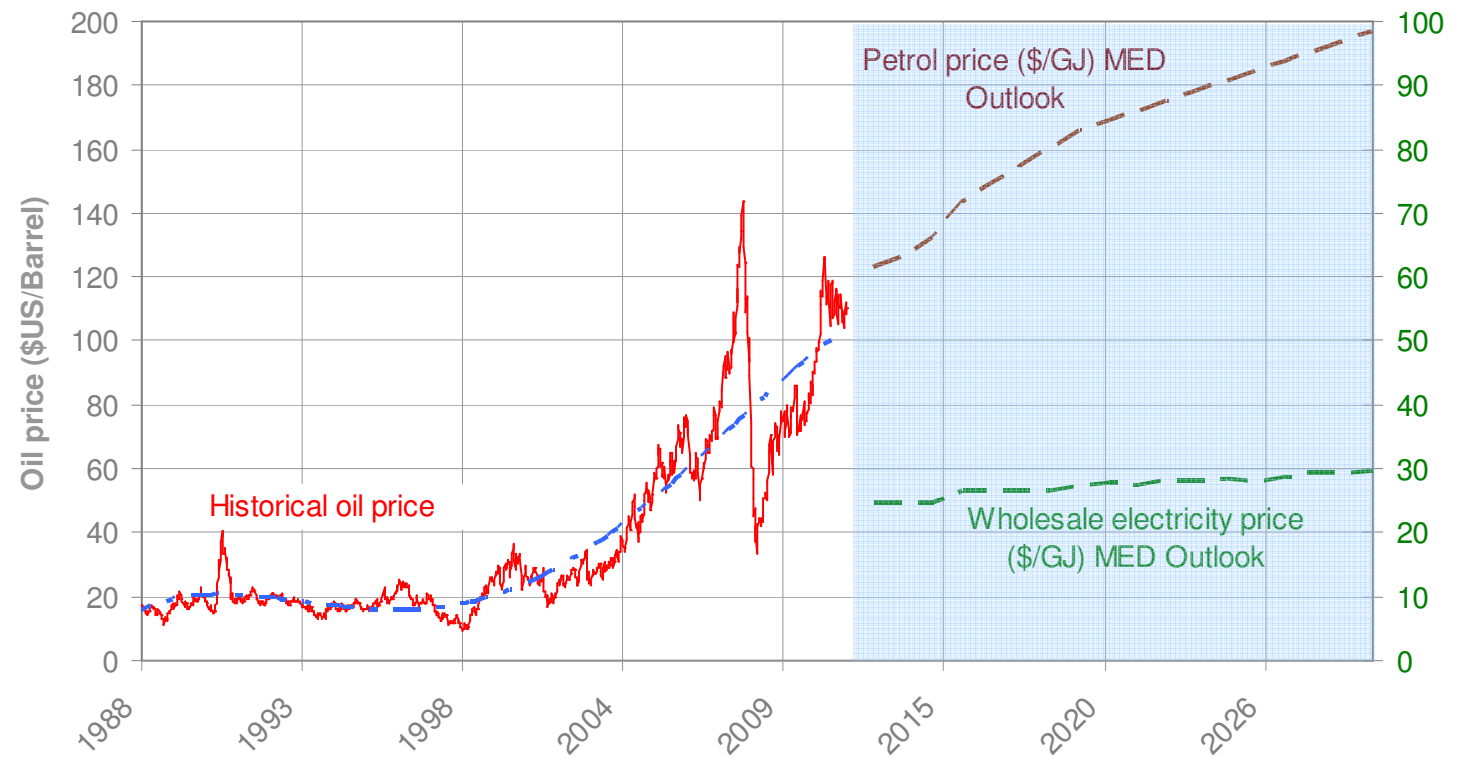
Internal combustion engine energy loss chain



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Energy cost comparison - future

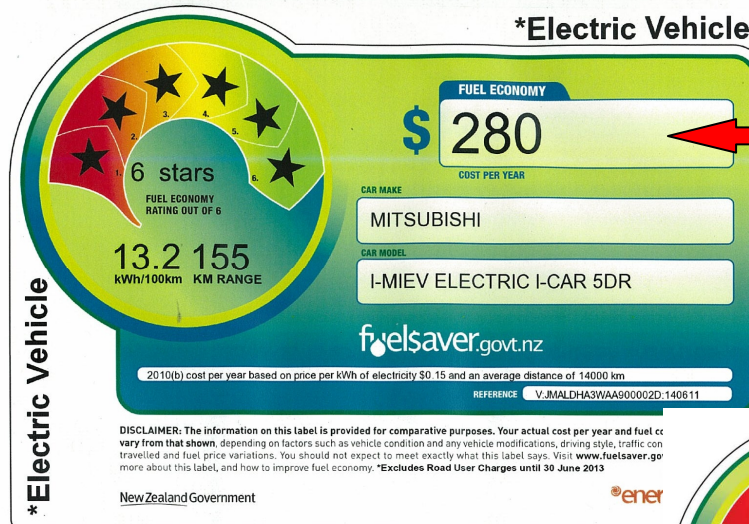
Energy Prices - Past and Projected



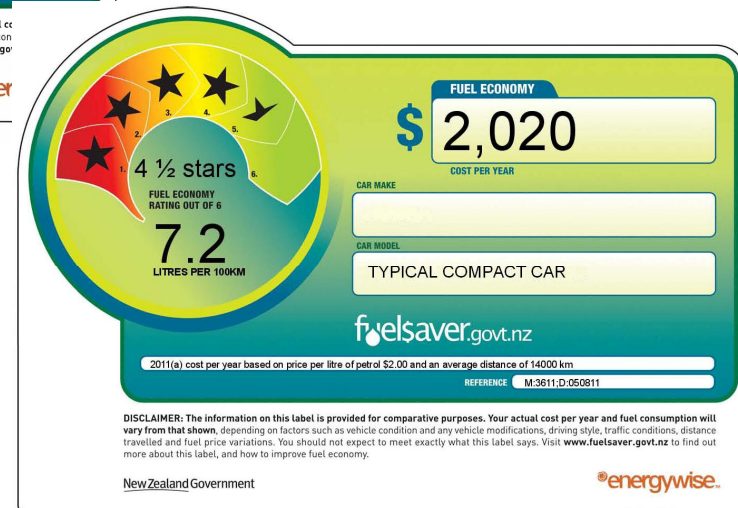


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Fill up your car for 26c a litre



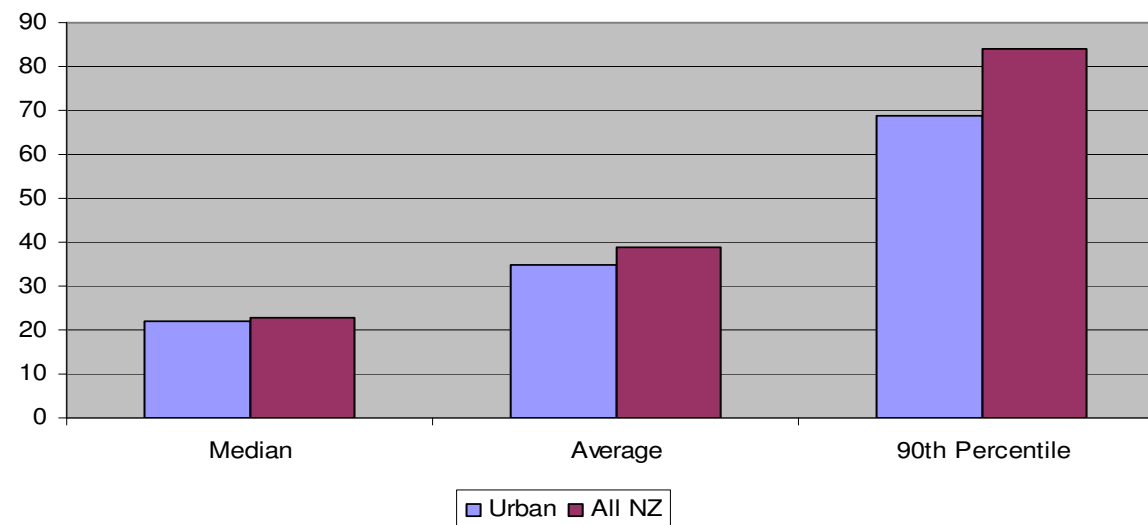
Annual running cost



EVs can work in NZ now

- 86% of New Zealanders live in urban areas
- 52% of NZ households have 2 or more vehicles
- Over 85% of homes have garages
- 230 Volt domestic supply gives full overnight charge
- 90% of cars are driven less than 85 km per day, well within the range of today's electric vehicles

Daily Travel Distance (Km)

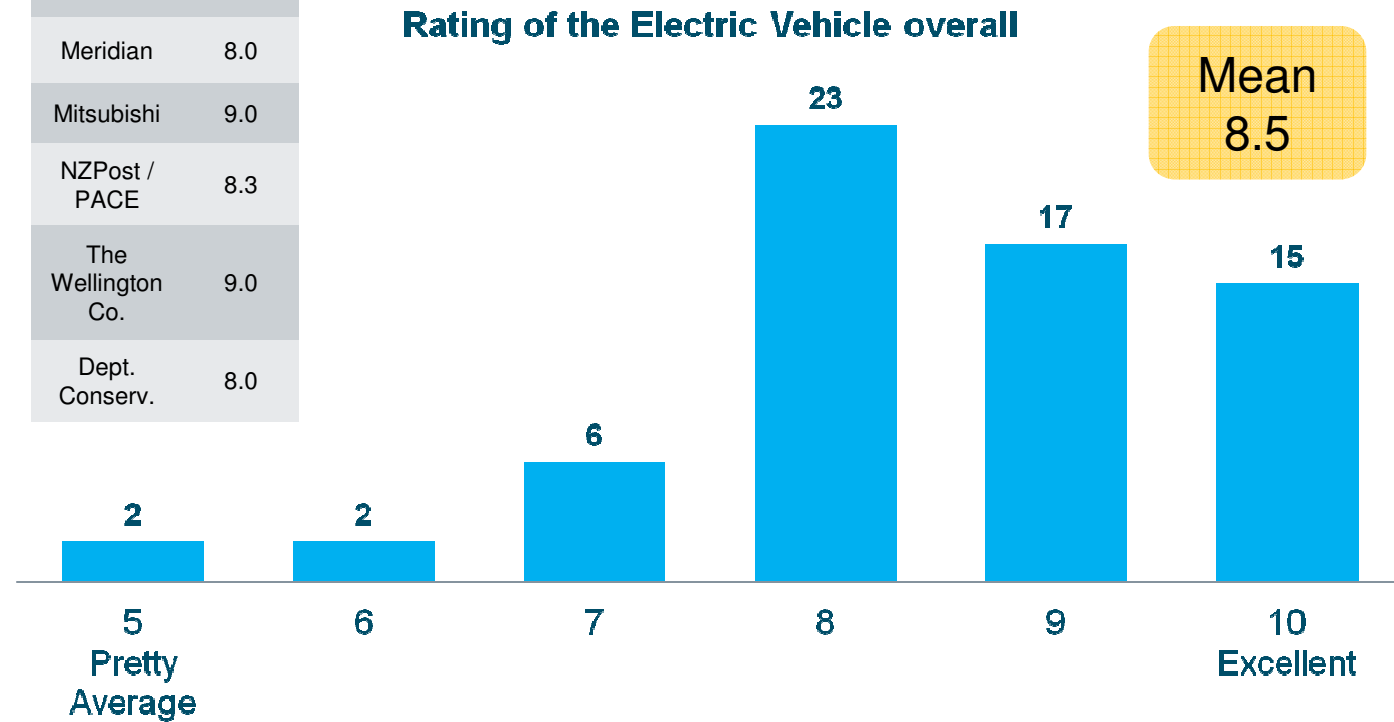




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Wellington EV user ratings

| Company | Mean |
|--------------------------|------|
| WCC | 8.5 |
| Meridian | 8.0 |
| Mitsubishi | 9.0 |
| NZPost / PACE | 8.3 |
| The Wellington Co. | 9.0 |
| Dept. Conserv. | 8.0 |



EV rated out of 10 (no scores received below 5). 26

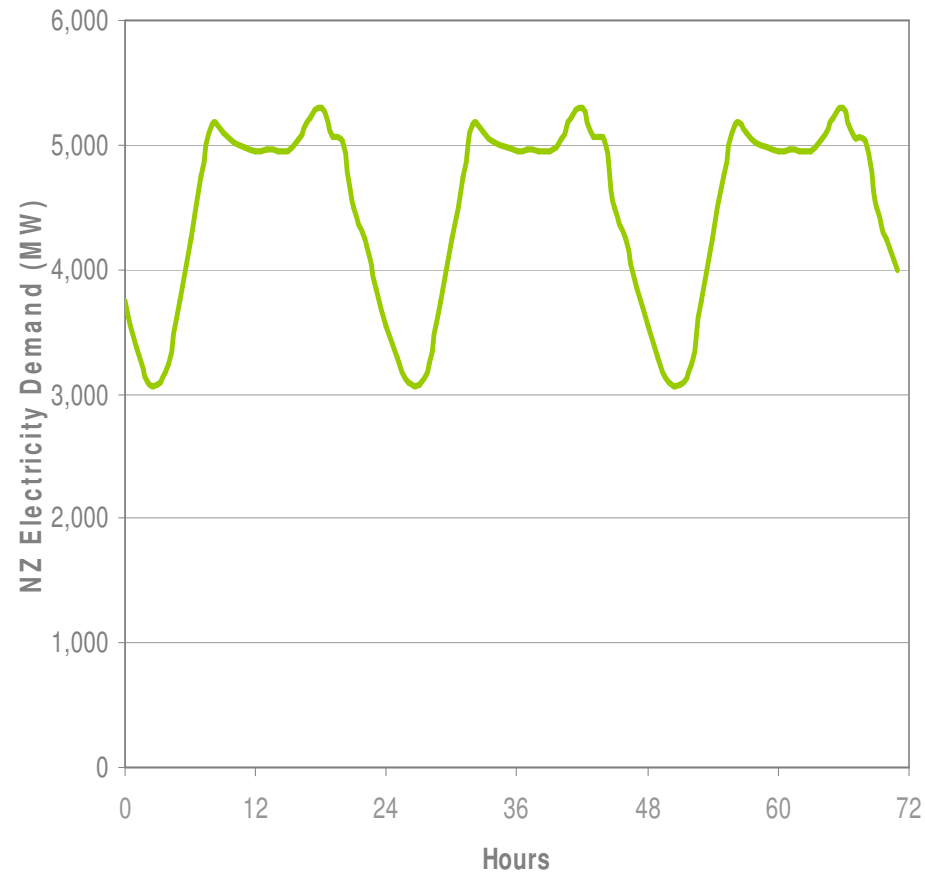
Source: Synovate 'Electric vehicle trial report' Dec 2011



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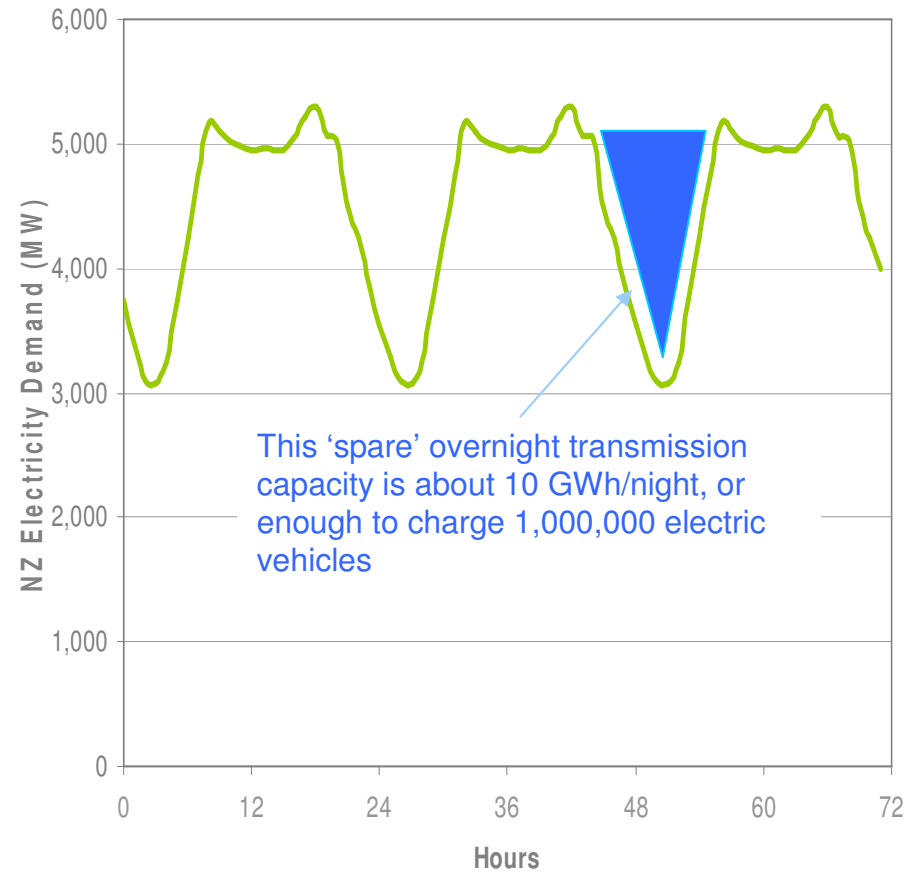
Making the most of “must run” generation

NZ Electricity Demand

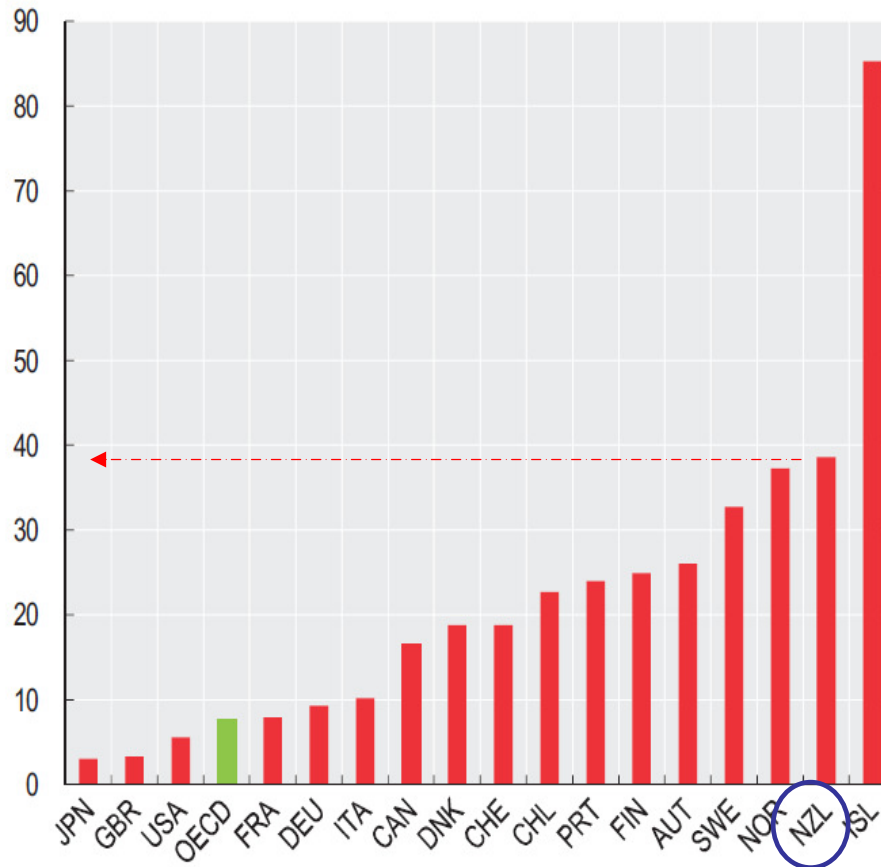


Making the most of “must run” generation

NZ Electricity Demand



Renewable energy bolsters our clean green image



Contribution of renewables to energy supply
As a percentage of total primary energy supply, 2010
Source: OECD Factbook 2011

Clean green New Zealand – worth \$18 billion

