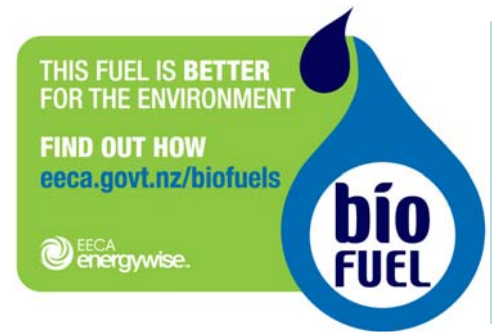




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Renewable energy in transport in New Zealand



Elizabeth Yeaman, Transport Partnerships Manager, March 2011

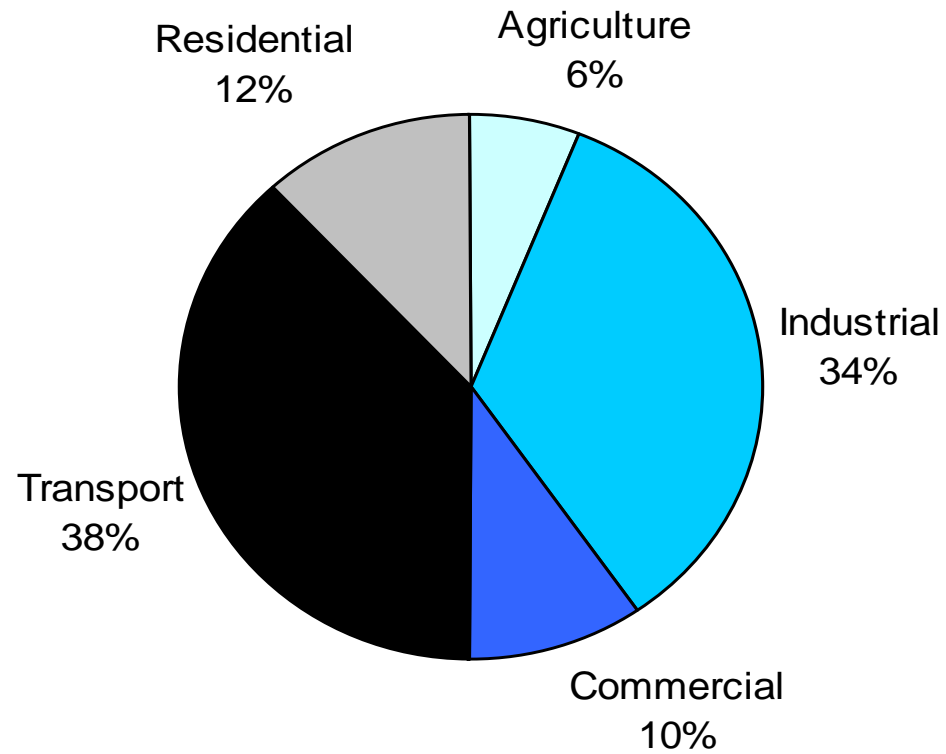


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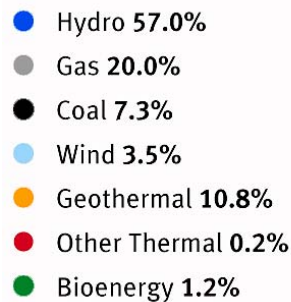
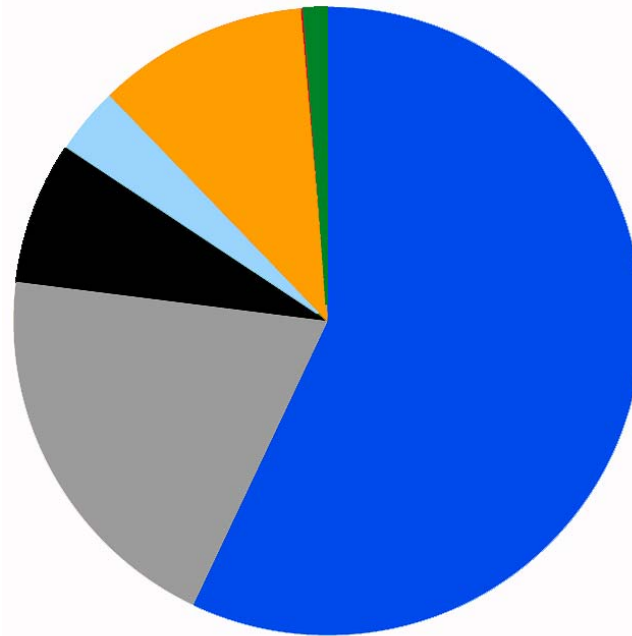
Agenda

- Introduction to transport energy in New Zealand
 - New Zealand energy mix
 - Vehicles and road funding
- Biofuels and biofuel blends
 - Biofuels in New Zealand
 - Advanced biofuels research
- Electric vehicles in New Zealand
 - NZ ideal market for EVs
 - Initial trials
- Summary

Transport is New Zealand's largest energy consuming sector



High proportion of renewable electricity generation



- In 2009, 72.5% of New Zealand's electricity generation came from renewable sources,
- Most generation is from hydro but in recent years with increasing quantities are coming from geothermal and wind
- New Zealand has the 3rd highest percentage of renewable energy supply, after Norway and Iceland

Transport sector is significantly behind in the uptake of renewables

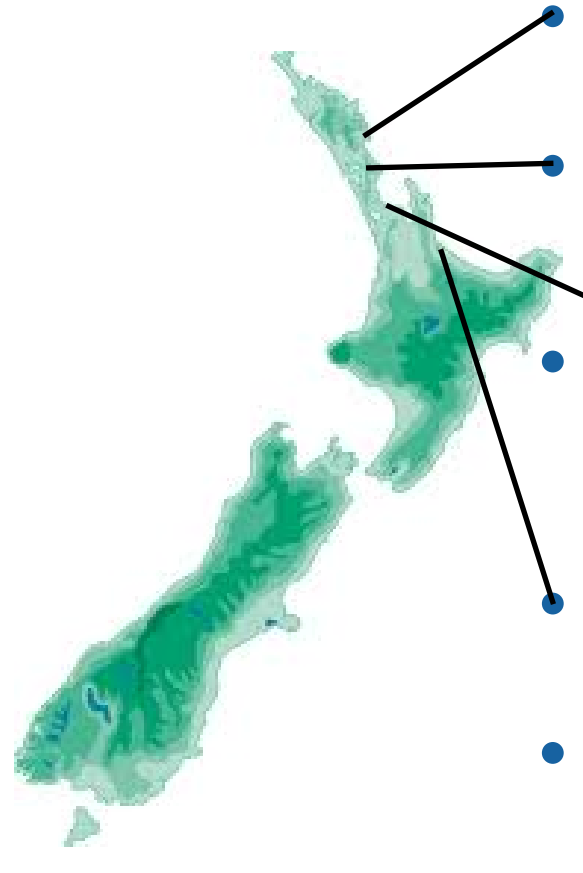
Sector	% renewable
Residential	62%
Industrial	50%
Commercial	48%
Agriculture	16%
Transport	0.3%

Based on 2009 data reported in New Zealand Energy Data File 2010 and NZ electricity generation 72.5% renewable



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Shared refined petroleum products infrastructure

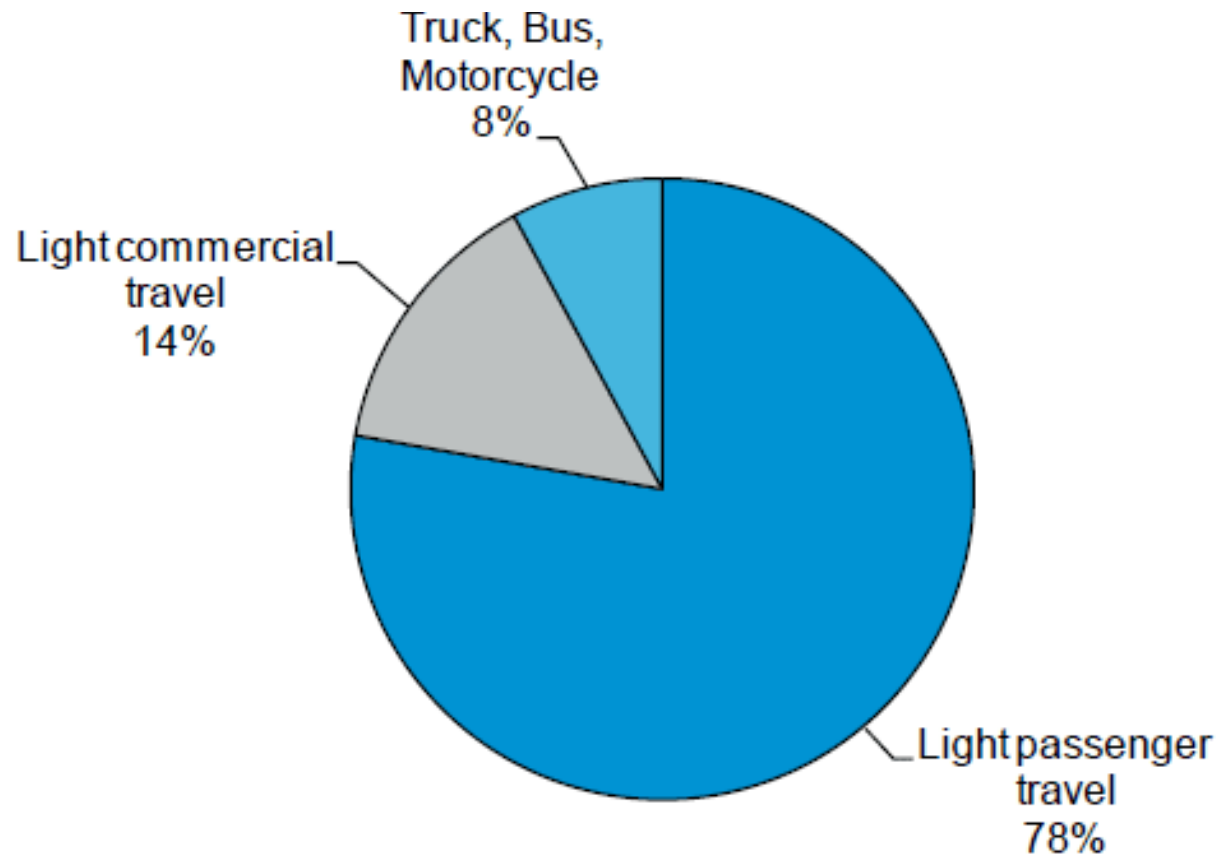
- 
- A map of New Zealand is shown in a light green color. Five black lines with blue circular endpoints point from the map to the text on the right. The lines originate from the following locations on the map: the top of the North Island, the central North Island, the central North Island (lower), the southern North Island, and the southern South Island.
- One refinery, jointly owned by four oil companies (BP, Mobil, Chevron, Greenstone) and other shareholders
 - One refined oil products pipeline (owned by the refinery) transporting refined fuels from the refinery to Auckland, New Zealand's largest city
 - Two coastal tankers (owned jointly by the four major oil companies) delivering to 9 coastal terminals (each terminal owned by two or more oil companies jointly)
 - One independent retailer (Gull) has separate import terminal for all its refined products
 - Road delivery from terminals to service stations and commercial customers



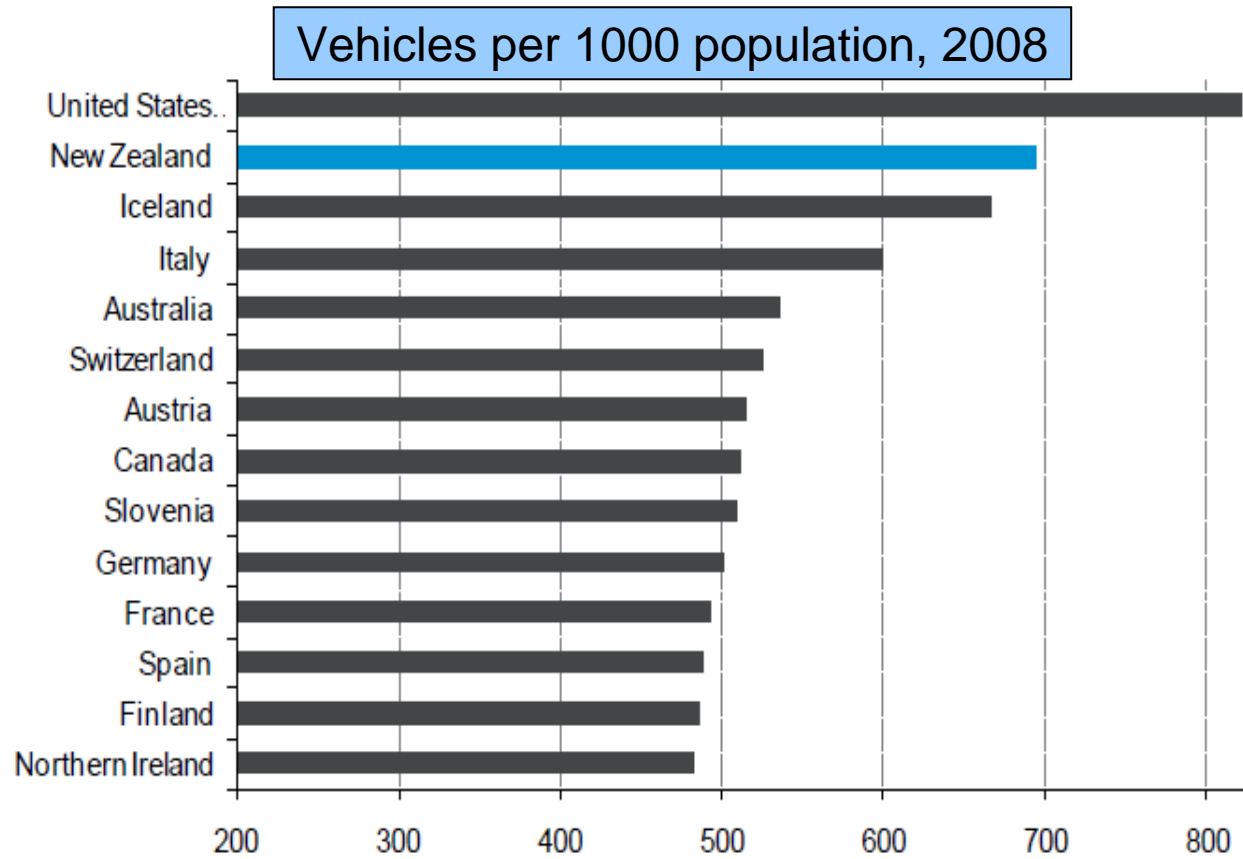
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Most road travel is light vehicles

Travel in 2009, total vehicle.km



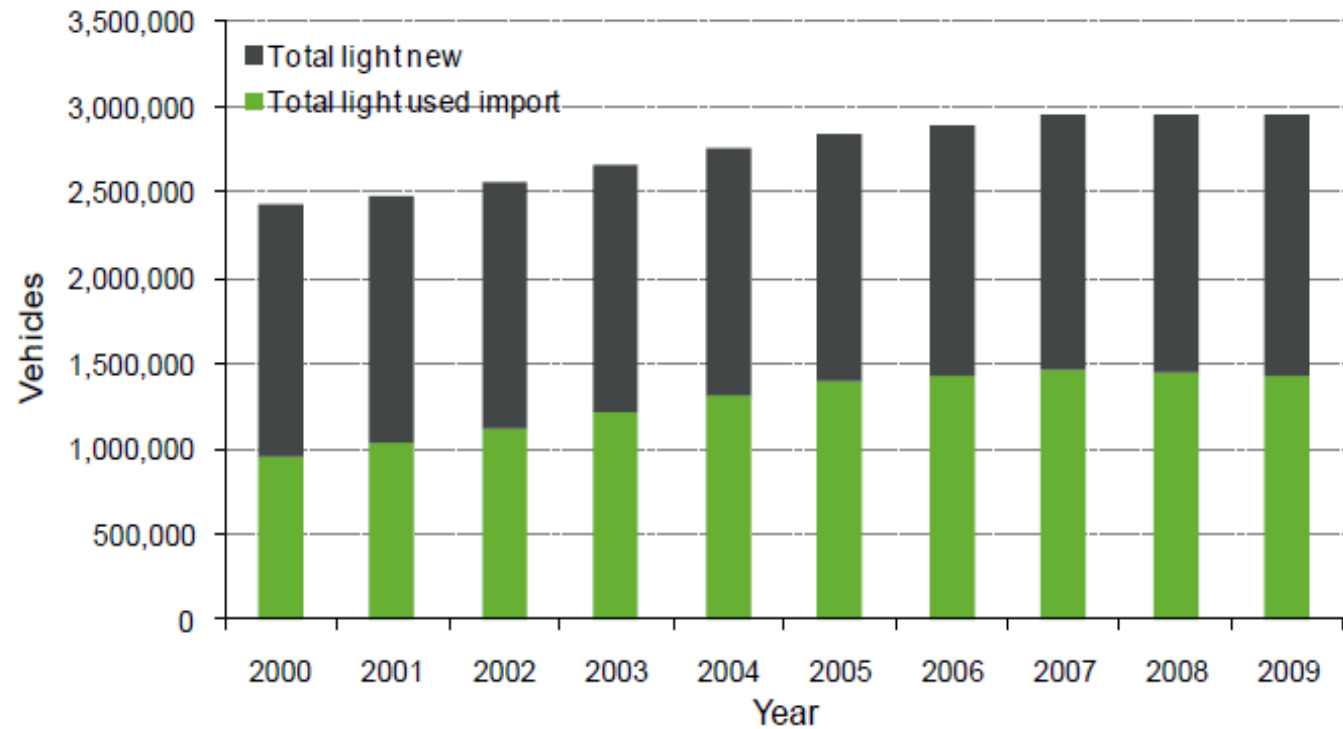
New Zealand has a high rate of vehicle ownership





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50% of light vehicles are second-hand imports





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Paying for roads

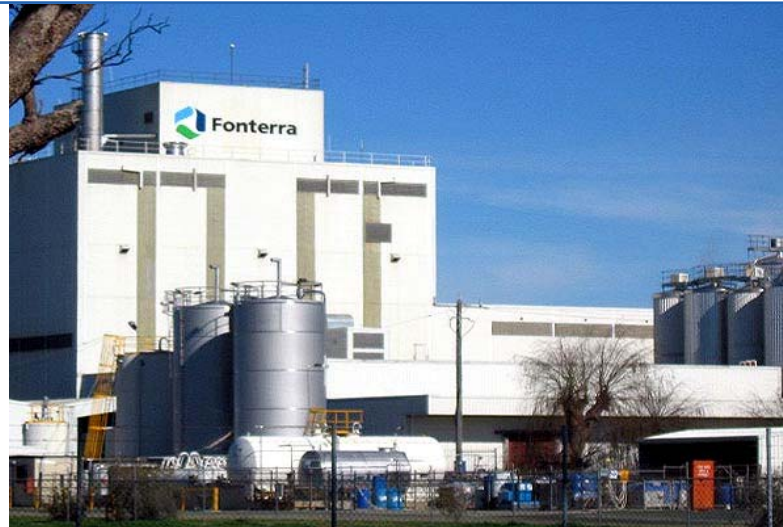


Vehicle and fuel	Road User Charges	Fuel excise
Heavy vehicles Diesel	Yes – variable with axel weight and type	0
Light vehicles Diesel	Yes – NZ\$42 - 46 per 1,000 km	0
Light vehicles Petrol	No	NZ\$0.48 / litre
Light vehicles Ethanol component	No	0
Heavy or light vehicles Biodiesel blends	Yes – as for diesel	0
Heavy or light vehicles Electricity	Yes – as for diesel	0
Light vehicles CNG/LPG	No	NZ\$0.10 / litre

Approach to renewable energy for transport

- Changing vehicle technology at the same time as needing a new energy supply infrastructure is difficult and expensive – “chicken and egg” problem of which comes first, the vehicle or the fuel
- Focus is on two complementary options which need to change only one of either vehicles or energy supply to get started in the market:
 - Biofuel blends used in **existing** vehicles
 - Electric vehicles using **existing** electricity generation and distribution infrastructure to recharge

Current biofuel sources in New Zealand



- Ethanol from whey (lactose) – by product of milk processing – produced in 3 locations by Fonterra
- Imports of sugarcane ethanol from Brazil
- Biodiesel from crops, used cooking oil and animal fats – NZ exports of animal fats could meet 4% NZ diesel demand



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Government support for biofuels

- Removal of regulatory barriers to biofuel blends
- Zero rate of excise on ethanol for blending with petrol
- Biodiesel Grants Scheme paid to biodiesel producers to provide similar incentive for biodiesel blends (NZ\$ 0.425 cents per litre) sold into the market – replaced former Biofuels Sales Obligation
- Consumer and motor industry information provision on biofuel blends, vehicle compatibility and biofuel sustainability

Biofuel blends in the market

- Retail sales of up to E10 permitted if labelled
- Retail sales of up to B5 permitted – no labelling required
- Wholesale sales (where there is a written contract for supply) permits any blend level
- Motor industry very cautious about ethanol blends above E3 particularly for used Japanese import vehicles
- Gull, independent retailer with own import terminal, now retails E10 in both regular and high octane grades at all its service stations, and has started retailing B5
- Mobil retailing E3 in regular grade and E10 in high octane in one region

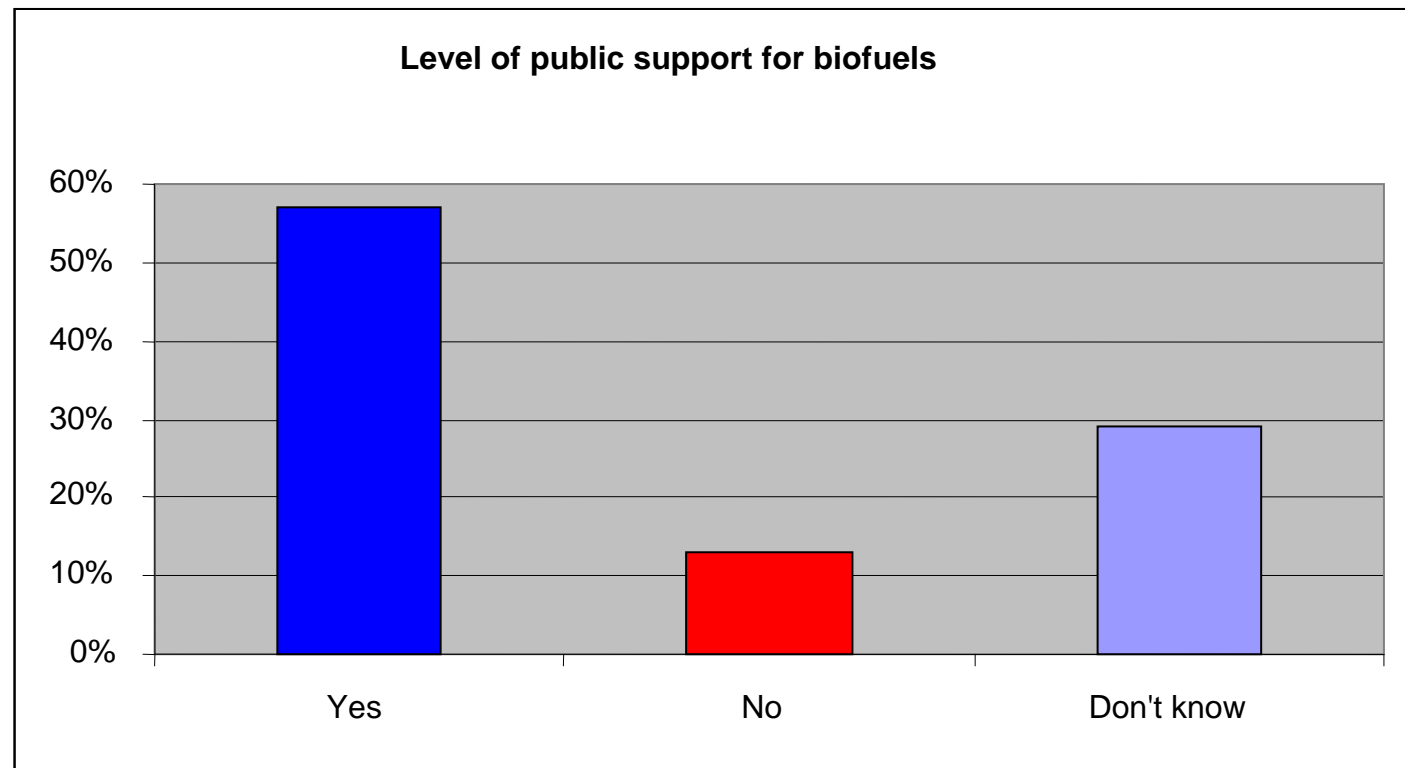
Biodiesel buyers' consortium

- Biodiesel producers supported by grant scheme cannot get major oil companies to buy their product
- EECA initiated a buyers' consortium of commercial tourism operators in Queenstown wanting to use biodiesel in Queenstown (not retail) to create market pull
- Independent distributor won consortium tender for B20
- Consortium approach now being replicated



Consumer attitudes to biofuels

- Relatively high proportion of consumers uncertain about biofuels (30%) with sustainability being main doubt, so information needed



Voluntary sustainability reporting scheme

- Based on UK renewable transport fuels obligation approach
- Reporting scheme and values internationally peer reviewed
- All retailers and wholesalers offering biofuel blends are participating in the scheme

THIS FUEL IS BETTER FOR THE
ENVIRONMENT. FIND OUT HOW
eeca.govt.nz/biofuels



New Zealand transport biofuel research and potential

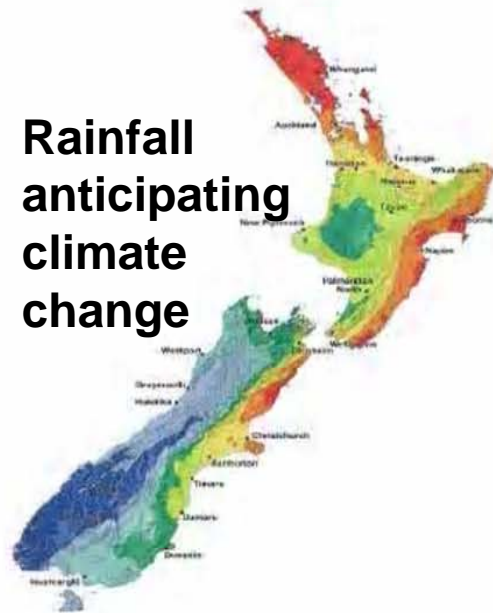
- Lanzatech – producing ethanol from carbon monoxide in industrial waste gases (now in partnership with Boasteel in China)
- Solray Energy and NIWA – producing renewable crude oil at a pilot scale super critical water reactor from wild algae harvested from high rate algal ponds as part of sewage treatment
- Aquaflow – researching renewable crude and fine chemicals production from wild algae as part of sewage treatment (partnership with UOP)
- Scion – developing pilot plant for recovering sugars from soft wood (*pinus radiata*) for biofuel feedstock
- Scion – bioenergy feedstocks resource mapping and projections: 3.5 million Ha marginal land available for forestry for biofuels – sufficient to meet current NZ transport fuel needs
- http://www.bioenergy.org.nz/liquid_biofuels_about.asp#KeyPlayers

Marginal land available for biofuels from wood

Marginal land

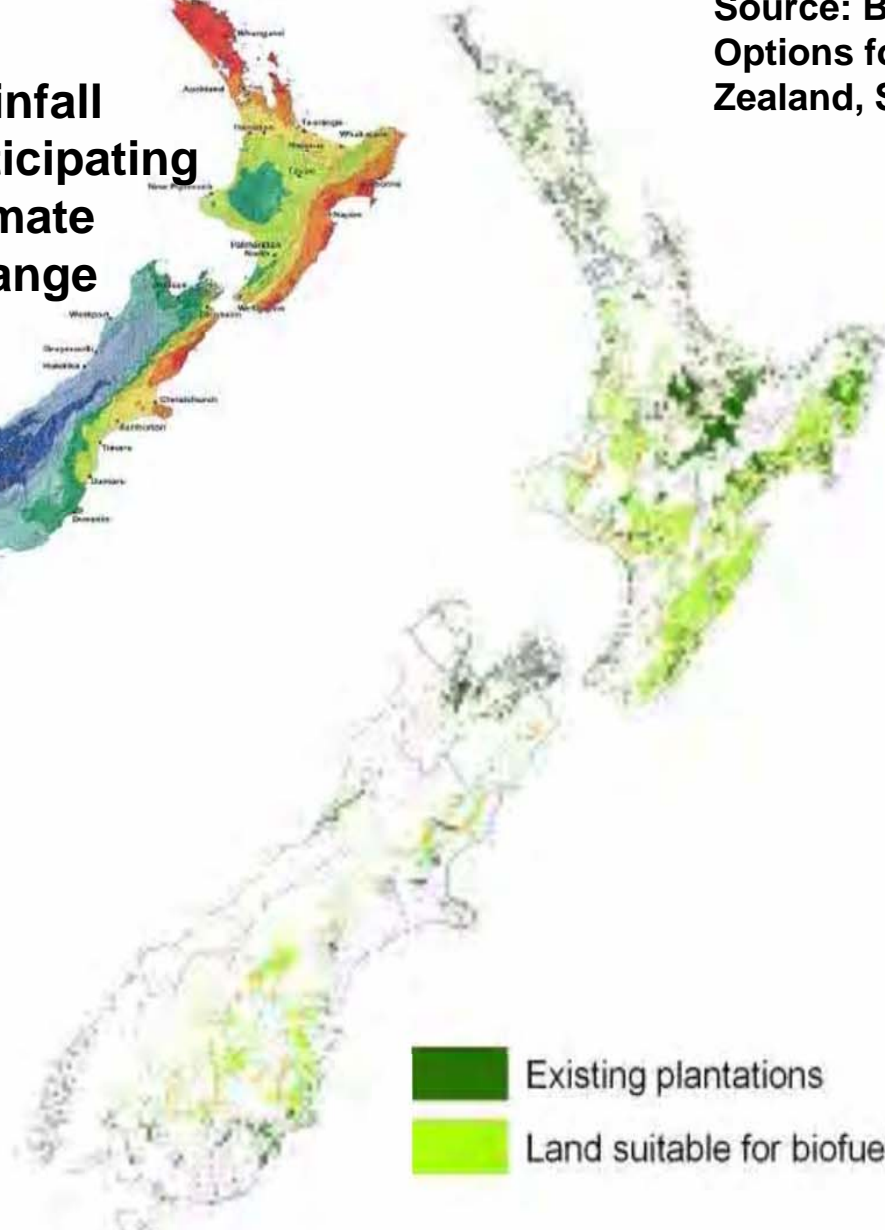
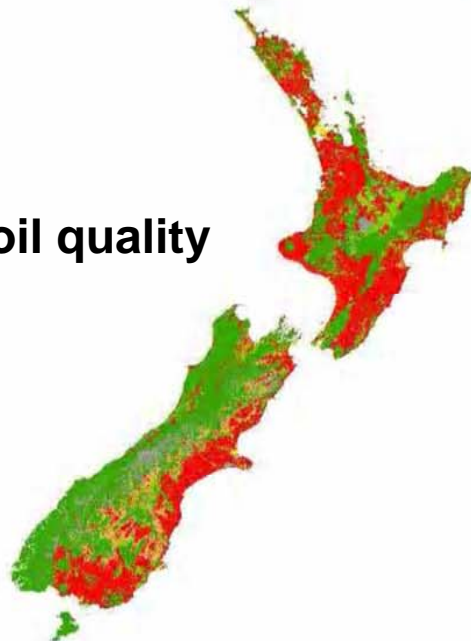


Rainfall anticipating climate change



Source: Bioenergy Options for New Zealand, Scion

Soil quality



- Existing plantations
- Land suitable for biofuel



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New Zealand ideal market for EVs

- High proportion of renewable electricity generation maximises EVs benefits
- No infrastructure needed to start bringing in EVs today
- Travel patterns suited to EVs



How can EVs can contribute to New Zealand energy efficiency

- Improve transport energy efficiency
 - 4 times more efficient than comparable petrol vehicles
 - 3 times more efficient than a hybrid
- Even on a ‘well-to-wheel’ basis, EVs are on top

Model	Type	Car (km/MJ)	W to W (km/MJ)
Leaf	Electric	1.74	0.98
Insight	Hybrid	0.69	0.57
I30	Efficient ICE	0.64	0.52
Corolla 1.8	Standard petrol	0.38	0.31

Assuming 2009 New Zealand electricity generation mix

Emissions reductions big for New Zealand

- EVs will displace a large quantity of GHG emissions
- EVs also reduce PM and other emissions, improving air quality
- By replacing a petrol car with an EV we can reduce per year:
 - energy use by 27GJ
 - 1.9 tonnes of CO₂e
- For a million EVs the savings would be:
 - 27PJ of energy
 - 1.9 million tonnes of CO₂e

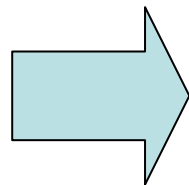
Emissions per kilometre

Model	Grams CO ₂ e per Km
Leaf	25
Insight	93
I30	106
Corolla	173

Assuming 2009 New Zealand electricity generation mix of 72.5% renewable
 If target of 90% renewable generation by 2025 achieved, even greater GHG reductions

Barriers to uptake: Infrastructure

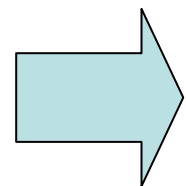
- New Zealand's infrastructure is already able to support electric vehicle deployment
 - 230 Voltage – recharges vehicles in 6 to 8 hrs
 - Most household wiring supports 15 amp electricity sockets
 - High proportion of households have garages
 - No transmission upgrade required (assuming overnight charging)
- As vehicle numbers grow, then address fast charging and charging away from home, but no need to wait for these before bringing in EVs



We have the infrastructure we need today for EVs

NZ travel patterns

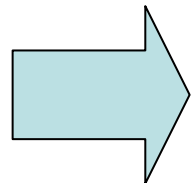
- Most New Zealanders travel short distances on a daily basis, well within EV stated ranges
 - 90% percent of NZ vehicles travel less than 84km
 - For main urban areas less than 69km
- This range won't support holiday trips or large loads
 - 52% of NZ households have 2 or more vehicles
 - EVs are a perfect second vehicle for city driving
 - Alternatives for single vehicle households for the occasional long range demand can include:
 - Hire vehicles for a holiday
 - Swap with family or friends for a short spell



EVs can be everyday vehicles for most NZ drivers

Barriers for Uptake: Regulatory

- Hardware regulations
 - 3 pin plug is OK
 - Voltage and Amp requirements are good
- Safety regulations
 - Electrical safety standards – existing requirements ensure safe charging and operation
 - Frontal impact standards – existing requirements ensure safe cars



EVs can charge up and be driven today

Wellington City Council trial

- Two year trial commenced in October 2010 with five Mitsubishi i-MiEV vehicles, including some with a courier company
- Expanding in 2011 with Nissan LEAF vehicles and more i-MiEVs
- Wellington is home to the 142 MW West Wind wind farm which operates at a capacity factor of about 48%



Summary

- New Zealand has a significant potential for both biofuels and electric vehicles, and they are complementary technologies
- Elizabeth.Yeamans@eecca.govt.nz
- www.eeca.govt.nz
- www.energywise.org.nz
- www.eecabusiness.govt.nz