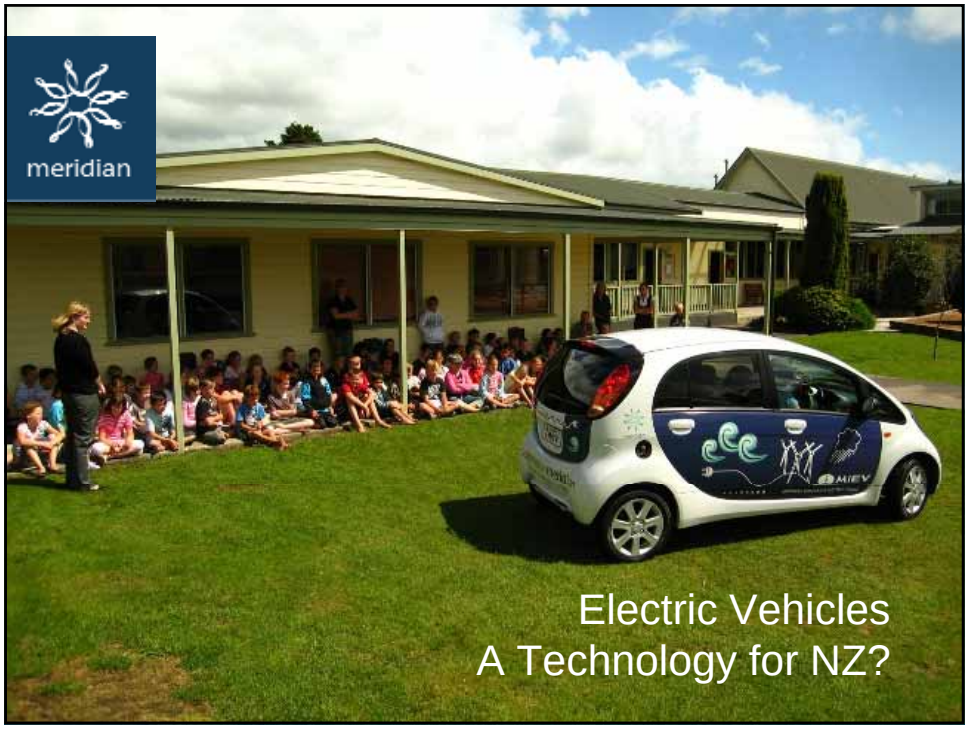
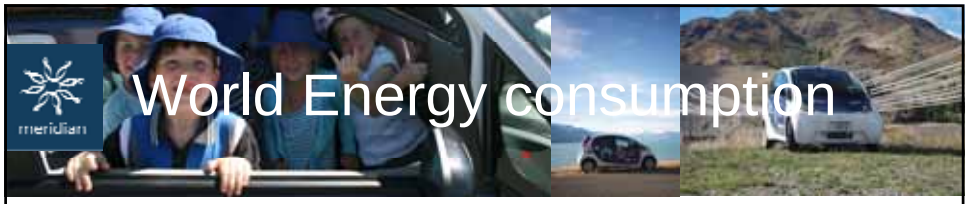
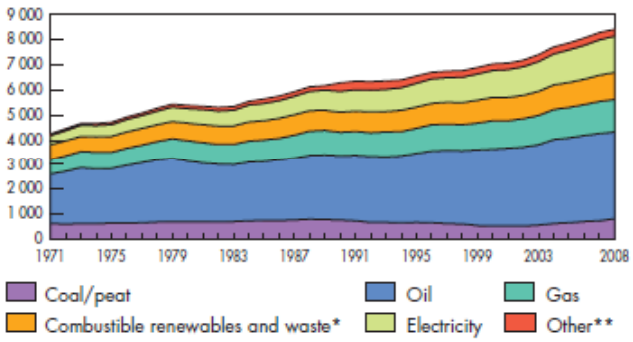




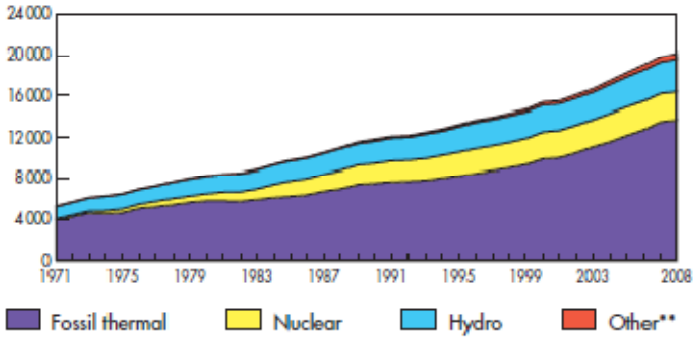
World

Evolution from 1971 to 2008 of world total final consumption by fuel (Mtoe)



World Electricity Generation

Evolution from 1971 to 2008 of world electricity generation* by fuel (TWh)



74% of all C02e is from energy

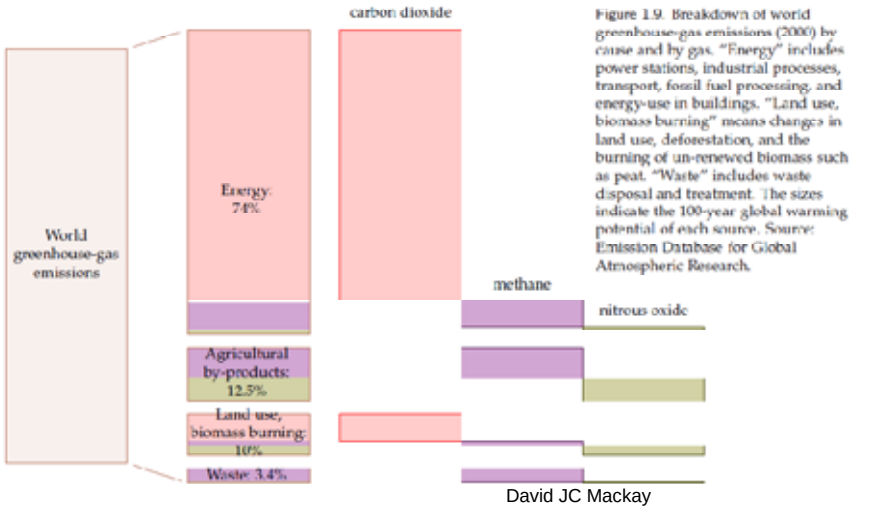
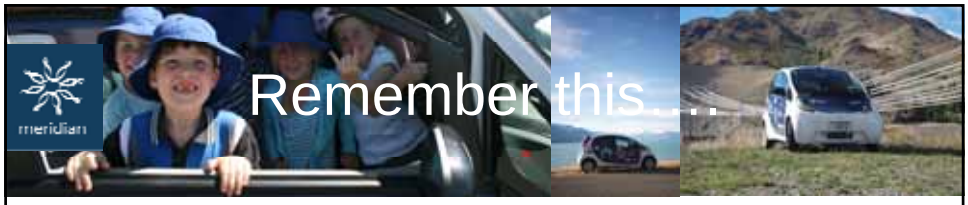
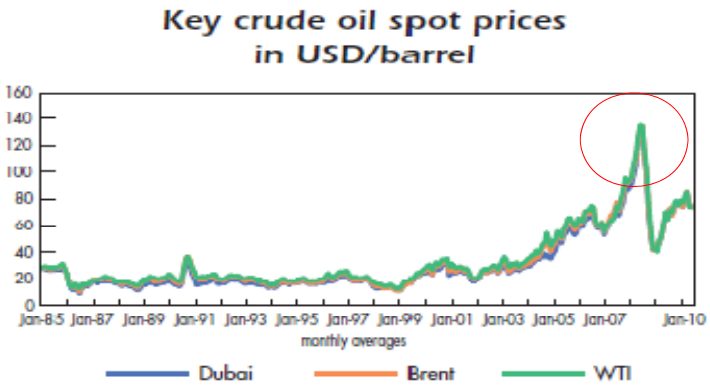


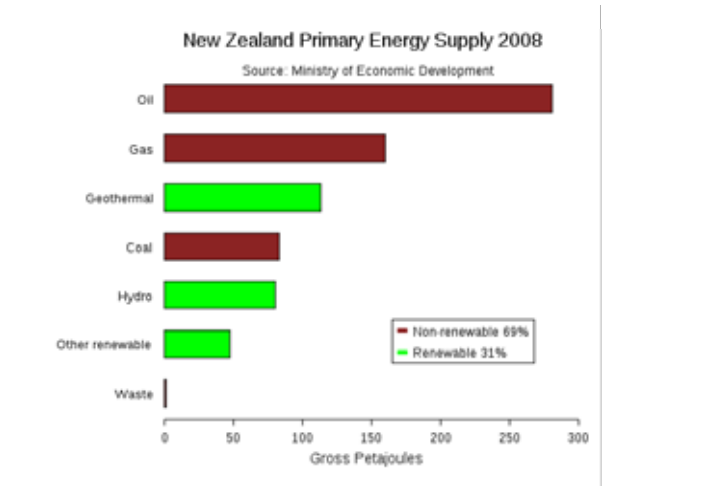
Figure 1.9. Breakdown of world greenhouse-gas emissions (2000) by cause and by gas. "Energy" includes power stations, industrial processes, transport, fossil fuel processing, and energy-use in buildings. "Land use, biomass burning" means changes in land use, deforestation, and the burning of un-renewed biomass such as peat. "Waste" includes waste disposal and treatment. The sizes indicate the 100-year global warming potential of each source. Source: Emission Database for Global Atmospheric Research.

David JC Mackay
Sustainable Energy without the hot air. 2008

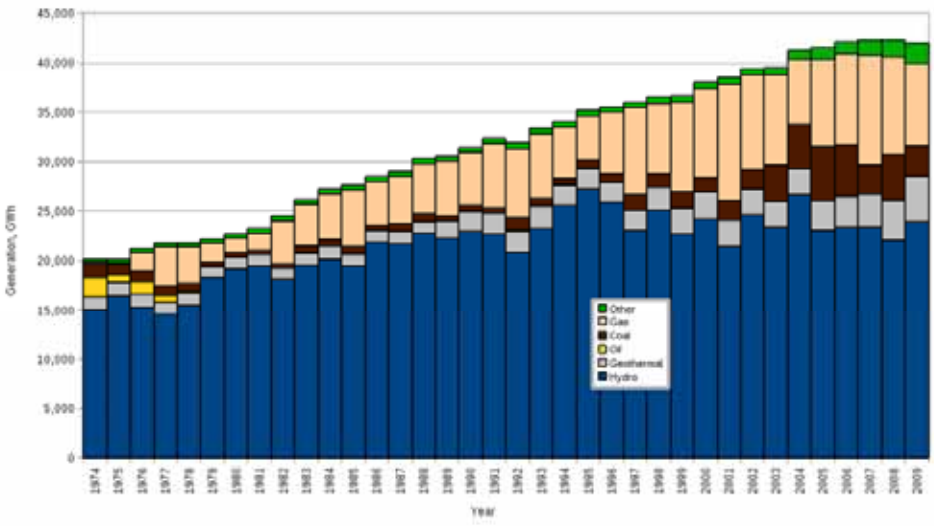


Remember this…





NZ Electricity Generation Fuel Sources



90% Renewable Energy by 2025

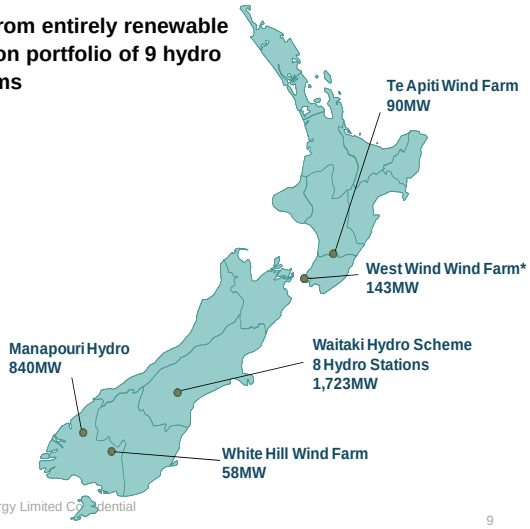
"New Zealand has an abundance of renewable resources for electricity generation.
Renewables contributed 73 per cent of electricity generation in 2009."

Developing our Energy Potential (Draft New Zealand Energy Strategy) 2010.

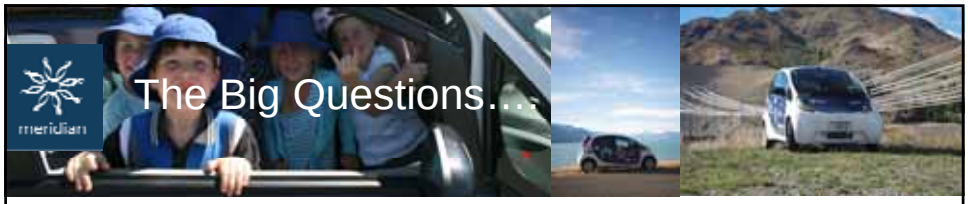
100% Renewable Generation Portfolio & NZ's Largest Generator/Retailer

Meridian generates its electricity from entirely renewable sources, with an existing generation portfolio of 9 hydro stations and 3 operating wind farms

Power Station	Type	Capacity
Manapouri	Hydro	840MW
Tekapo A, B	Hydro	185MW
Ohau A, B C	Hydro	688MW
Benmore	Hydro	540MW
Aviemore	Hydro	220MW
Waitaki	Hydro	90MW
Te Aptii	Wind	90MW
West Wind*	Wind	143MW
White Hill	Wind	58MW



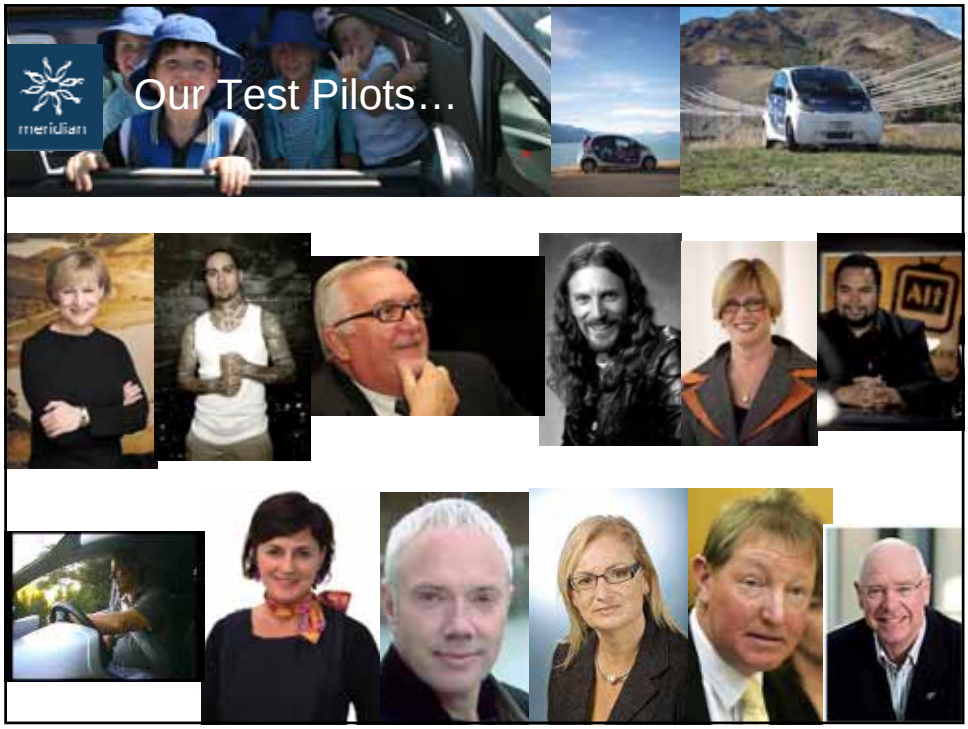
9



The Big Questions…

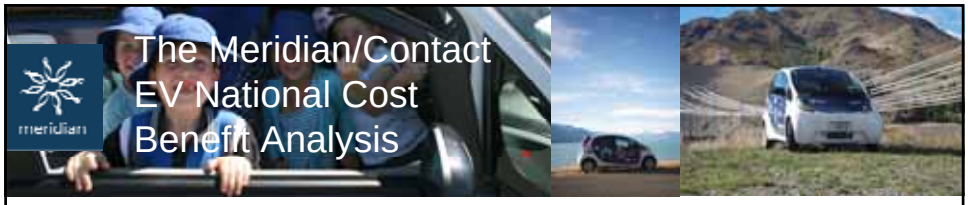
- What value does an accelerated electric vehicle programme bring to NZ?
- What are the likely hurdles to uptake?
- What do Kiwi's feel about electric cars?


The Trial….2 Cars,
3 Months…..
meridian


Our Test Pilots…

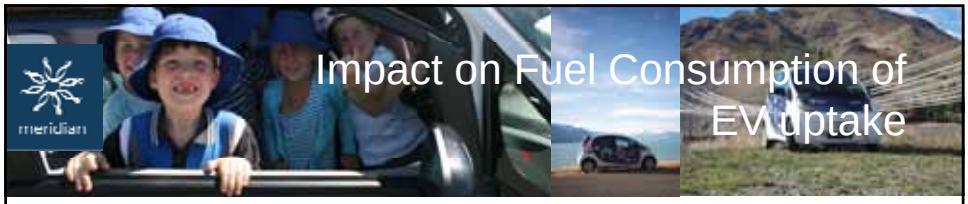

Consumer Response

- Research summary – national averages.
  - Use of an electric car…
    - 62% would use the car for commuting
    - 63% would use an EV for shopping and errands.
    - 39% said they would use it for 1 day trips…
  - How far would you drive it?
    - An average of ~51kms/day
  - How much would you expect to pay (for the iMiEV)?
    - ~$28,000
  - Range anxiety was an issue – would prefer some backup (ability to charge when out and about).



The Meridian/Contact EV National Cost Benefit Analysis

- Primary Objectives
  - Credibly determine whether early adoption accrues a net benefit to NZ
  - Determine and quantify the costs and benefits
  - In the case of benefits, identify barriers to accelerated demand.
  - In the case of costs, identify any change mechanisms to overcome them.
  - Identify and quantify mechanisms to overcome these barriers.
- Scope
  - Estimates of EV uptake
    - which is both battery electric vehicles (BEV's) and plug in hybrid electric vehicles (PHEV's)



Impact on Fuel Consumption of EV uptake

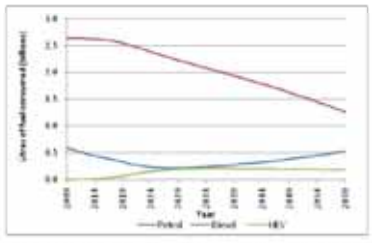


Figure 11-6 Aggregate fuel consumption under no EV uptake scenario

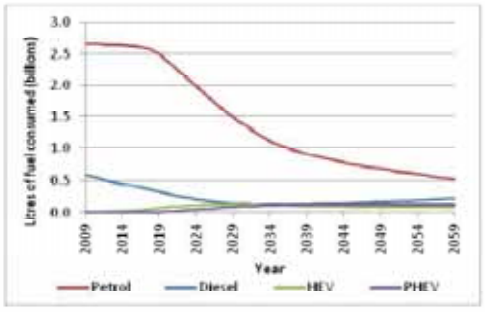
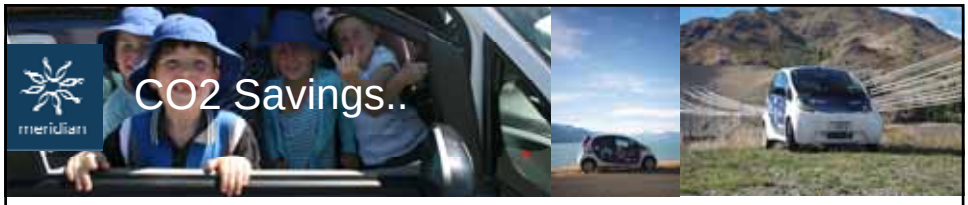


Figure 11-6 Aggregate fuel consumption under business as usual EV demand scenario



CO2 Savings..

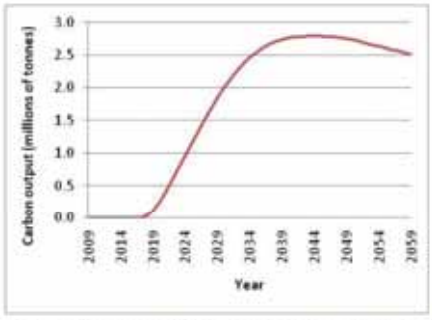


Figure 11-7 Total CO_2 savings (business as usual EV demand relative to no EV uptake)

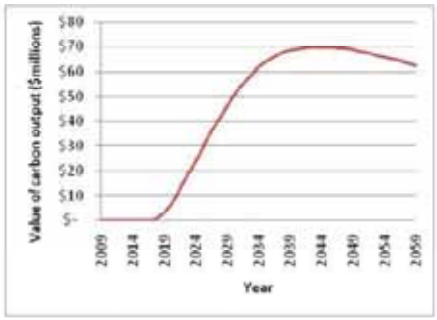
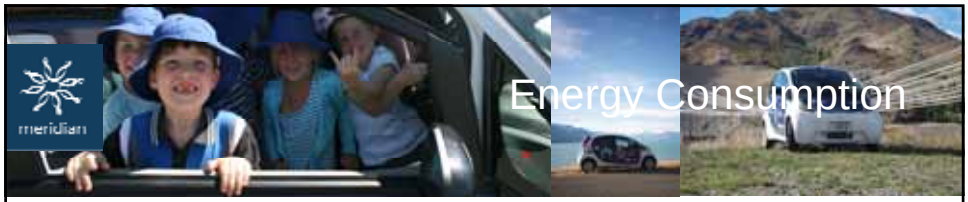


Figure 11-8 Total CO_2 savings (business as usual EV demand relative to no EV uptake)



Energy Consumption

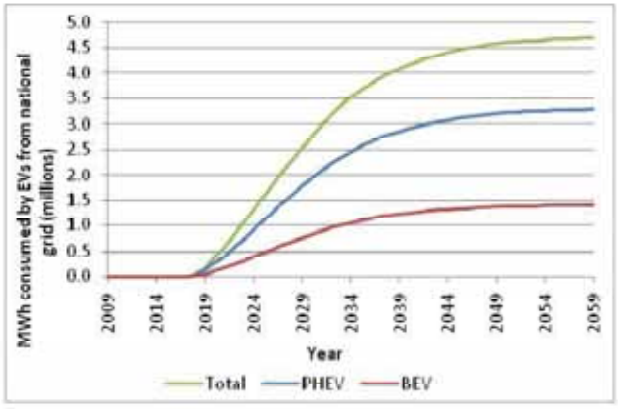
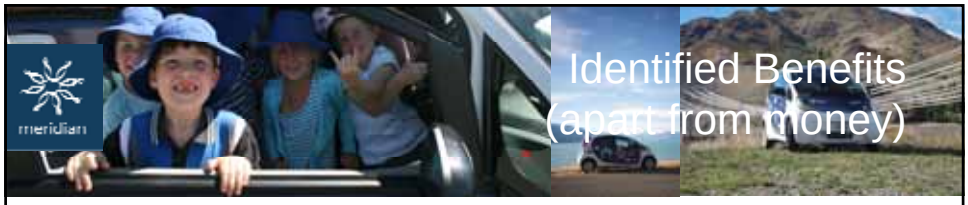


Figure 11-9 Electricity consumption in business as usual EV demand scenario

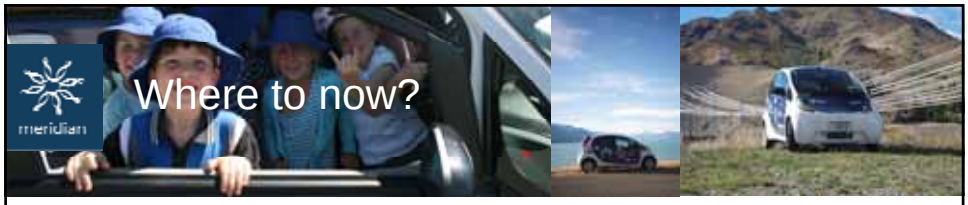


Identified Benefits (apart from money)

- Energy security
  - Decreased costs of holding oil reserves and national dependence on imports.
- Air Quality
- Stormwater quality
  - Reduced coastal degradation due to reduced pollutants deposited on roads.
- Noise Pollution Reduction
  - EV's have very little road noise.

The Cost Benefit Results

- Conclusions
  - Electric vehicles are good for New Zealand
    - $8.2bn (91% is accrued to the vehicle purchaser)
    - $769m is gained by the wider community
  - Accelerating demand increases net benefits
    - Additional $360m ($280m+ is accrued to externalities – air pollution and carbon)
  - Supply constraints make realising the benefits difficult
    - Production constraints and strong overseas incentives will mean demand exceeds supply
  - The challenge is to create and environment where business as usual demand can be realised
    - In a supply constrained environment, the ICV will continue to dominate.



- We’re continuing to work with manufacturers.
- Price remains a major barrier.
- Safety is something we’re focusing on.
- New questions we are exploring:
  - Significant investment is going into smart grids internationally - what can NZ learn from this?
  - How do we ensure that new smart devices (like EV’s?) are optimised into the grid?

- Meridian Ltd & Contact Energy Ltd National cost-benefit assessment of the early uptake of electric vehicles in New Zealand
- Sustainable Energy without the hot air. David JC MacKay
- IEZ Key World Energy Statistics 2010
- Contact Details: nigel.broomhall@meridianenergy.co.nz