

Electric Vehicles

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Introductions

- ★ Ian Hooper, Maida Vale
- ★ Degree in Mechatronic Engineering
- ★ Currently run a business promoting electric vehicles in Australia
- ★ Recently converted Mazda MX5 to battery electric



Free Lunch Will Soon Be Over

- ★ Petrol contains an amazing amount of energy, but is non-renewable resource
- ★ Other forms of combustible fuel need to be produced
 - ★ Hydrogen production by electrolysis of water <50% efficient
 - ★ Biofuel requires large amounts of farmland
 - ★ Biofuel to fill a Hummer's fuel tank requires same farming resources as food for a family for a year!
- ★ Combustion engines are only 30% efficient



Sustainable Transport

- ◆ 40% of all greenhouse gas emissions are from transport
 - ◆ We need transport solutions which use renewable energy and do not generate CO₂!
- ◆ Electric vehicles can be recharged from electricity generated by renewable sources
 - ◆ e.g Green Power, roof-top solar
- ◆ Electric vehicles are highly efficient
 - ◆ Up to 90% total system efficiency



Commonly Held Misconception

- ★ *“If electric cars are recharged from a mains grid primarily powered by fossil fuels, they are just as bad for the environment as petrol cars?”*
- ★ The simple answer: Why haven't you signed up for Green Power yet?
- ★ Also, power stations and EVs are much more efficient than petrol engines

CO2 Emissions Comparison



Holden Commodore
V6 Petrol
255 g/km



Toyota Prius
Hybrid
104 g/km



Tesla Roadster
Battery Electric
~50 g/km*

** Based on electricity generated entirely from fossil fuels*



Running Cost Comparison

- ★ Typical petrol vehicle: 10L/100km
- ★ 1L fuel costs say \$1
- ★ 10 cents per km
- ★ Electric vehicle uses 0.2kWh/km
- ★ \$0.20/unit (kWh)
- ★ ~4 cents per km
- ★ *Offpeak electricity @6c/unit = ~1c/km!*



Converting a Car to Electric

- ★ It's a big job!

- ★ First-timers usually take about 100 hours
 - ★ not including research and design time..

- ★ So why bother?

- ★ Unfortunately there are no mass produced electric vehicles for sale in Australia*, so we have to make our own.

** as of December 2008*



Motivation?

- ★ The environmental imperative

- ★ *"We do not inherit the earth from our ancestors, we borrow it from our children."*
- *Native American Proverb*

- ★ *"You must be the change you wish to see in the world."*
- *Mahatma Gandhi*

Conversion Process



- ◆ Remove the petrol engine, fuel tank, radiator, etc..

Conversion Process



- ◆ Replace with an electric motor

Conversion Process



- ◆ Install some batteries up front..

Conversion Process



◆ Some more in the back..

Conversion Process



- ◆ And some extra electronics etc..

Conversion Process



◆ And we're done! (Sounds easy, right?)

The Future

- ★ Real change will be possible when mass-produced electric vehicles hit the market (2010?)
- ★ Huge scope for improving vehicle efficiency
 - ★ e.g Lighter and more aerodynamic
 - ★ The Aptera (right) uses six times less energy to get from A to B than my MX5!



The Future

★ I'm also a big advocate of personal transportation solutions, e.g

◆ Electric bicycles

◆ Electric scooters

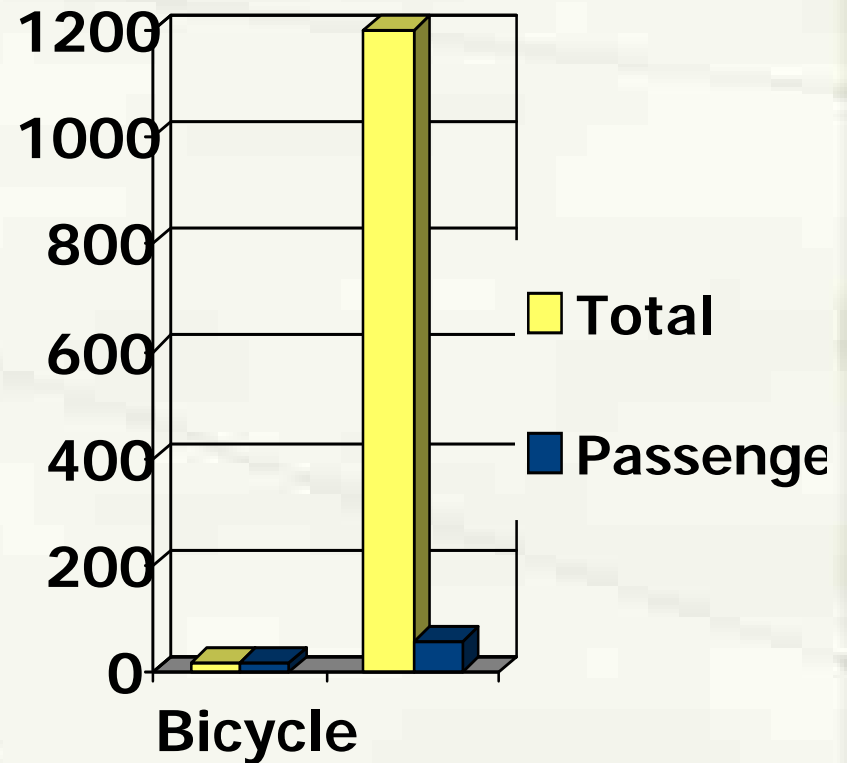
◆ Segway type scooters



★ Makes a lot more sense than bringing 1 tonne of metal with you everywhere!

Side Note: Energy Efficiency

- ★ Human riding a bicycle: 20 calories per kilometre
- ★ Average car: 1200 calories per km! (60x worse)
- ★ Problem: The passenger only represents 5% of total weight in car.





Get Involved

◆ Australian Electric Vehicle Association

◆ <http://www.aeva.asn.au>

◆ Zero Emission Vehicles Australia

◆ <http://www.zeva.com.au>