

# Electric Cars ! Then & When?

AEVA ADELAIDE PRESENTATION

Wednesday September 21, 2011

# Electric Cars !

- Introduction
- A Short History of the Electric Car
- What is in Electric Car ?
- Now and the Future...
- Converting a Car to Electric Drive.

# Electric Cars !

- Introduction
- A Short History of the Electric Car
- What is in Electric Car ?
- Now and the Future...
- Converting a Car to Electric Drive.

# Electric Cars !

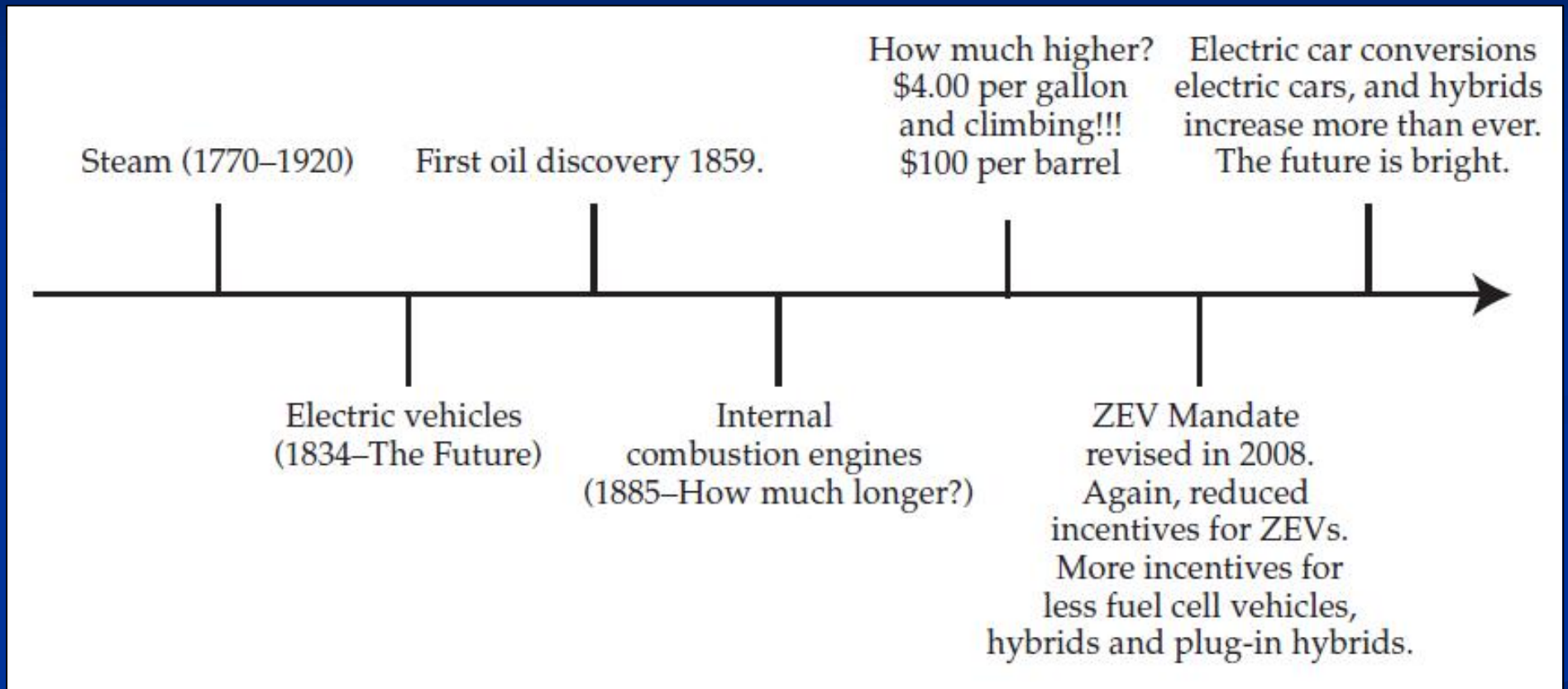


Diagram: courtesy of "Build Your Own Electric Car" by Seth Leitman and Bob Brant

# Electric Cars !

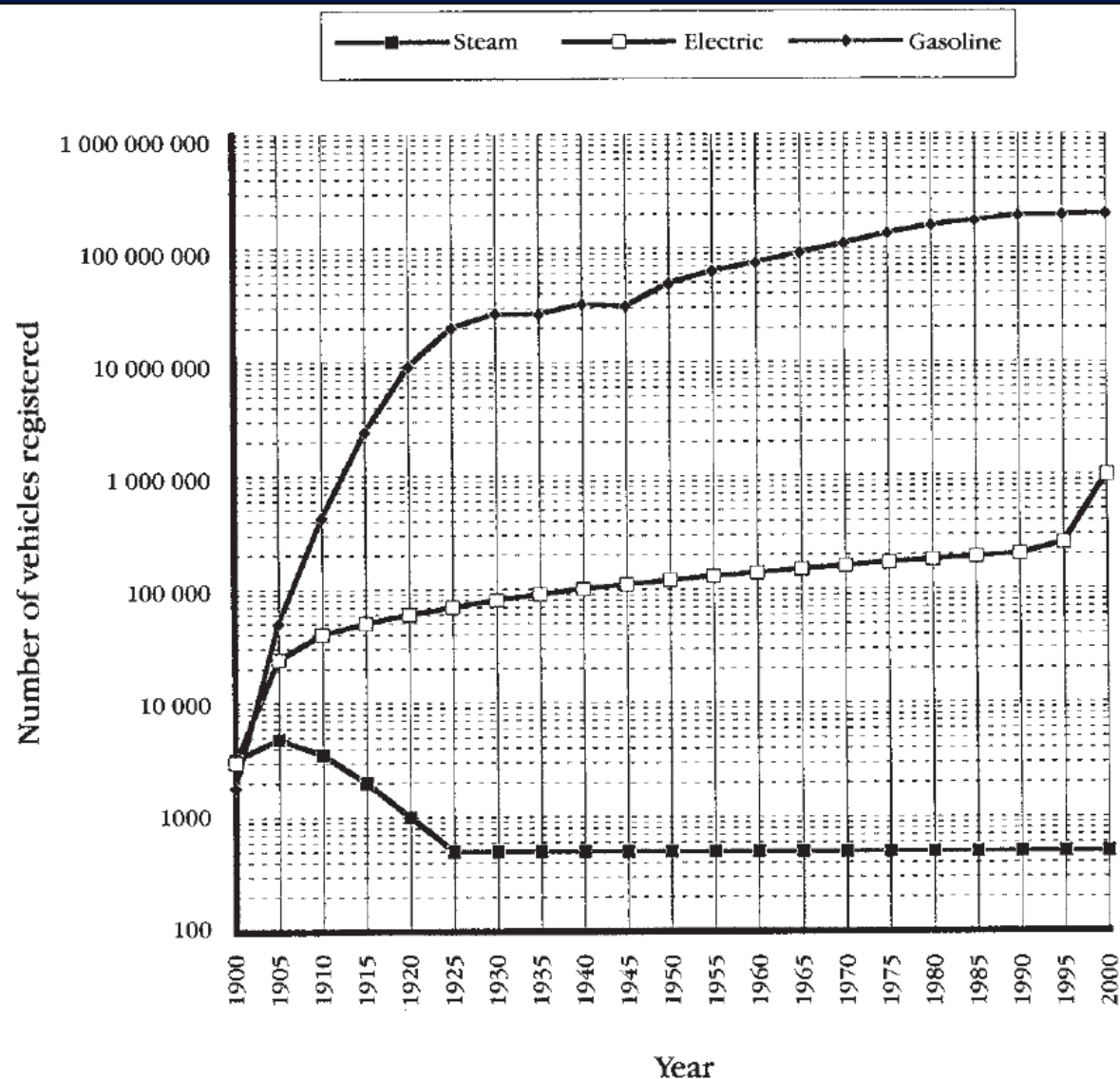
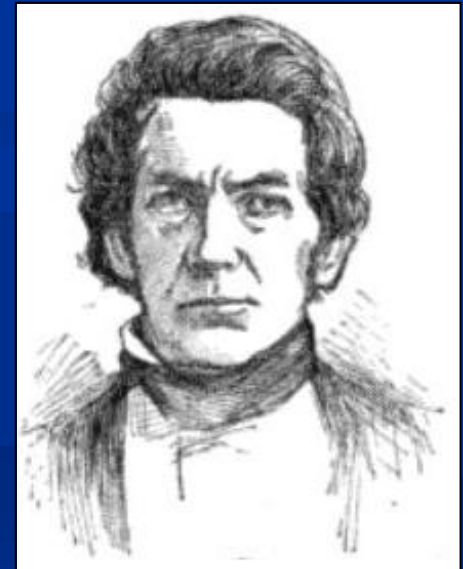


Diagram: courtesy of  
"Build Your Own Electric Car"  
by Seth Leitman and Bob Brant

# Electric Cars !

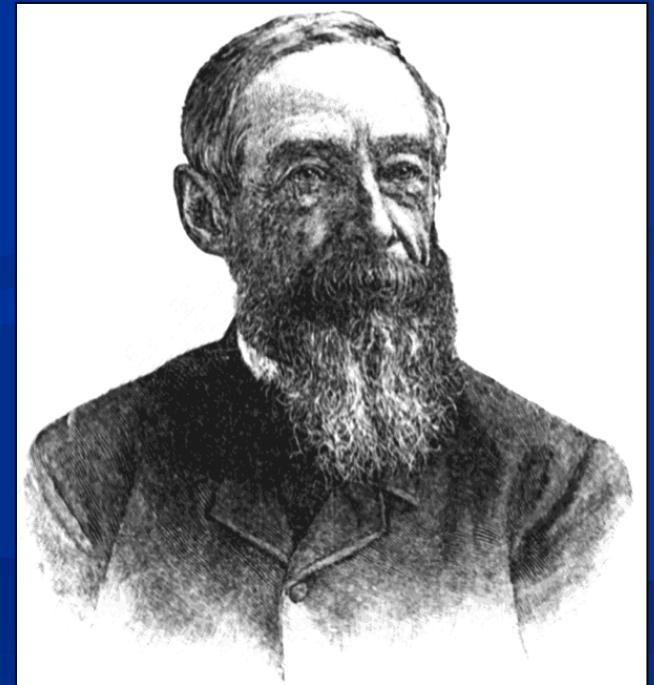
1834 - Thomas Davenport, America.  
Thomas invented the electric motor  
and tested it in a battery powered  
model electric car on a short  
track. The battery was  
non-rechargeable.



# Electric Cars !

1847 - Moses Farmer, America.

Electric car, two passengers,  
non-rechargeable battery  
(experimental).

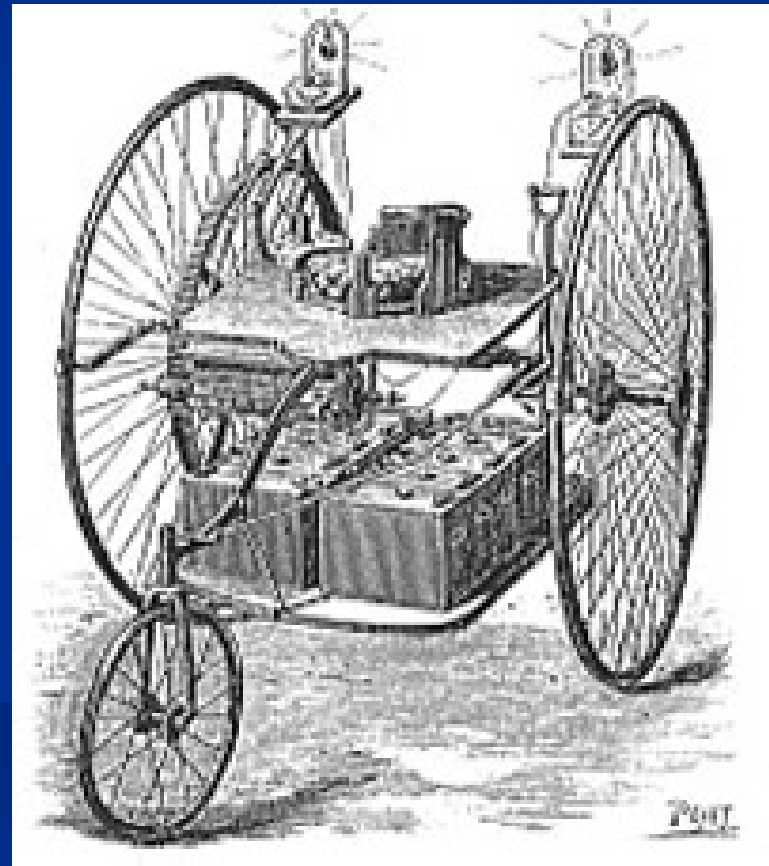


# Electric Cars !

1851 - Charles B Page, America

19mph (31km/hr)

electric car with  
non-rechargeable  
battery.





# Electric Cars !

1859 - Gaston Planté , France,  
developed the lead storage battery,  
the first  
rechargeable  
battery.



# Electric Cars !

1874 - Sir David L Salomons, England.  
Battery powered carriage.



# Electric Cars !

1881 - Camille Favre, France.

Storage battery improvement.

This led the way for the development of many electric vehicles.

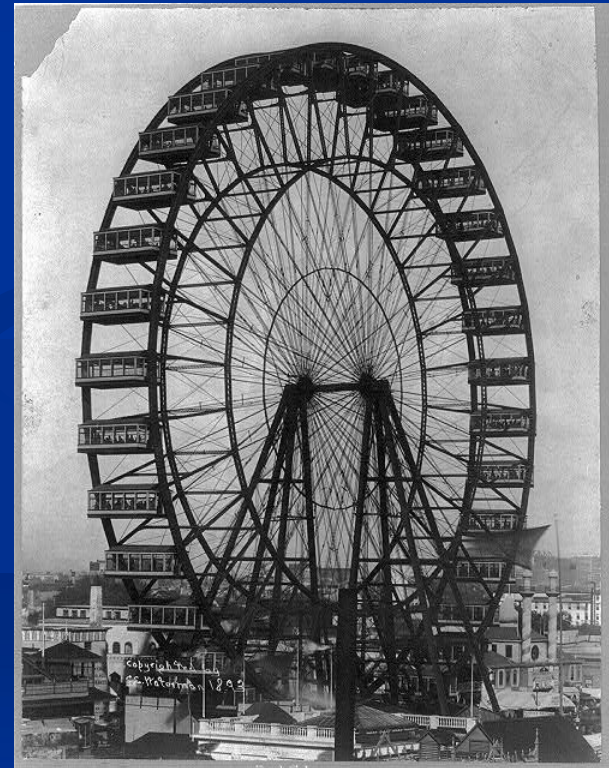
# Electric Cars !

1888 - Fred Kimball, America.  
Electric car operated in Boston.

1891 - William Morrison, America.  
Electric car operated in Chicago.

# Electric Cars !

1893 - Electric carriages were used at the Chicago World's Fair to carry visitors.



# Electric Cars !

1899 - Land speed record in an electric car: La Jamais Contente. The vehicle had two 25kW direct drive motors.

Approx 68HP. (200 V Pb-acid). The vehicle was driven by Camille Jenatzy, a Belgian.



110Km/hr

# Electric Cars !

18

car

ha

Ap

ve

a F



C

# Electric Cars !

There were many electric vehicle manufacturers in operation from 1895 through to the 1930's, with the peak production in 1912.

The next slides show some of these...



# Electric Cars !



Riker Electric: 1896-1899 - USA

# Electric Cars !



Lohner-Porsche Electromobile: 1900

# Electric Cars !



Columbia Electric: 1904 - USA



# Electric Cars !



Krieger: 1904 - France



# Electric Cars !

**The Standard of Electric Vehicles**

The carriage for every-day service—no matter what the weather.

The simplest to operate—the safest to drive.

**Baker Electric Vehicles**

The Automobile without a repair bill.

The Car with a motor and controller which require no attention, and that will **not** arc or freeze.

The highest expression of modern electrical and mechanical engineering combined with nine years' experience in progressive Electric Automobile construction.

**Runabout**

The Machine with a factory behind it which produces quality.

The pride of the maker.

The pride of the owner.

The Electric recognized as the most efficient in the world.

The Automobile with the fewest parts and fewest adjustments.

**Queen Victoria**

**Roadster**

**Landaulet**

**Inside driven Coupe**

**Baker Electric Vehicles**

Baker Electrics are built on the principle that

**"Simplicity means Reliability"**

Let us send you our catalog showing a complete line of fifteen different models of Baker Electrics.

**The Baker Motor Vehicle Company**

Agencies in all principal cities. 33 W. 80th Street, Cleveland, O.

Baker Electric:  
1899-1916 - USA

Eric Rodda

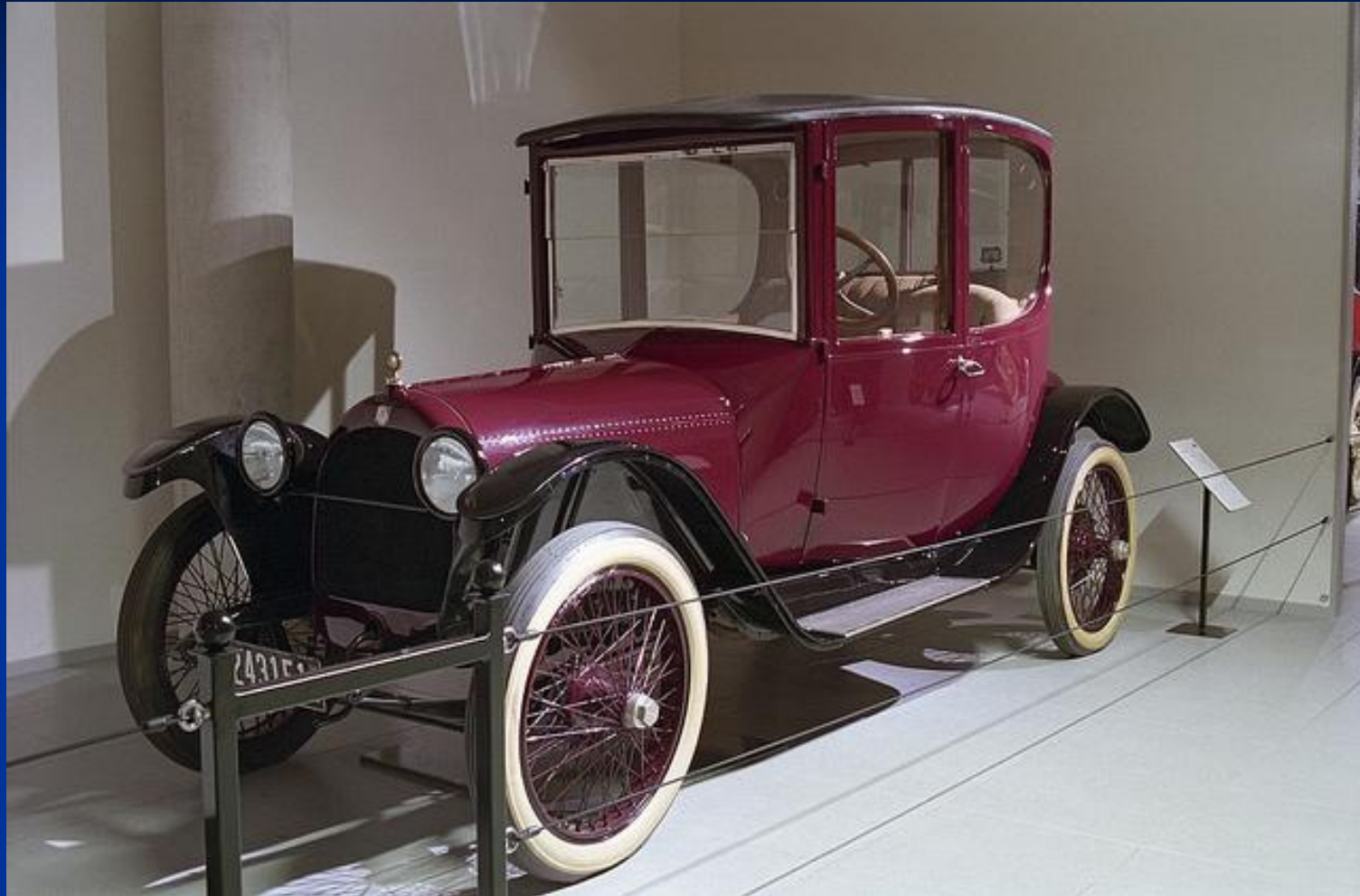
# Electric Cars !



Detroit Electric: 1915 - USA



# Electric Cars !



Woods Dual Power: 1917-1918 - USA

# Electric Cars !



1922

Milburn Electric: 1914-1927 - USA



# Electric Cars !

There was some but not a lot of activity in electric vehicle manufacturing between the 1930's and the 1960's...

# Electric Cars !



Fuel Cell  
-Electric

GM Electrovan: 1966 - USA

# Electric Cars !



Ford Comuta: 1967 - UK

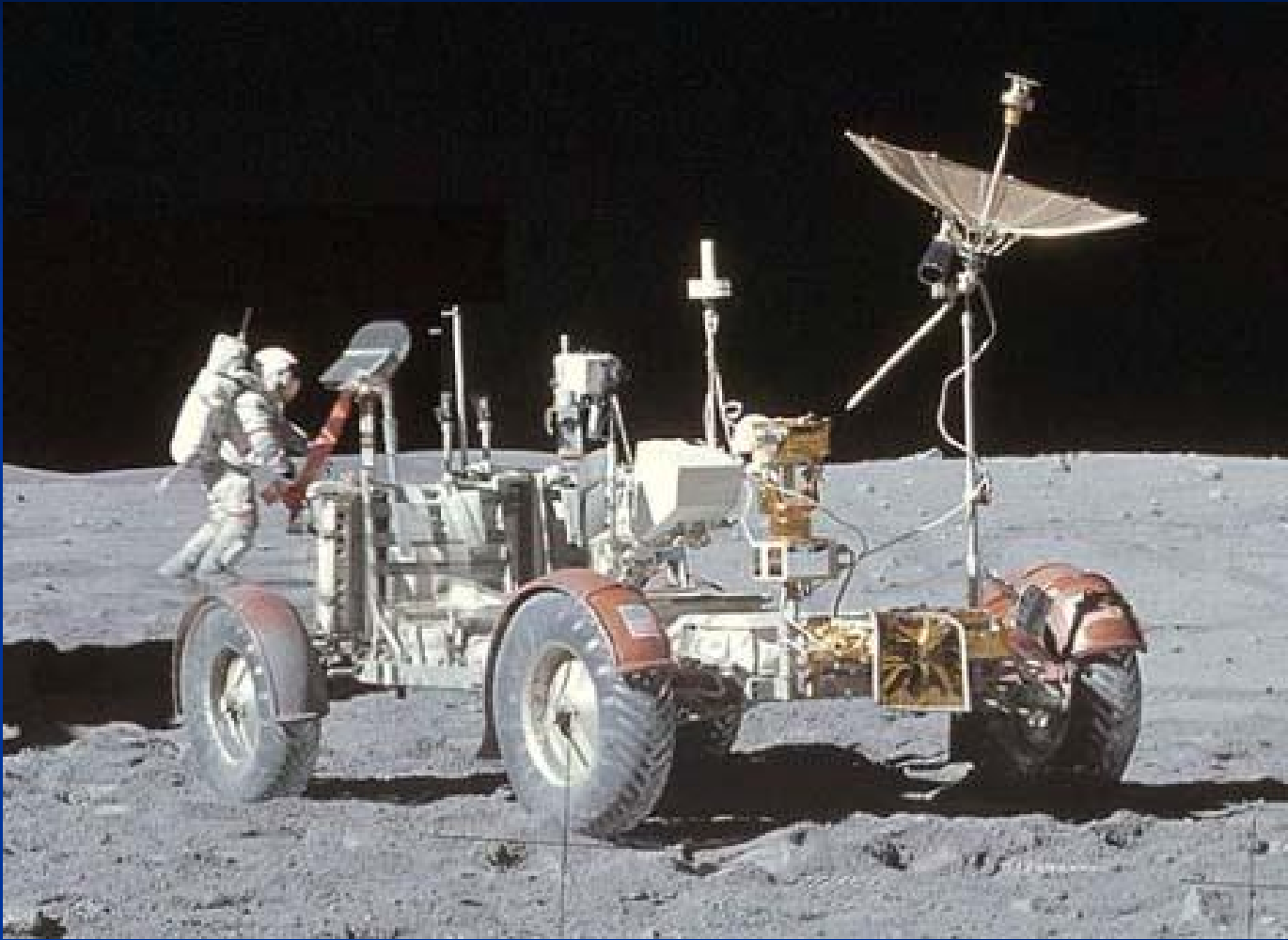
# Electric Cars !



GM Series 512 Electric: 1969 - USA

Eric Rodda

# Electric Cars !



Apollo 15,  
16 & 17  
missions.  
92km  
range &  
16km/hr  
top speed.

Lunar Roving Vehicles: 1971-1972 - USA



# Electric Cars !



Enfield 8000 Electric: 1971-1976 - UK

# Electric Cars !

In 1996 GM introduced the all electric  
“EV1”

into California.

This electric car was powered initially  
by Pb-acid, and later models by NiMH.

In total; 1,117 EV1s were produced.

# Electric Cars !



Electric

ally  
MH.  
ed.



# Electric Cars !

1996 to 1999 – GM's “EV1”.

The range was up to 100miles with the Lead Acid batteries and up to 140miles with the NiMH batteries.

The car's top speed was electronically limited to 80 mph (130 km/h).

# Electric Cars !

1996 to 1999 – GM's “EV1”.

By 2002 the lease on all EV1s had been cancelled and all recalled.

Most were crushed, with a few disabled ones remaining in universities and museums.

# Electric Cars !



# Electric Cars !

1996 to 1999 – GM's "EV1"

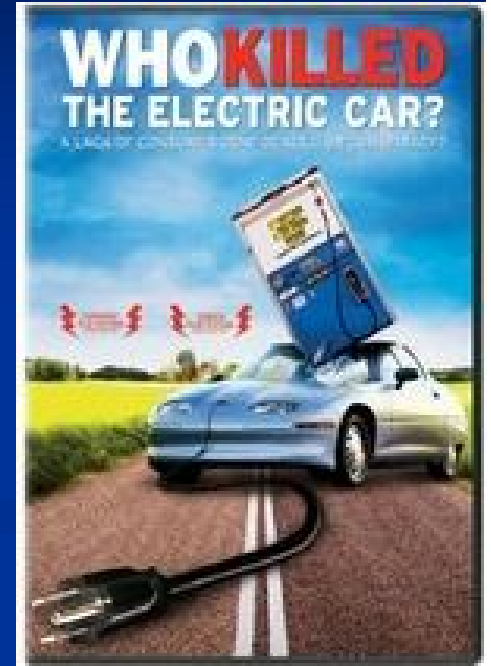
Chris Paine's documentary movie:

"Who Killed the Electric Car" is available on DVD.

This tells the whole story.

\*\*\* New movie by Chris Paine:

"Revenge of the Electric Car"



# Electric Cars !

- Introduction
- A Short History of the Electric Car
- What is in Electric Car ?
- Now and the Future...
- Converting a Car to Electric Drive.



# Electric Cars !

Is a hybrid an electric car ?

- No

Is a plug-in hybrid an electric car ?

- No, but getting closer...

# Electric Cars !

## The Definition of an Electric Car:

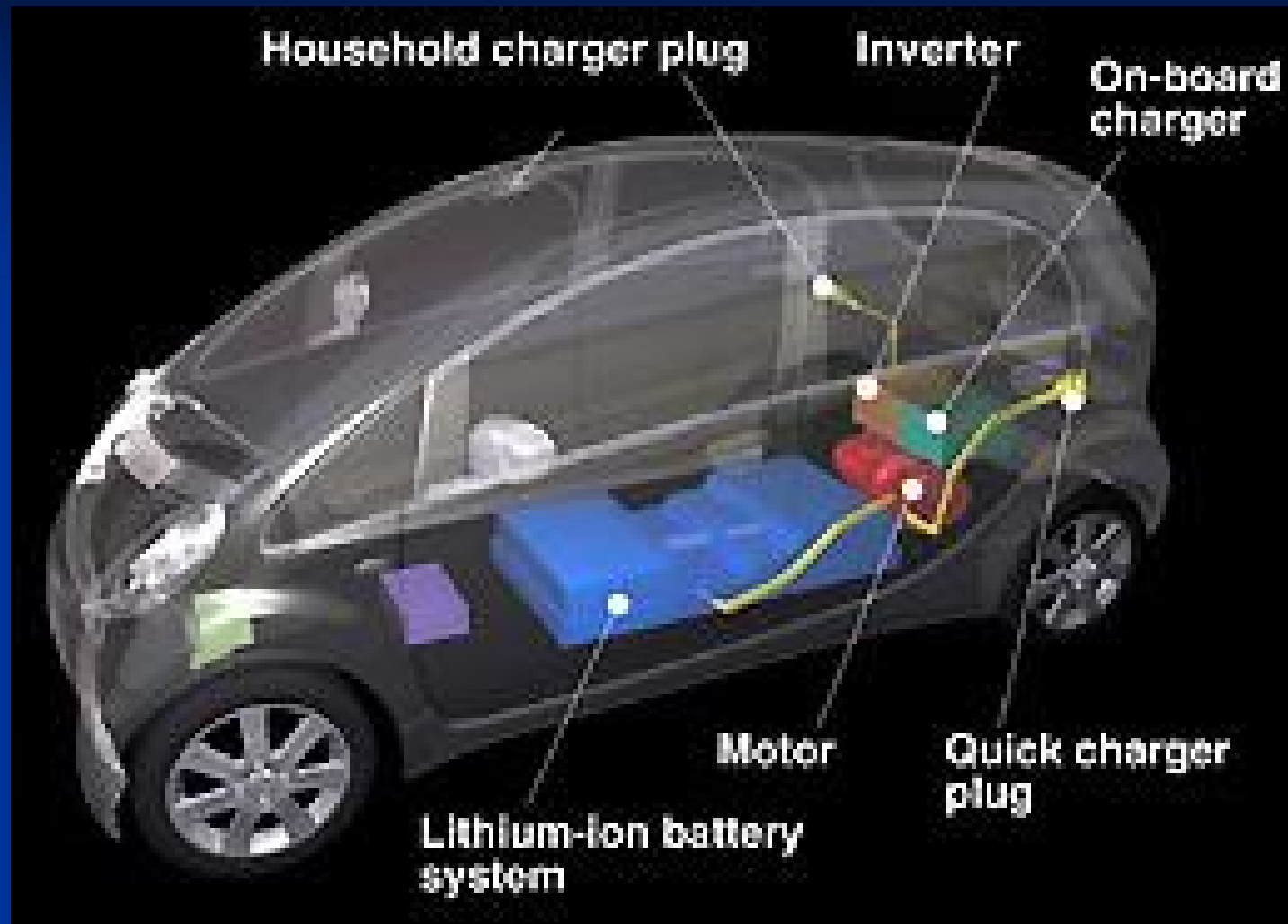
An electric car uses only an electric motor and a battery bank which is recharged from an external electricity supply. It has no drive-time emissions.

# Electric Cars !



Nissan LEAF cut-away

# Electric Cars !



Mitsubishi i-MiEV internals

# Electric Cars !

- Introduction
- A Short History of the Electric Car
- What is in Electric Car ?
- Now and the Future...
- Converting a Car to Electric Drive.



# Electric Cars !

~ \$A50,000



Lease ? Buy ?  
When ?  
August 2011 !?

## Mitsubishi i-MiEV

Eric Rodda

# Electric Cars !

\$US32,780



Nissan LEAF



19 released in  
the US in Dec  
2010, more  
in 2012

# Electric Cars !

Tesla Roadster 2.5 starts at  
\$A206,000 (plus on road costs).

Buy now - Be quick !!!



Tesla Roadster 2.5



# Electric Cars !

- 0 to 96km/hr in 3.7 seconds !
- 288 horsepower.
- AC induction motor and single speed gearbox.
- 394km per charge.
- Carbon fibre body.



Tesla Roadster 2.5

# Electric Cars !

- 5 adults & 2 children - family car.
- 480km per charge - Production: 2012



Tesla Model S



# Electric Cars !

- 100 mile range.
- Available: 2013.



Ford Focus Electric

# Electric Cars !

There are many companies,  
especially in Asia who are  
developing electric cars.

# Electric Cars !

- Introduction
- A Short History of the Electric Car
- What is in Electric Car ?
- Now and the Future...
- Converting a Car to Electric Drive.

# Electric Cars !

Why convert a petrol car to  
electric drive ?

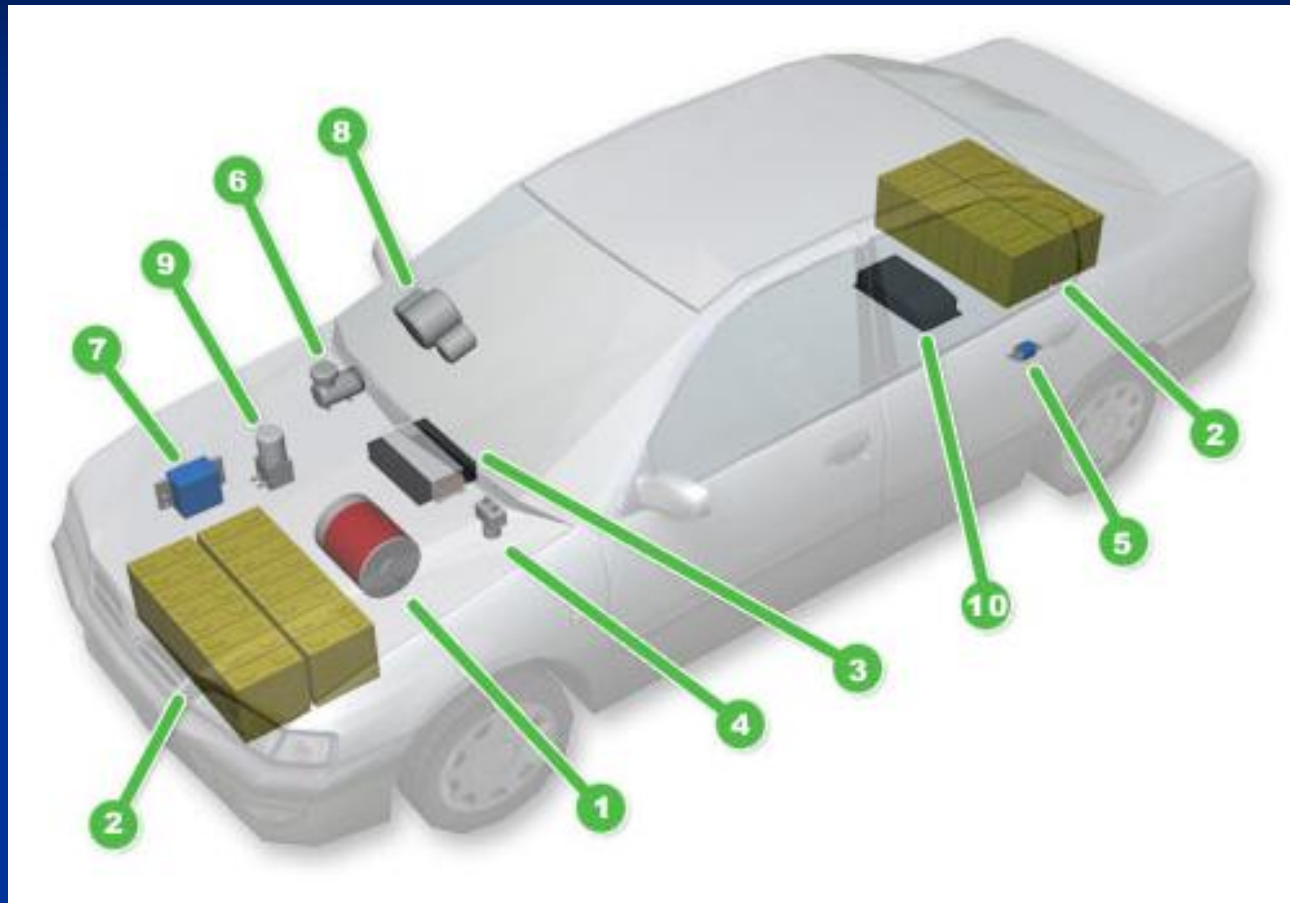
# Electric Cars !

## Electric Conversion: Why do it ?

- To save the world's oil resources ?
- Fun !
- School project ?
- Hobby ?
- Challenge ?
- Because you can't buy one, or they're too expensive ?



# Electric Cars !



1. Electric Motor
2. Battery Pack
3. Motor Controller
4. Contactor
5. Fuse
6. Vacuum Pump
7. DC/DC Converter
8. Instrumentation
9. Power Steering Pump
10. Battery Charger

## Components

# Electric Cars !



1985 Holden Barina EV Conversion

# Electric Cars !



To remove: One 57kg, 1.3litre engine



# Electric Cars !



That was quick...

# Electric Cars !



Adapter Plate steel blank - 20kg



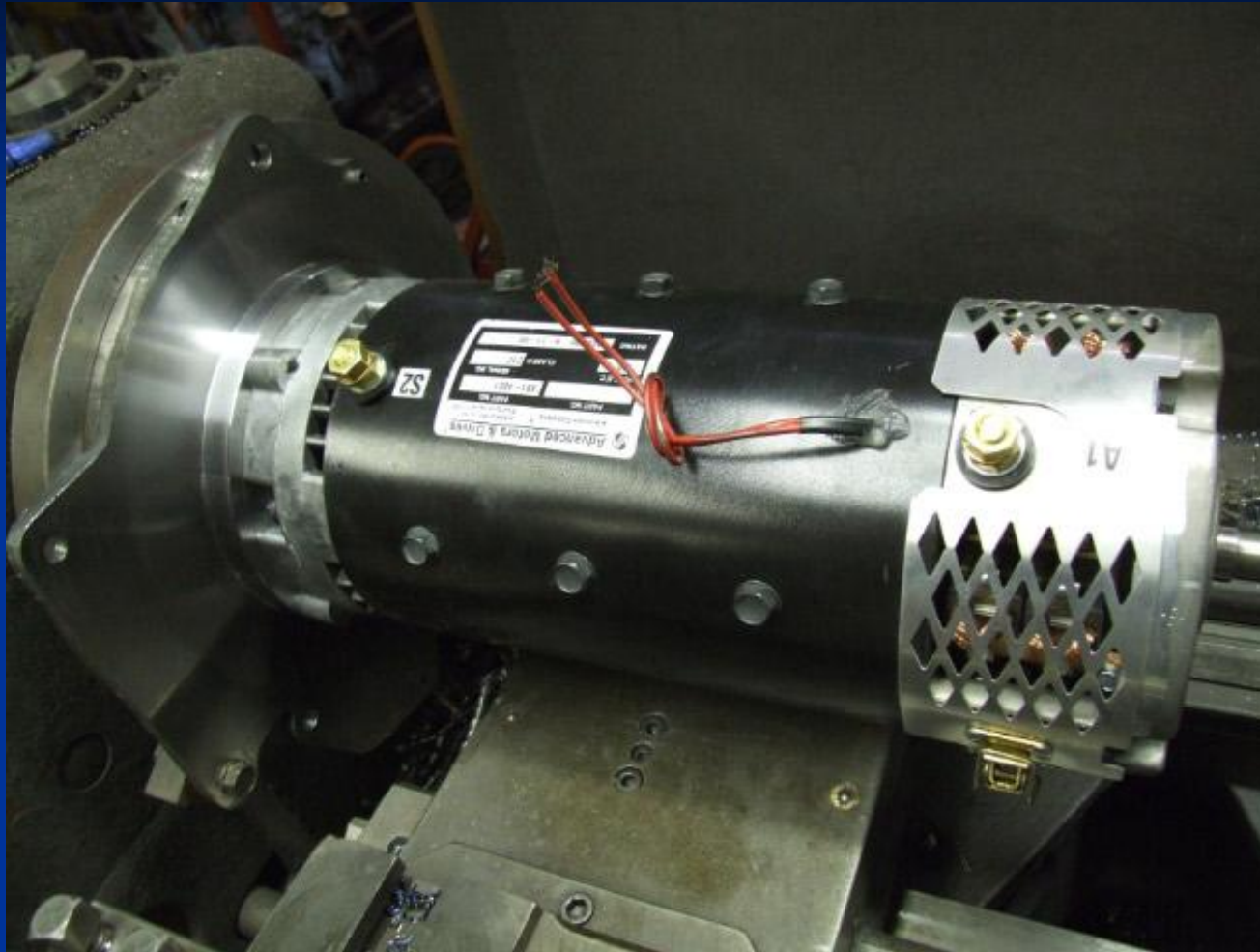
# Electric Cars !



Final  
weight  
of  
adapter:  
6kg

Checking gearbox/adapter alignment

# Electric Cars !



Checking motor/adapter alignment

# Electric Cars !



The coupler during manufacture

# Electric Cars !



Coupler attached to the motor

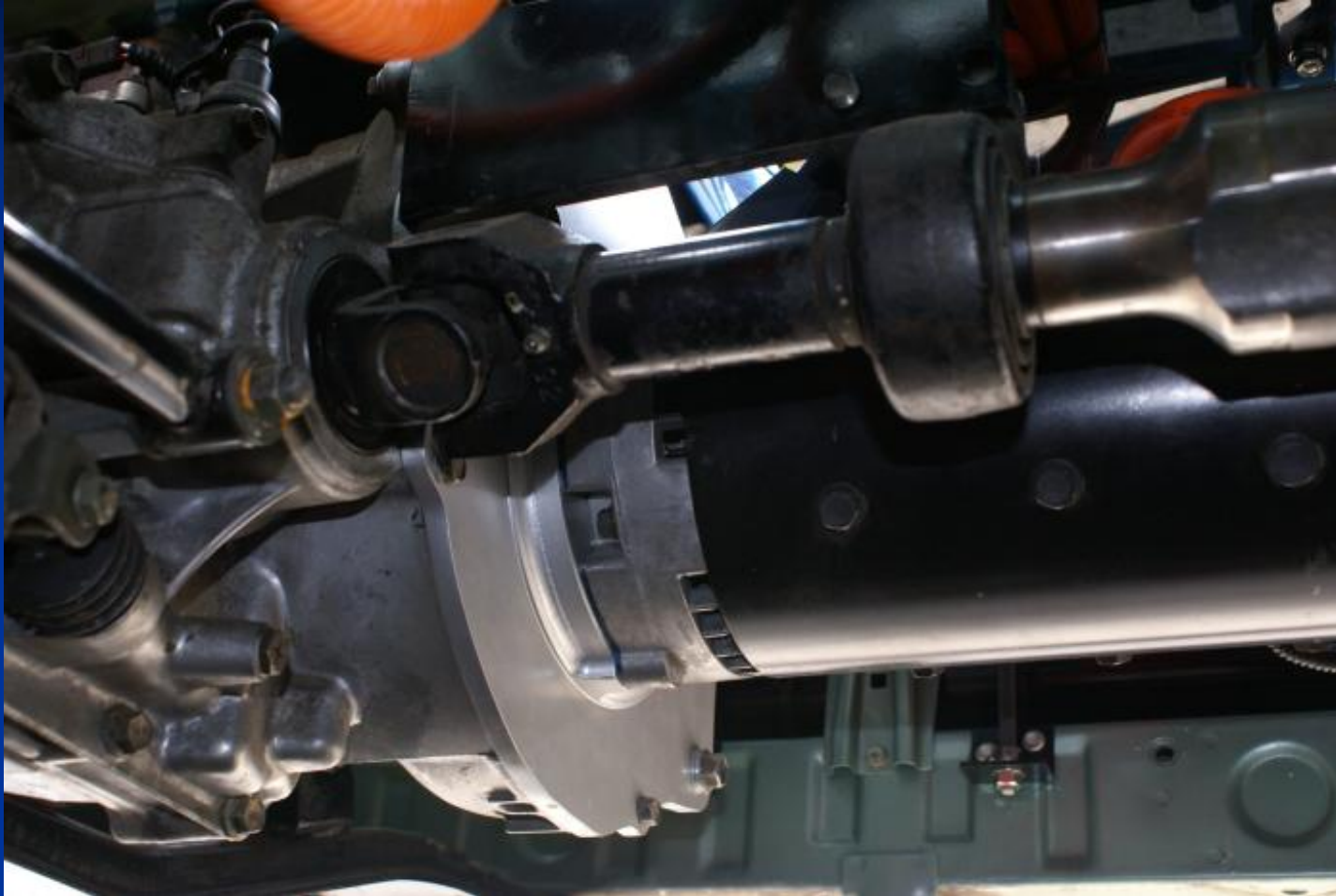


# Electric Cars !



Installing motor & gearbox

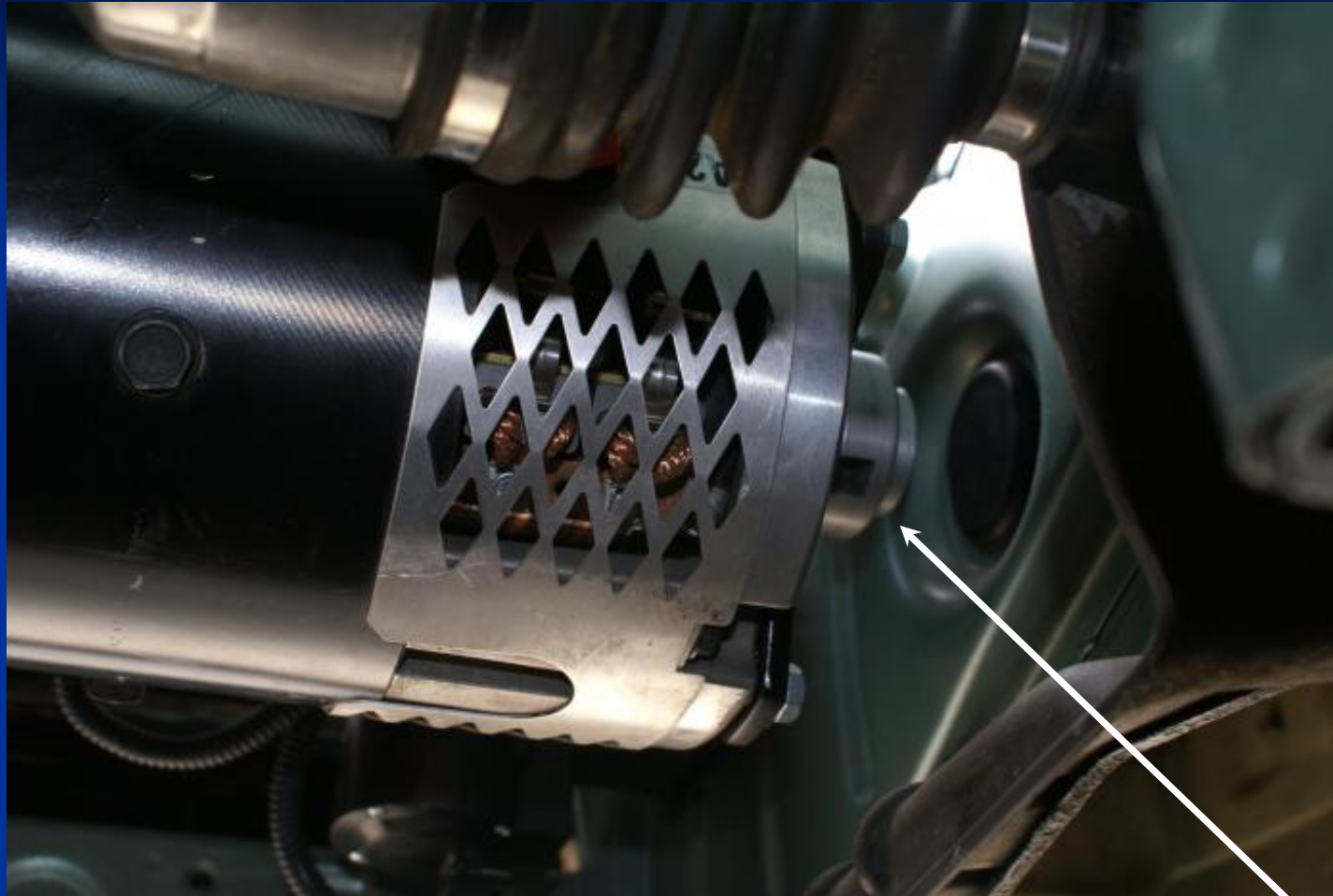
# Electric Cars !



Motor attached to gearbox



# Electric Cars !



Other end of motor - tacho sender

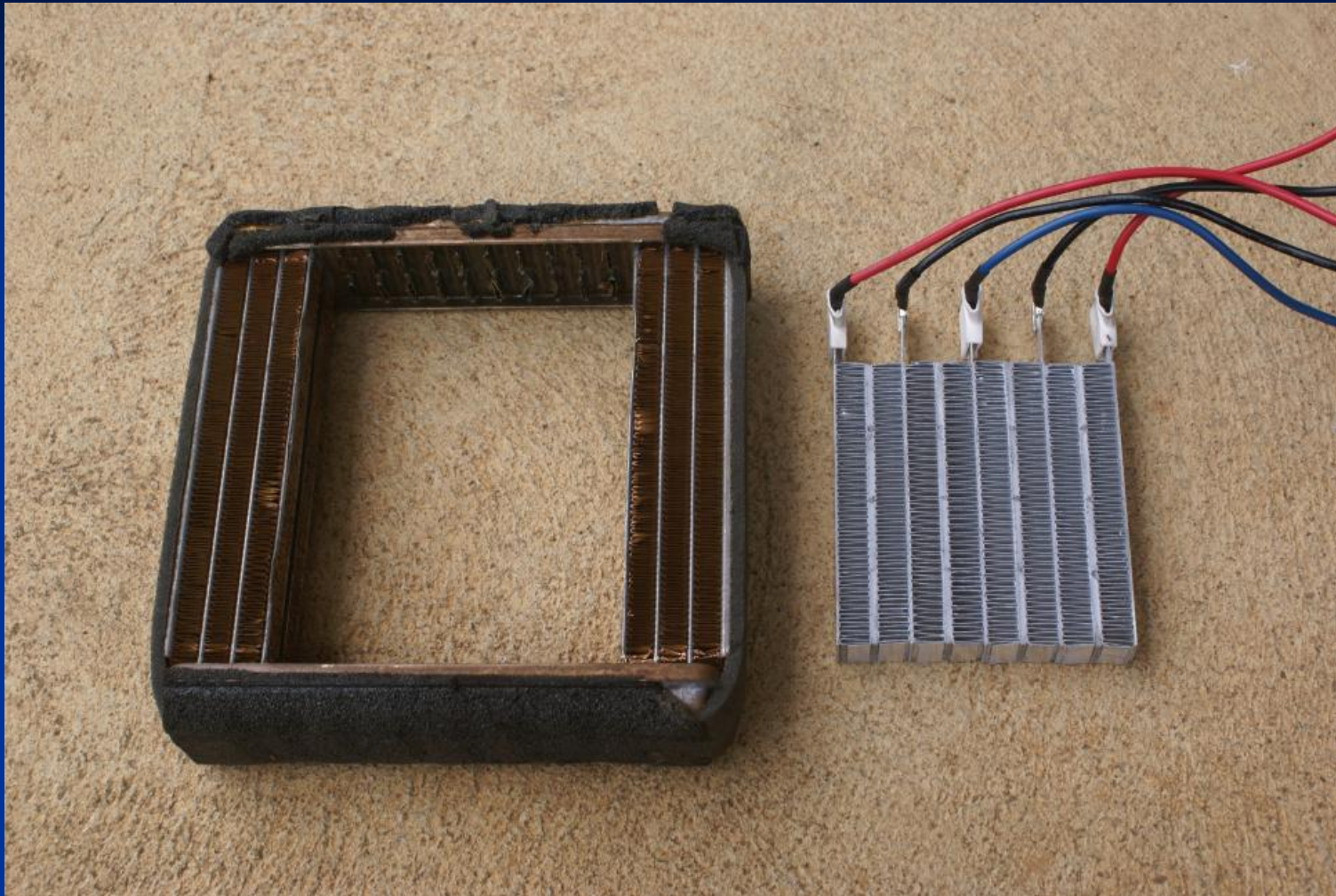
# Electric Cars !



Engine bay - wiring stage



# Electric Cars !



Converting heater/demister to electric

# Electric Cars !



Bringing the HV cables through...



# Electric Cars !



... and up to the front

# Electric Cars !



Battery frame welding completed

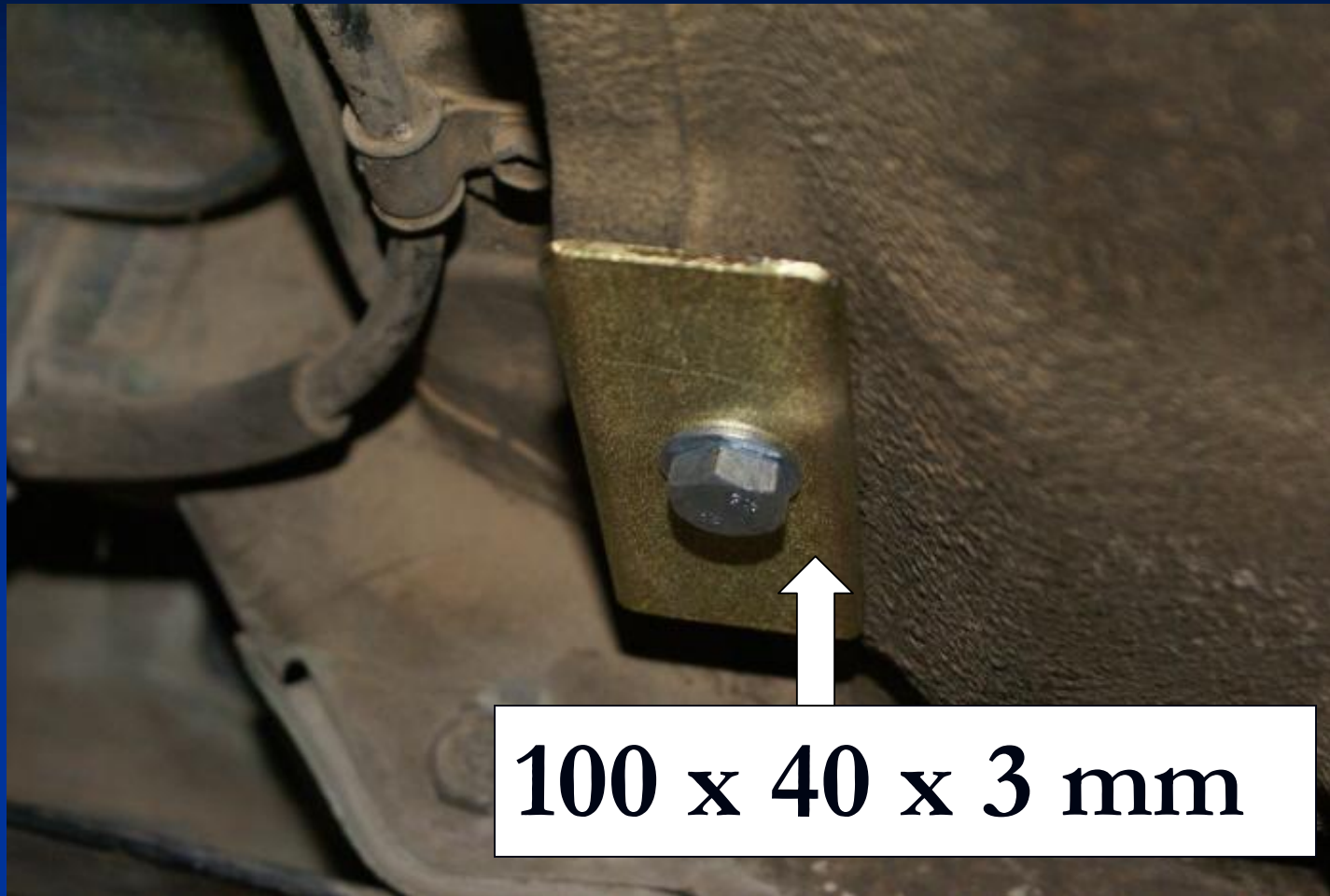


# Electric Cars !



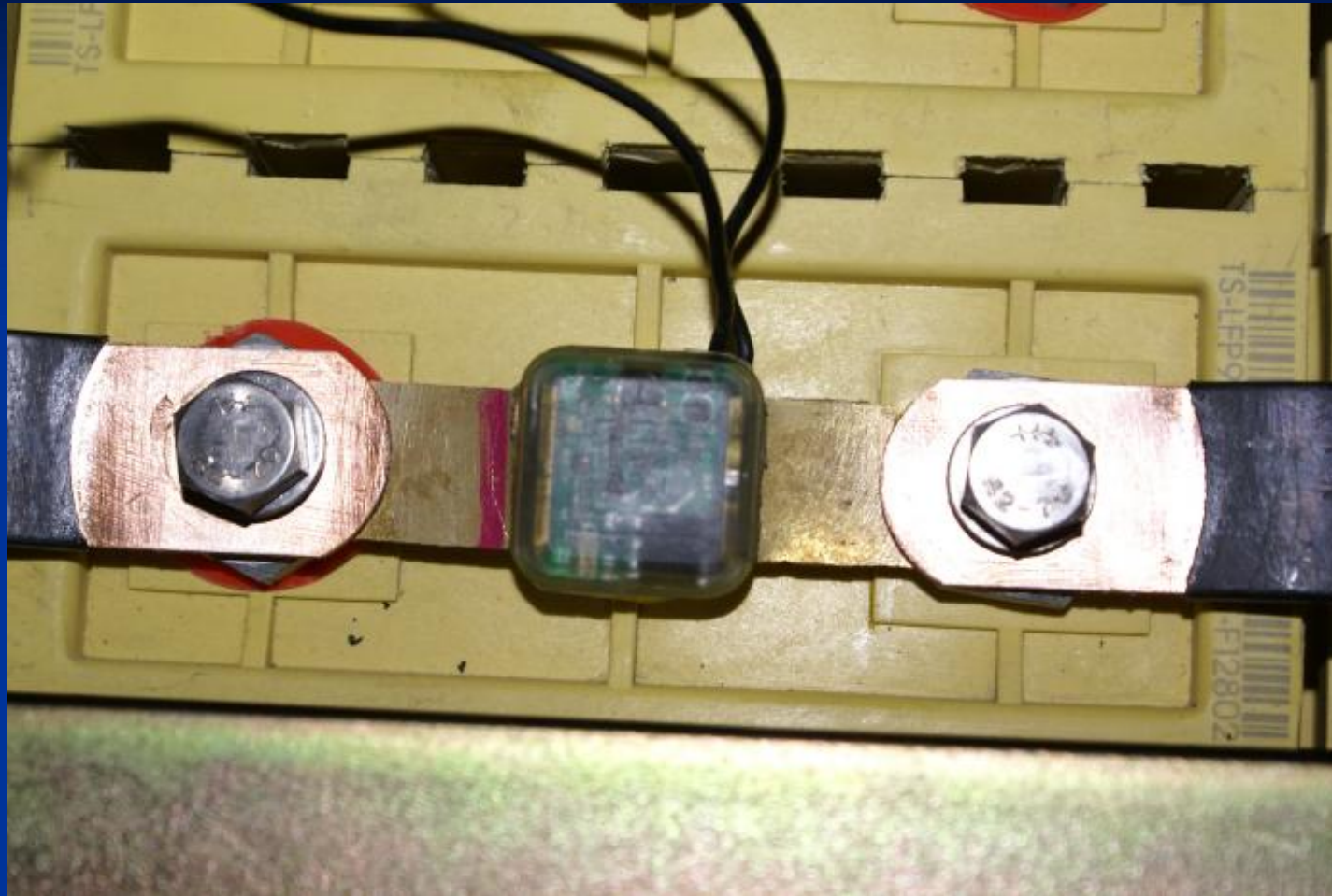
...then zinc (yellow) passivated.

# Electric Cars !



Battery box hold-down plate (1 of 3)

# Electric Cars !



One Lithium Iron Phosphate cell &  
EV Power BMS module

Eric Rodda



# Electric Cars !



40 “LiFePO<sub>4</sub>” cells all fit nicely

# Electric Cars !



Cover on pack and chargers mounted

# Electric Cars !



What batteries ?



# Electric Cars !



Anti splash treatment under car

# Electric Cars !



Completed “engine” bay

# Electric Cars !

More information and videos of the  
Holden Barina EV Conversion:

[www.evric.kestar.com.au](http://www.evric.kestar.com.au)

# Electric Cars !

Questions ?