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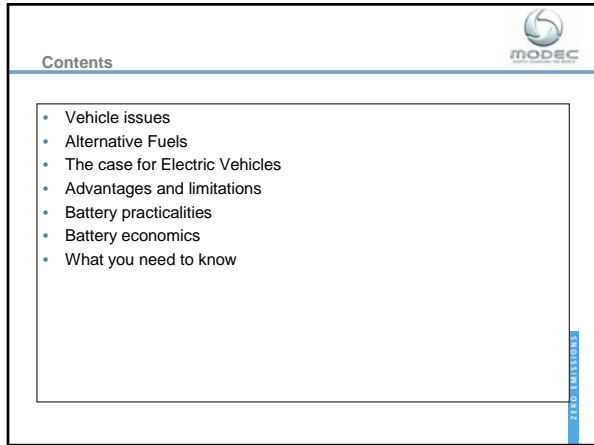
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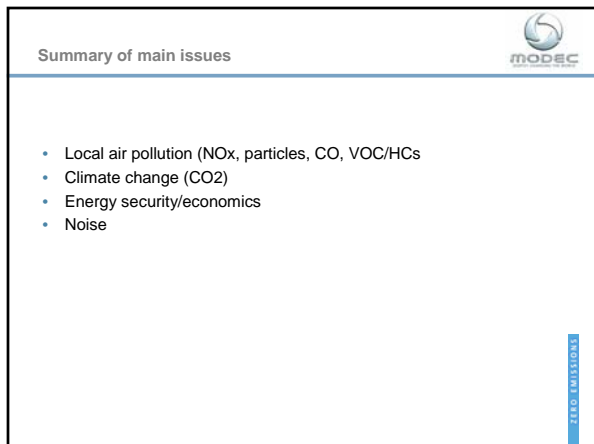
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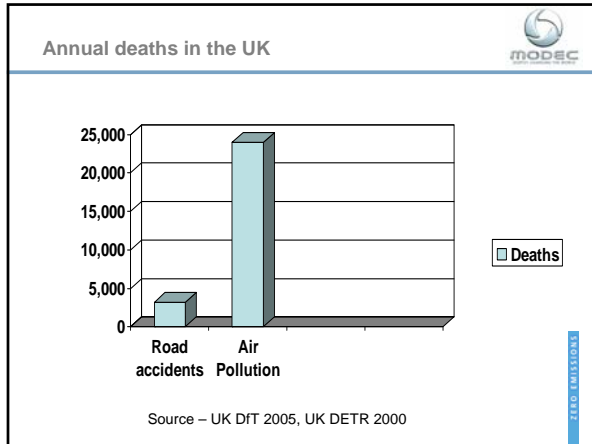
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# Geoff Reyner – Breakout A



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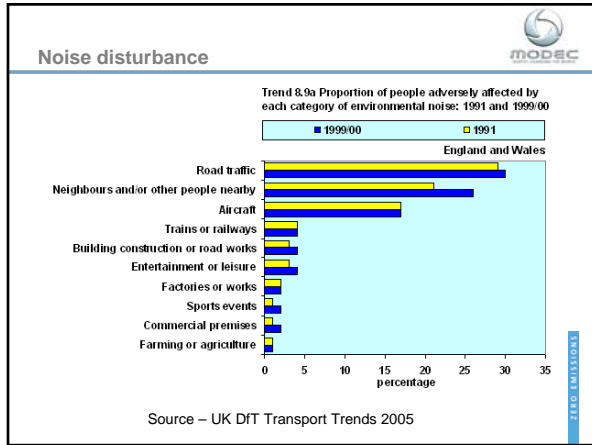
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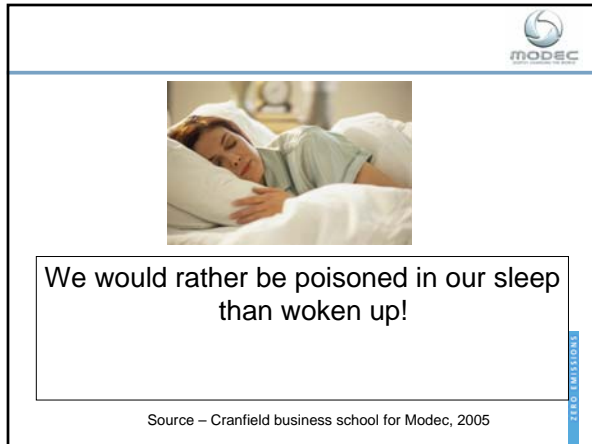
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# Geoff Reyner – Breakout A

Summary of main alternatives



- Natural gas (NGV), Liquid Petroleum Gas (LPG)
- Biodiesel, ethanol
- Hybrid (HEV), Plug-in Hybrid (PHEV)
- Pure electric vehicle (EV)



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NGV, LPG



+VE	-VE
<ul style="list-style-type: none"><li>• Somewhat lower carbon</li><li>• Lower emissions</li><li>• Fall back to petrol operation</li></ul>	<ul style="list-style-type: none"><li>• Conversion required</li><li>• Bulky, intrudes into load space</li><li>• Availability</li><li>• Inconsistent government support</li><li>• Still fossil fuels</li></ul>



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NGV, LPG



+VE	-VE
<ul style="list-style-type: none"><li>• Somewhat lower carbon</li><li>• Lower emissions</li><li>• Fall back to petrol operation</li></ul>	<ul style="list-style-type: none"><li>• Conversion required</li><li>• Bulky, intrudes into load space</li><li>• Availability</li><li>• Inconsistent government support</li></ul>

**Practical, but not very elegant**



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# Geoff Reyner – Breakout A

Biodiesel, (bioethanol)



+VE	-VE
<ul style="list-style-type: none"><li>• Lower carbon</li><li>• Fall back to diesel operation</li></ul>	<ul style="list-style-type: none"><li>• Small proportion added to fossil base - marginal improvement</li><li>• Availability</li><li>• Sustainability</li><li>• Cost of emissions system</li></ul>

ZERO EMISSIONS

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Biodiesel, (bioethanol)



+VE	-VE
<ul style="list-style-type: none"><li>• Lower carbon</li><li>• Fall back to diesel operation</li></ul>	<ul style="list-style-type: none"><li>• Small proportion added to fossil base - marginal improvement</li><li>• Availability</li><li>• Sustainability</li><li>• Cost of emissions system</li></ul>

**Good for CO2, not much better for air quality**

ZERO EMISSIONS

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Hybrids (micro, mini, full)



+VE	-VE
<ul style="list-style-type: none"><li>• Lower fuel consumption</li><li>• Fuel availability</li><li>• Can use biofuel</li></ul>	<ul style="list-style-type: none"><li>• Complexity</li><li>• Cost</li></ul>

ZERO EMISSIONS

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# Geoff Reyner – Breakout A

Hybrids (micro, mini, full) 

<p><b>+VE</b></p> <ul style="list-style-type: none"><li>• Lower fuel consumption</li><li>• Fuel availability</li><li>• Can use biofuel</li></ul>	<p><b>-VE</b></p> <ul style="list-style-type: none"><li>• Complexity</li><li>• Cost</li></ul>
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**Balance capital/maintenance cost vs fuel savings**

ZERO EMISSIONS

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Plug-in hybrids 

<p><b>+VE</b></p> <ul style="list-style-type: none"><li>• The electric bit</li></ul>	<p><b>-VE</b></p> <ul style="list-style-type: none"><li>• Everything else - even more complex, with both an ICE/hybrid drivetrain and a large size battery</li></ul>
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ZERO EMISSIONS

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Plug-in hybrids 

<p><b>+VE</b></p> <ul style="list-style-type: none"><li>• The electric bit</li></ul>	<p><b>-VE</b></p> <ul style="list-style-type: none"><li>• Everything else - even more complex, with both an ICE/hybrid drivetrain and a large size battery</li></ul>
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**Could be the best (or worst) of all worlds...**

ZERO EMISSIONS

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# Geoff Reyner – Breakout A

Fuel cells (H<sub>2</sub>, Methanol) 

<p><b>+VE</b></p> <ul style="list-style-type: none"> <li>Local air quality</li> <li>Carbon emissions (if H<sub>2</sub> made from renewable energy)</li> </ul>	<p><b>-VE</b></p> <ul style="list-style-type: none"> <li>Not commercially available any time soon</li> <li>Where does H<sub>2</sub> come from?</li> <li>22-30% efficient (vs 80-90% for batteries) on energy round trip</li> <li>H<sub>2</sub> infrastructure</li> <li>Methanol properties</li> </ul>
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ZERO EMISSIONS

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Not the holy grail, not this decade

ZERO EMISSIONS

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Electric vehicles 

<p><b>+VE</b></p> <ul style="list-style-type: none"> <li>Local air quality</li> <li>Carbon emissions</li> <li>Efficiency</li> <li>Plug into existing infrastructure</li> <li>Electrical energy relatively cheap</li> <li>Available</li> </ul>	<p><b>-VE</b></p> <ul style="list-style-type: none"> <li>Energy density – battery weight and volume</li> <li>Cost of battery packs</li> <li>Poor quality and image of existing vehicles</li> <li>Limited speed and range of existing vehicles</li> </ul>
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ZERO EMISSIONS

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# Geoff Reyner – Breakout A

Electric vehicles 

+VE	-VE
<ul style="list-style-type: none"><li>Local air quality</li><li>Carbon emissions</li><li>Efficiency</li><li>Plug into existing infrastructure</li><li>Electrical energy relatively cheap</li></ul>	<ul style="list-style-type: none"><li>Energy density – battery weight and volume</li><li>Cost of battery packs</li><li>Poor quality and image of existing vehicles</li></ul>

**Worth another look – especially for urban duties**

ZERO EMISSIONS

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Electric vehicles 

+VE	-VE
<ul style="list-style-type: none"><li>Local air quality</li><li>Carbon emissions</li><li>Efficiency</li><li>Plug into existing infrastructure</li><li>Electrical energy relatively cheap</li></ul>	<ul style="list-style-type: none"><li>Energy density – battery weight and volume</li><li>Cost of battery packs</li><li>Poor quality and image of existing vehicles</li></ul>

**Worth another look – especially for urban duties**

**&**

**Disruptive technology is here**

ZERO EMISSIONS

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**MODEC**  
QUIETLY CHANGING THE WORLD

**The case for Electric Vehicles**

ZERO EMISSIONS

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# Geoff Reyner – Breakout A

Pure EV - environment



- **Zero local air pollution** – no particles, NOx, CO or Volatile Organic Compounds
- **Easy to run carbon free** using renewable electricity (8 existing UK suppliers, one phone call to switch, little or no additional cost)
- **Near silent operation** enables retailers to deliver under curfew
- **Perfect for urban stop/start** duty cycles

ZERO EMISSIONS

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Pure EV - operation



- **Zero** road tax
- **Zero** Operator's licence
- **Zero** congestion charge
- **Low** service cost and frequency
- **No** diesel, no diesel price concerns
- **Available now**

...comparable cost to diesel on a whole life, pence per mile basis, depending on application – and can only get better

ZERO EMISSIONS

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Used to be quirky



ZERO EMISSIONS

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# Geoff Reyner – Breakout A

Increasingly mainstream



MODEC

ZERO EMISSIONS

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High Energy EV performance

- Up to 2.5 tonne payload
- Up to 80 km/h
- 180+ km range
- 1:5 hill climb

...all from one charge



MODEC

ZERO EMISSIONS

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Batteries need analysis

- Cost of operation 80% battery, 20% electricity
- If you're going to buy one you need to know:
  - Replacement cost
  - Life (time and cycles)
  - Warranty (straight replacement, credit for cycles used, statistical?)
  - Size and duty cycle impact on life and warranty

MODEC

ZERO EMISSIONS

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# Geoff Reyner – Breakout A

Or you could rent...



**GE** GE Capital Solutions  
Leasing and finance

- Rent the battery:  
Pay a fixed monthly price for rental of the battery  
You get a new battery if the original fails  
Costs vary depending on mileage  
Indicative price £400/month for 18,000 miles p.a.

ZERO EMISSIONS

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Summary



- Reality check the figures
- Evaluate the performance or get it warranted
- Review the trade-offs
- Rent the batteries or get their life warranted

...and enjoy many years of hassle free, cost effective, green motoring.

ZERO EMISSIONS

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**MODEC**  
QUIETLY CHANGING THE WORLD

**Zero emissions  
Zero compromise**

ZERO EMISSIONS

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# Geoff Reyner – Breakout A

ZERO EMISSION VEHICLES – A REALITY



MODEC

ZERO EMISSIONS

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BUSINESS PHILOSOPHY

- Agnostic about Battery chemistry – it will improve
- Battery cassettes form a long term profit source
- Lease rather than sell battery cassettes thru GE Capital
- Manufacture as little as possible
- Manufacture sub-assemblies in China, India
- IP is in systems, not patents on vehicles

MODEC

ZERO EMISSIONS

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WITHOUT COMPROMISE

- **Up to 2.5 tonne** payload
- Governed maximum speed of **50 mph**
- **100+** mile range
- **Regenerative** braking
- **1:5** hill climb

...all from a single charge

Perfect for urban delivery operations – a growing sector

MODEC

ZERO EMISSIONS

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# Geoff Reyner – Breakout A

**CLEAN AND QUIET**



- **Zero local air pollution** – no particles, NOx, CO or Volatile Organic Compounds
- **Easy to run carbon free** using renewable electricity (8 existing suppliers, one phone call to switch, little or no additional cost)
- **Near silent operation** enables retailers to deliver under curfew

ZERO EMISSIONS

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**SUPERB ERGONOMICS**



- **Easy entrance/exit**
- **Great visibility**
- **Command driving position** to avoid back support issues
- **Class leading manoeuvrability**
- **Keyless operation**
- **Low rear entry** for ease of delivery



ZERO EMISSIONS

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**TOUGH & RELIABLE**



- Built to **HGV Standards**
- **375,000** mile/10 year design life – only 4 serviceable moving parts
- Tested at Millbrook to 8,900km (= 89,000km in real life)
- Heavy duty chassis with front & rear crash zones
- Tested to N2 type approval level of EU regulations
- Easy to repair/replace lower cab panels



ZERO EMISSIONS

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# Geoff Reyner – Breakout A

CURRENT RANGE



- Two cab styles, including crew cab:



ZERO EMISSIONS

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CURRENT RANGE



- Flexible bodywork package
- Modec "one-stop" shop or your own supplier solution



**Box van** (extended cab shown)

**Dropside** (extended cab shown)

**Chassis Cab** (standard cab shown)

ZERO EMISSIONS

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Zero compromise



Thank you for listening

greyner@modec.co.uk

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