

zero emission vehicles

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Electrification of Large Vehicles

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Andrew Rushworth,
Managing Director Zero Emission Vehicles Limited

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REQUIREMENT

- Large (commercial) vehicles require:
 - Range
 - Clear cost/benefit & ROI
 - Lots of energy
- Supporting infrastructure
- Common standards

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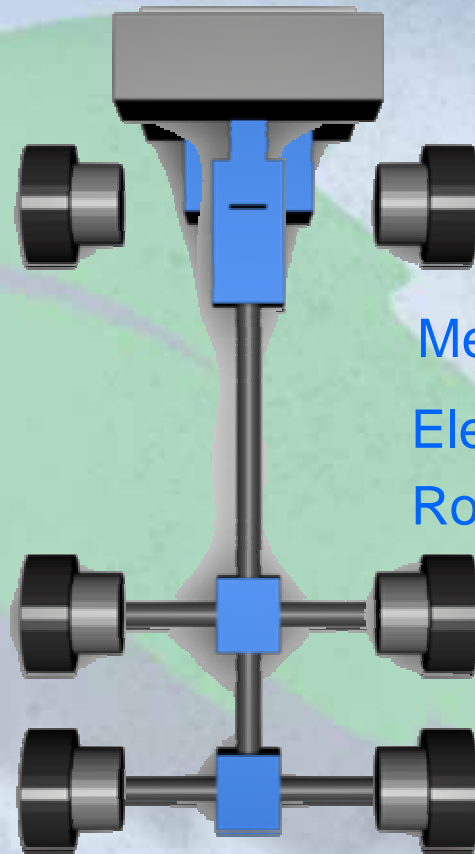
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Traditional ICE

Series Hybrid

Independent

Electric Drive



Mechanical with electronic assist

Electronic with mechanical assist

Road Train

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POWER SOURCE

- Fuel Cell
- Hybrid
 - Greater than 20 tonnes
 - Long haul
- Battery
 - Less than 20 tonnes
 - Start stop / short haul

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BATTERIES

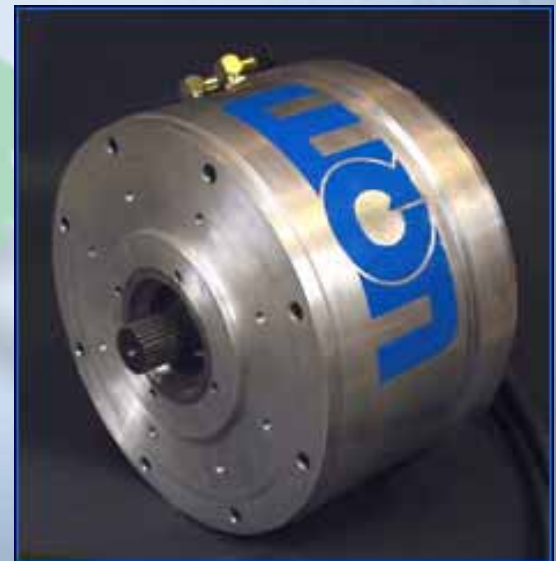
- Generic Lithium Ion
- Lithium Titanate
- Vanadium Redox
- Lead Acid / Molten Sodium Chloroaluminate

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DRIVE MOTORS

- PML Flightlink (UK)
- UQM (USA)



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INFRASTRUCTURE

- Recharge stations:
 - Home base
 - Public/Commercial
- Grid Impact
 - Demand characteristics
 - Leveling
 - Protocols
 - Increase in Green electricity production
- Support

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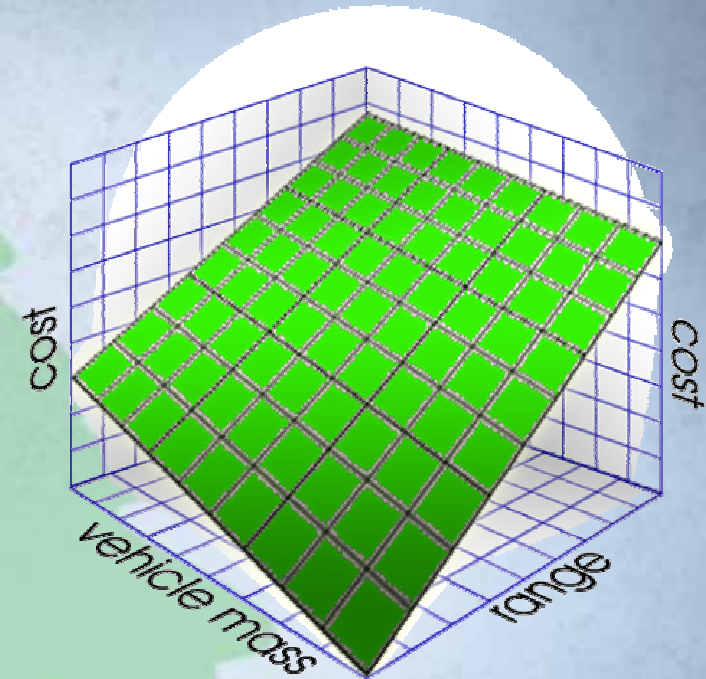
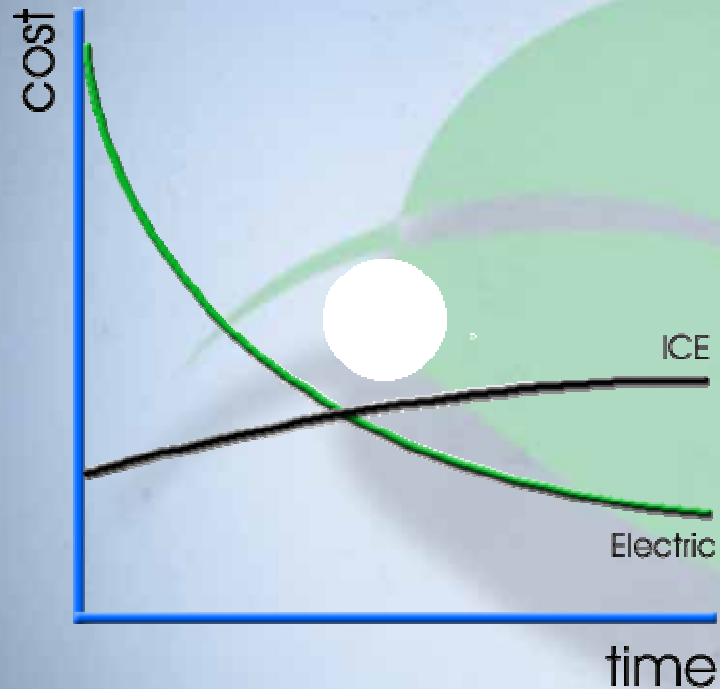
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PRODUCT EVOLUTION

- Lower compliance requirements
- Initial markets for heavy electric vehicles:
 - Urban start/stop – passenger service, utility
 - Specialist vehicles - clinics, libraries
 - Specialised vehicles - remote control, crab

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- Traditional ICE vehicles increasing in cost
- Electric vehicles decreasing in cost

- Range
- Weight
- Operation

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WIDER ISSUES

- Supply Side
- Demand Side
- National Leadership

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ZERO EMISSION VEHICLES

- Manawatu-based
- Design and build heavy electric vehicles
- Promoting commercial “green tech” solutions
- Current Status:
 - Independent battery testing
 - High level vehicle design, chassis & control systems
 - Three year horizon