

IMTT
Mobilidade Eléctrica: O Veículo
2010-03-08

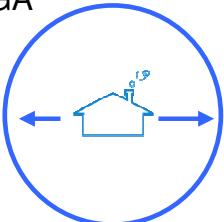
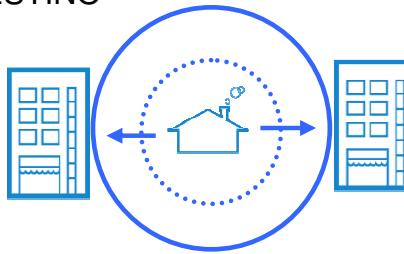


- 1. Infraestrutura de carga de VE**
- 2. EV Power Train**

TIPOLOGIA DE CARREGAMENTO

EXEMPLO PARA AUTOMÓVEL ELÉCTRICO COM AUTONOMIA DE 150KM

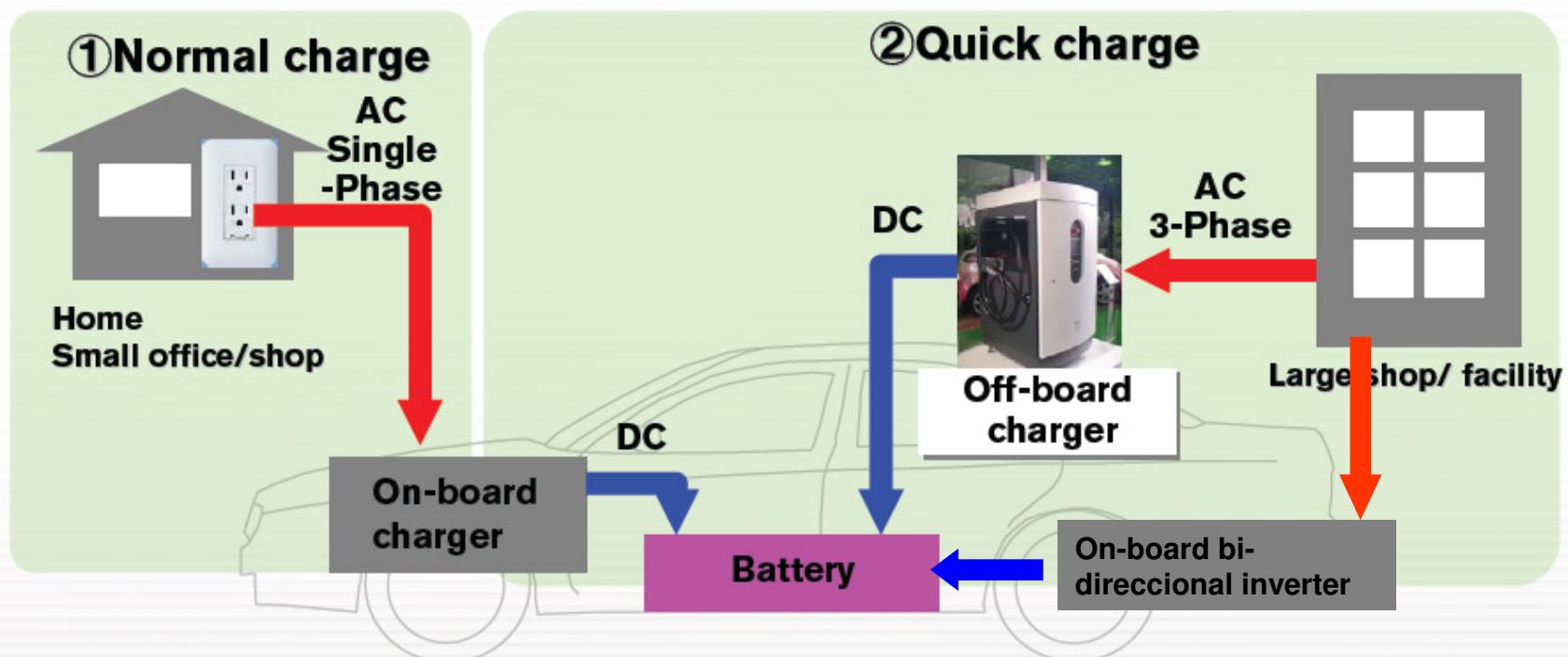


UTILIZAÇÃO	IDA E VOLTA À DISTÂNCIA DE UMA CARGA 	IDA E VOLTA COM RECARGA NO DESTINO 	CARGA DURANTE TRAJECTO 
CARGA	STANDARD	OPORTUNIDADE /EMERGÊNCIA	EXTENSÃO DE AUTONOMIA
LOCAL DE CARREGAMENTO	CASA LOCAL DE TRABALHO BASE DA FROTA	CENTRO COMERCIAL SUPERMERCADO PARQUE DE ESTACIONAMENTO VIA PÚBLICA	ÁREA DE SERVIÇO
REQUISITOS	100% EM 8H	50% / 30 MINUTOS (OPORTUNIDADE) 20 KM / 10 MINUTOS (EMERGÊNCIA)	80% / 10 MINUTOS
TIPO DE CARREGAMENTO	LENTO	LENTO / RÁPIDO	RÁPIDO

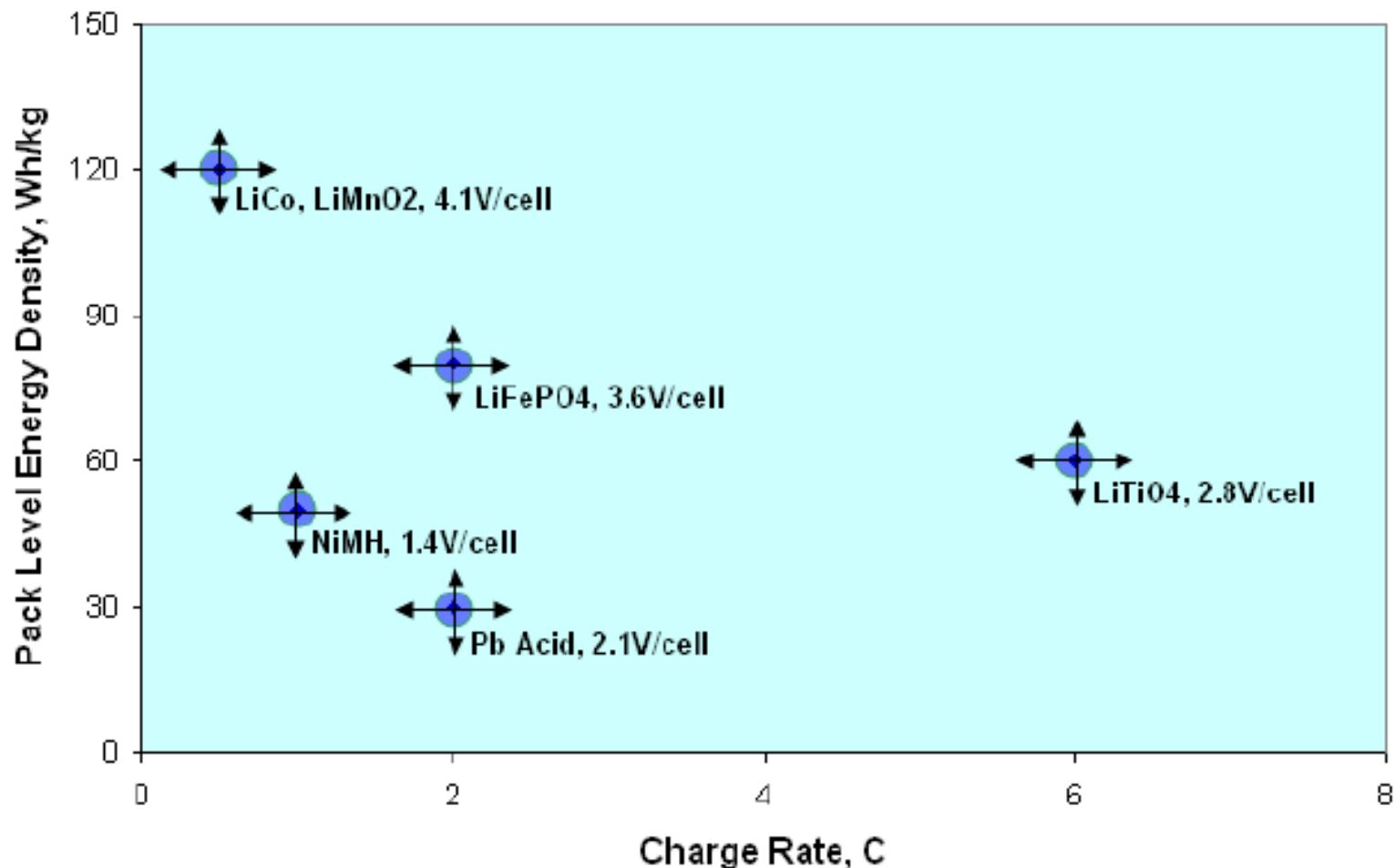
Métodos de carga a bordo

①Normal charge: AC supply (Single) + On-board charger

②Quick charge: High power AC supply (3-Phase) + Off-board charger



Carga rápida : Diferentes tecnologias de bateria permitem diferentes tempos de carga

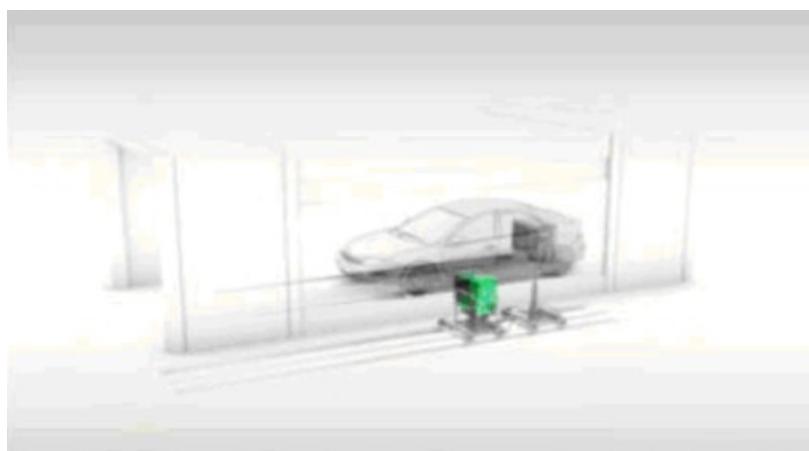


Tempo de carga (0 – 100 %) é aprox. 60 min / Charge rate

Off board charging



Estações de troca

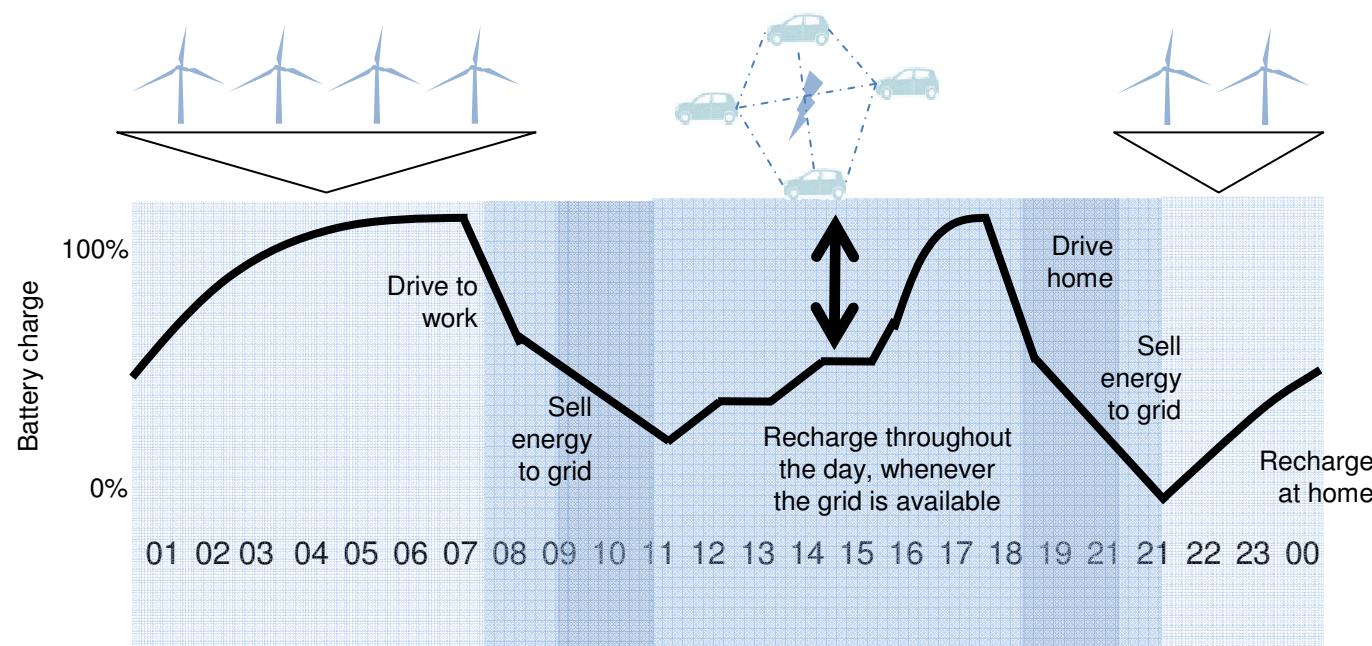


A solução de troca da bateria pode ser mais rápida do que carga rápida on board, e pode permitir diminuir a necessidade de carregar tão rápido, extendendo a vida da bateria.

Tem implicações na propriedade da bateria, e por isso apenas se adapta a modelos de negócio particulares ou frotas privativas

V2G – Vehicle to Grid

Gestão dos períodos de carga / descarga



V2G – Vehicle to Grid

Possíveis funções V2G

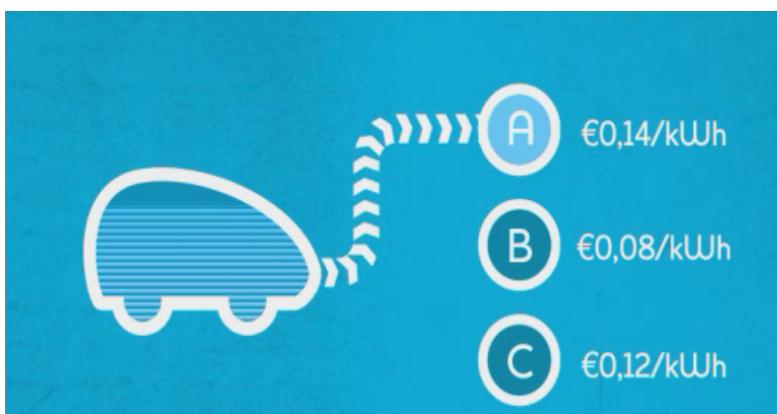
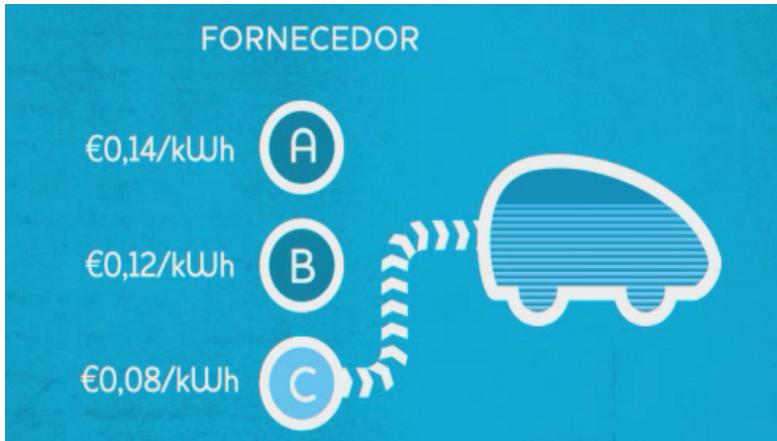
- Gestão de períodos de carga
- Peak shaving do diagrama de carga
- EVs usados para regulação da rede
- Backup power
- ...

A fiabilidade da bateria é afectada por várias destas funções e por isso :

Ainda insuficiente maturidade tecnológica e falta de standardização

SMART GRIDS e V2G

- ▶ Gestão de carga em tempo real
- ▶ Estabilização e regulação da rede
- ▶ Fluxo de energia bidireccional
- ▶ Atractividade económica: Preços dinâmicos criando oportunidades de negócio
- ▶ Maturidade tecnológica das baterias e falta de standardização de comunicações V2G



Solução modular



Exemplos

Solução de interior

Postos EFACEC
Design preliminar



Aderimos à Associação CHADEMO (com TEPCO, Nissan, Mitsubishi, Fuji e Toyota)

Tanto quanto sabemos a EFACEC é uma das primeiras empresas a desenvolver postos de carga rápida fora do Japão

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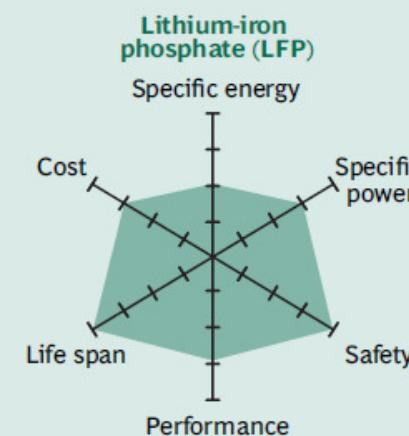
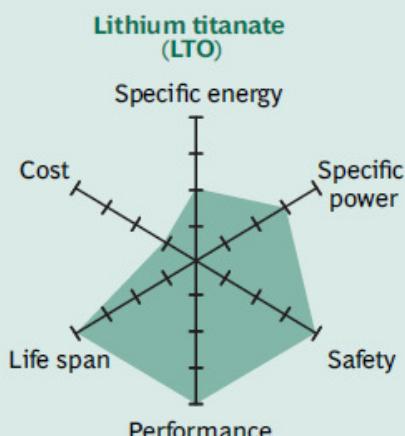
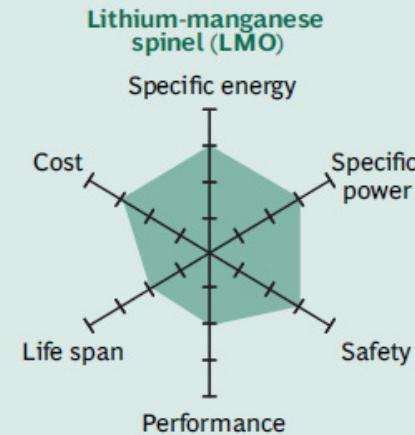
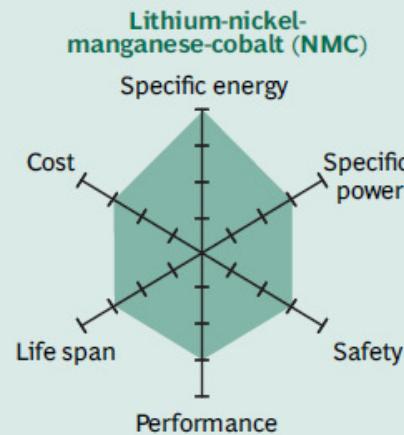
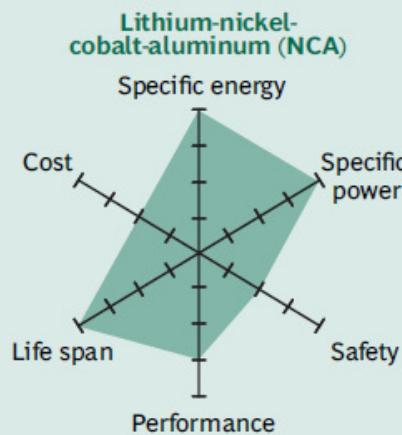
Autocarro Caetano/EFACEC



A EFACEC é responsável pelo pack de energia eléctrica e motorização

Autocarro de 17.000 Kg peso bruto, piso rebaixado
Compatível com rede Mobi.E (Chademo). Prevê-se desenvolver um carregador externo específico mais potente que os da rede Mobi.E

Exhibit 2. There Are Tradeoffs Among the Five Principal Lithium-Ion Battery Technologies



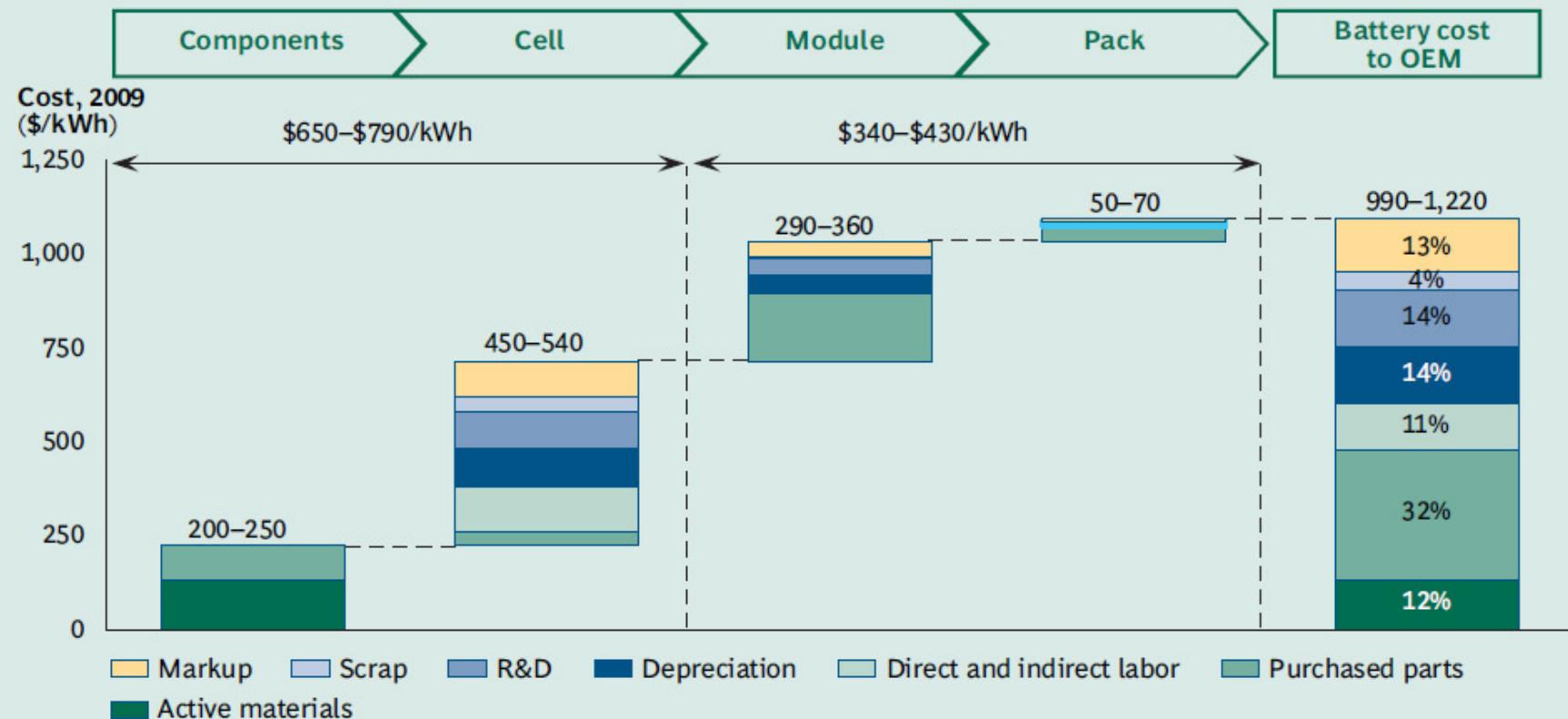
Source: BCG research.

Note: The farther the colored shape extends along a given axis, the better the performance along that dimension.

Bateria escolhida : Li Fe PO₄ (LFP)

Pode vir a sofrer alteração em função da disponibilidade de baterias produzidas em Portugal

Exhibit 3. Batteries Cost OEMs About \$1,100 per kWh at Low Volumes

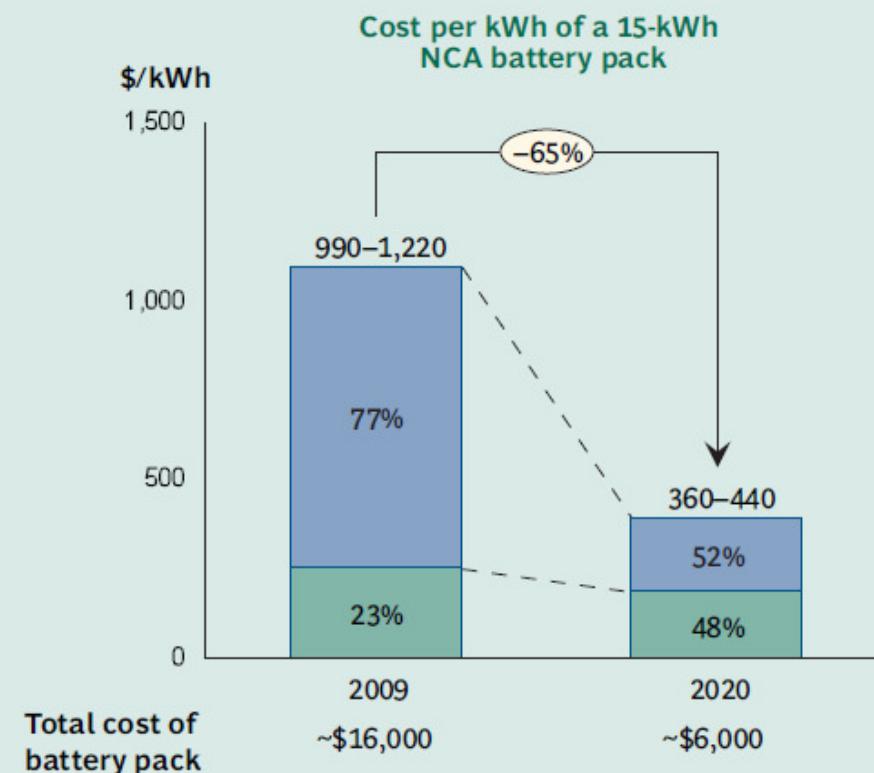
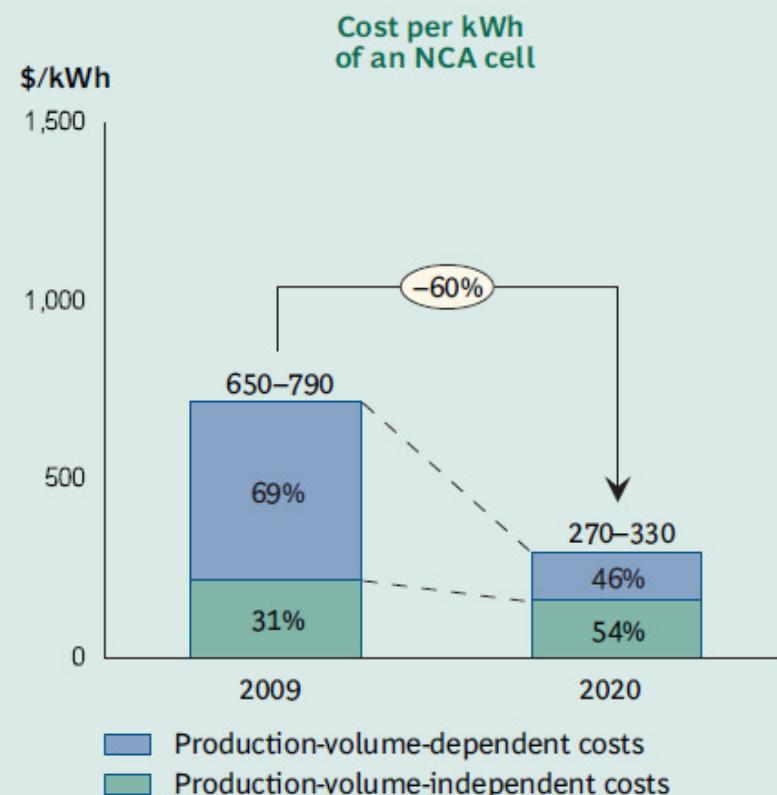


Sources: Interviews with component manufacturers, cell producers, tier one suppliers, OEMs, and academic experts; Argonne National Laboratory; BCG analysis.

Note: Exhibit shows the nominal capacity cost of a 15-kWh NCA battery and assumes annual production of 50,000 cells and 500 batteries, as well as a 10 percent scrap rate at the cell level and a 2 percent scrap rate at the module level. Numbers are rounded.

A BCG prevê até 2020 uma descida de 60% ao nível das células e de 65% ao nível do pack graças ao volume

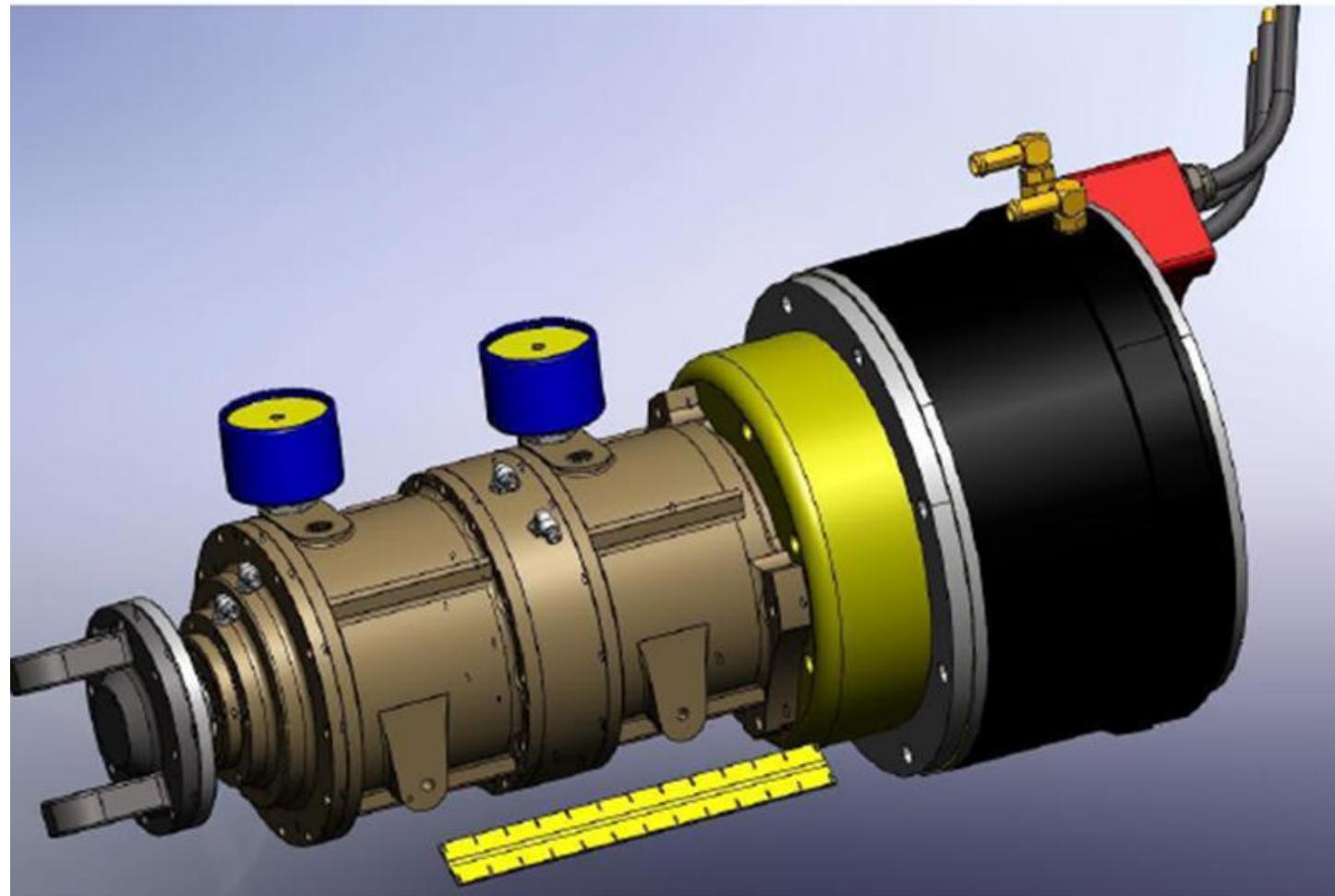
Exhibit 4. Battery Costs Will Decline 60 to 65 Percent from 2009 to 2020



Sources: Interviews with component manufacturers, cell producers, tier one suppliers, OEMs, and academic experts; Argonne National Laboratory; BCG analysis.

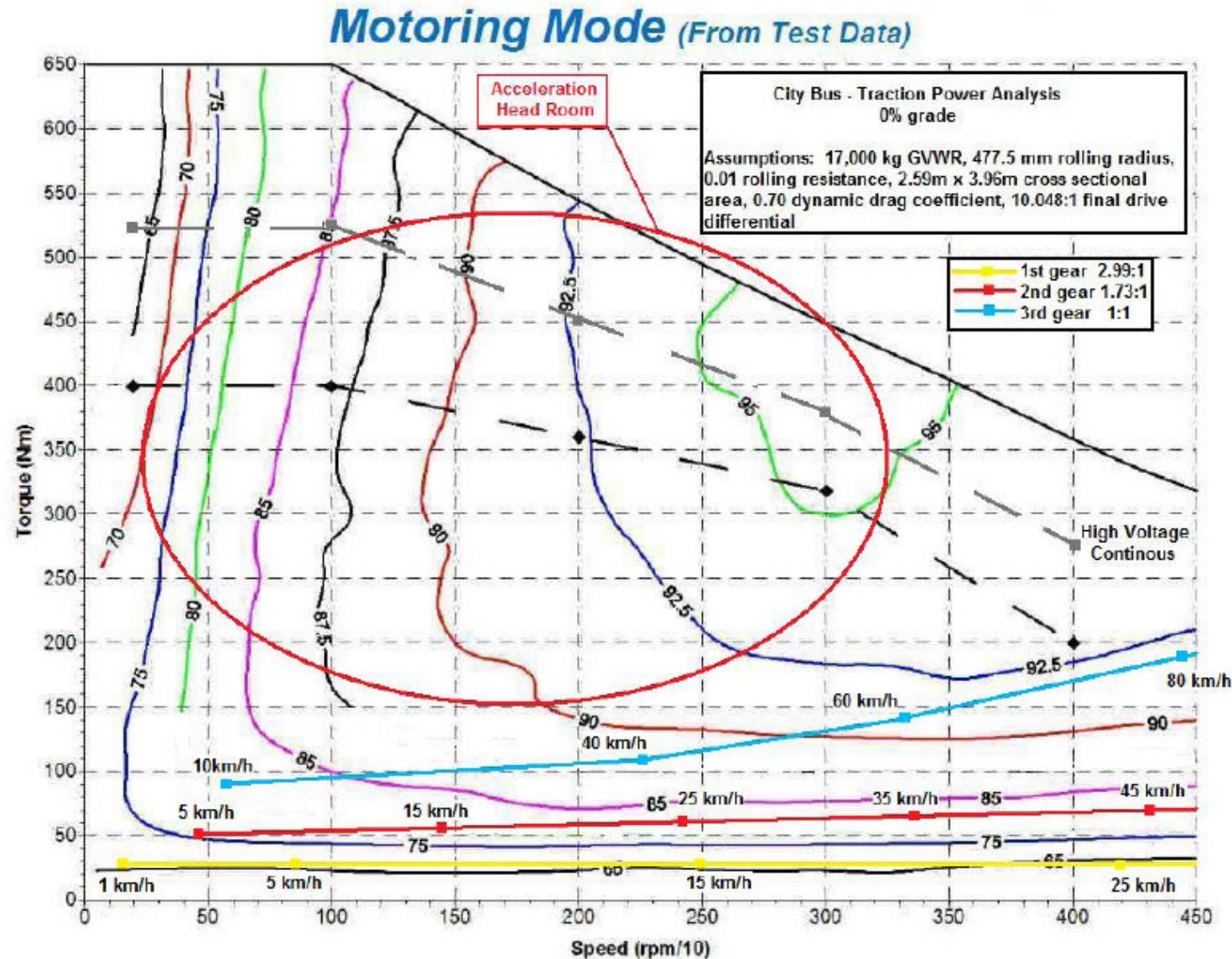
Note: Exhibit assumes annual production of 50,000 cells and 500 batteries in 2009 and 73 million cells and 1.1 million batteries in 2020. Numbers are rounded.

Motor e transmissão de 3 velocidades



Estudo do comportamento com Transmissão com 3 velocidades para maximizar autonomia.

Prevê-se passar a apenas 2 mais tarde

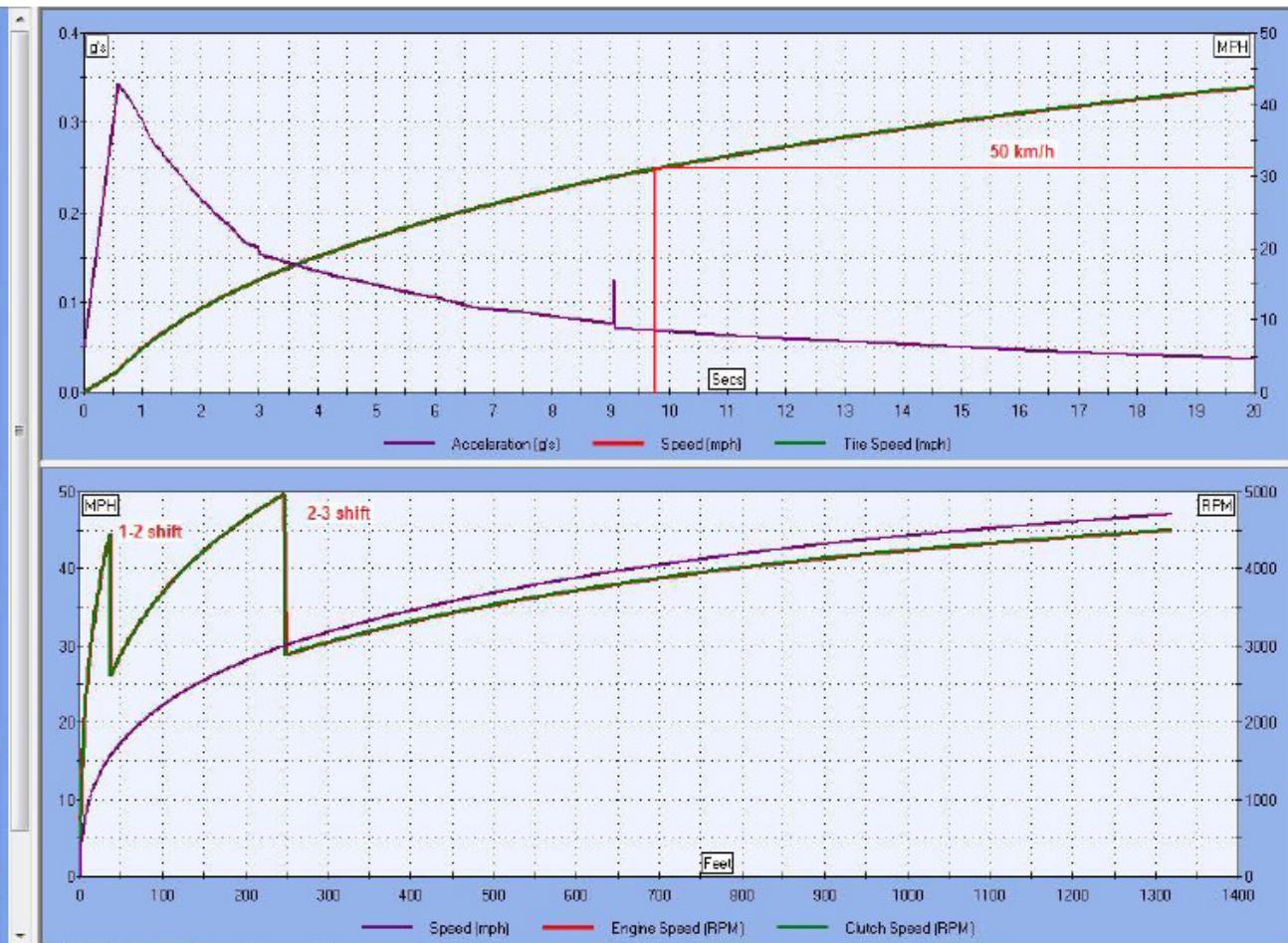


UQM PP150 performance map with steady state vehicle speed for each gear – (max rpm 5,000 not illustrated)

Algumas características do estudo preliminar



Vehicle	
Vehicle: EFACEC PP150	Vehicle Type: Automobile
Vehicle Weight: 37400 lbs	Wheelbase: 240.000 in
Driving Wheels: Rear	Front Area: 33.0 sqft
% Weight On Driving Wheels: 70.0%	Aero Drag Coefficient: 0.98
Engine	
Engine: PP150-2008	Type: IC Engine
Displacement: 290.0 ci	HP Curve
Peak Power: 203 hp @ 4000 rpm	Jet/Rocket Engine
Peak Torque: 473 lb-ft @ 2500 rpm	Jet/Rocket Thrust
	Jet/Rocket Weight
Drivetrain	
Transmission: I-Driven 3 step	Gear Eth: Planetary
Coupling: Clutch	Gear Ratios: Gears: 3
Torque Converter Speed: 1000 rpm	1: 2.99 4: 1.00
Torque Converter Multiplier: 1.00	2: 1.73 5: 1.00
Torque Converter Slippage: 0.0%	3: 1.00 6: 1.00
Rear-Drive Ratio: 3.99	Motorcycle Primary Ratio: 1.00
Tires & Wheels	
Tires/Wheels: Stock Steel	Traction Data
Static Tire Diameter: 35.250 in	Traction Cost: 1.35
Static Tire Width: 6.000 in	Growth Factor: 0.00
Driving Style	
Driving Style: Custom	Driver Shift Points:
Redline RPM: 5000 rpm	Launch: 750 rpm 3>4: 2500 rpm
Shift Time: 0.100 secs	1>2: 4500 rpm 4>5: 1000 rpm
Rollout: 0.000 in	2>3: 5000 rpm 5>6: 1000 rpm
Weather	
Weather: Typical Track Conditions	Temperature: 60.01
Wind & Elevation	Humidity: 0.0%
Wind Speed: 0.0 mph	Equivalent Elevation: 000.0 ft
	Barometer: 29.05 inHg
Notes	
DESCRIPTION:	



Speeds – Continuous Rated			Launch Gradeability	20.9% @ GVWR
Top speed @ GVWR			Low Speed Gradeability @ GVWR	
Maximum Current Acceleration 0-50 km/h @ GVWR			10% at 20 km/h 15% at 15 km/h	
Top speed 1 st gear 30 km/h 2 nd gear 52 km/h 3 rd gear 89 km/h Reverse 5 km/h (electronically limited by vehicle master ECU)			Continuous rating < 125 kW	
10.048:1 final ratio 5000 max rpm for motor			0.0% at 88 km/h (104 kW) 2.0% at 65 km/h 4.0% at 45 km/h 6.0% at 35 km/h 8.0% at 25 km/h 10.0% at 20 km/h	