

A CASE STUDY IN THE DEVELOPMENT OF SUSTAINABLE VEHICLE DRIVELINE STRATEGIES - “V1 TAXI PLATFORM FOR NYC ToT”

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- Driveline Selection
- Conducting P&FE Analysis

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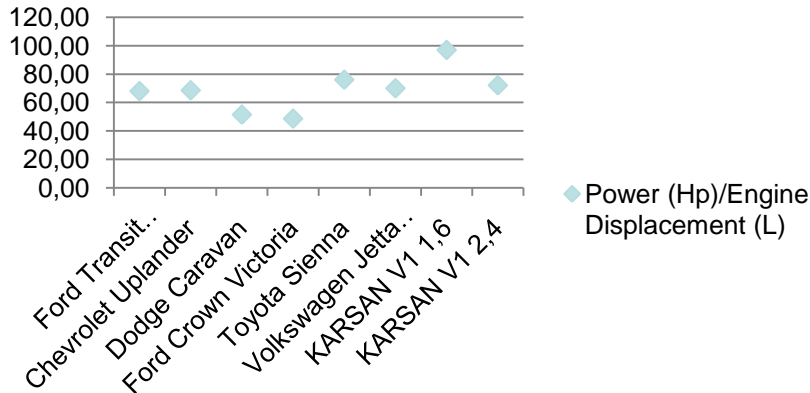
NECESSITY FOR NEW TAXI PLATFORM

Table I: Current Status of the Taxis in the NYC

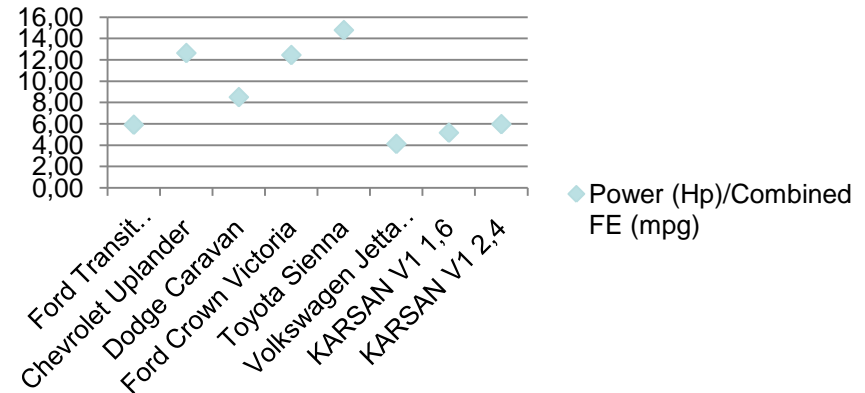
	Ford Transit Connect	Chevrolet Uplander	Dodge Caravan	Ford Crown Victoria	Toyota Sienna	Volkswagen Jetta Diesel	KARSAN V1 1,6	KARSAN V1 2,4
Engine Type	I-4	V6	V6	V8	V6	I-4 TDI	I-4 TCI	I-4 NA
Fuel Type	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Diesel	Gasoline	Gasoline
Engine Displacement (L)	2,0	3,5	3,3	4,6	3,5	2,0	1,6	2,4
Power (Hp)	136	240	170	224	266	140	155	173
Torque (lb-ft)	128	240	200	275	245	236	177	166
Transmission (Gears/Type)	4 Speed Automatic	4 Speed Automatic	4 Speed Automatic	4 Speed Automatic	4 Speed Automatic	6 Speed Manual	6 Speed Automatic	6 Speed Automatic
Curb Weight (lbs)	3690	4325	4150	4400	4685	3450	3815	3815
City FE (mpg)	22	16	17	15	16	30	26	25
Highway FE (mpg)	25	23	24	23	21	41	35	36
CombinedFE (mpg)	23	19	20	18	18	34	30	29

NECESSITY FOR NEW TAXI PLATFORM

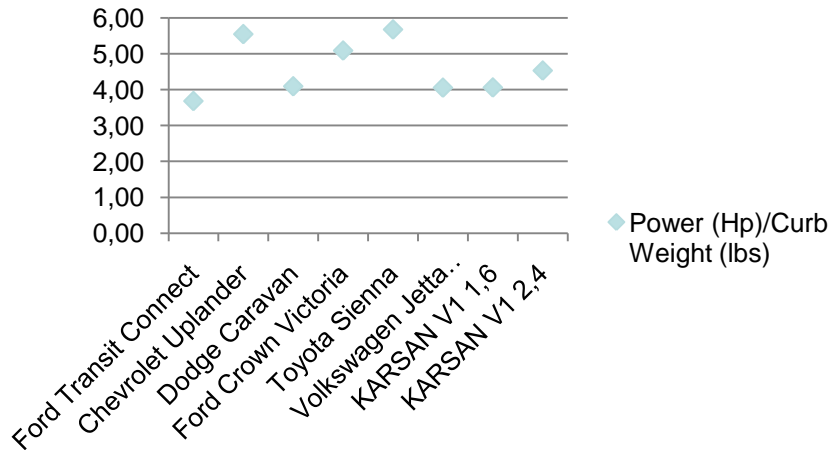
Power (Hp)/Engine Displacement (L)



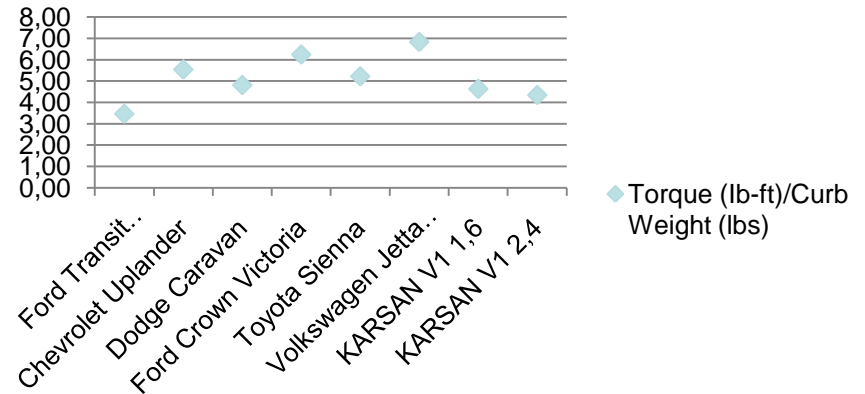
Power (Hp)/Combined FE (mpg)



Power (Hp)/Curb Weight (lbs)



Torque (lb-ft)/Curb Weight (lbs)



NECESSITY FOR NEW TAXI PLATFORM

Vehicle Level Targets	
0-30 mph (sec)	4 - 6
0-60 mph (sec)	10 - 12
Top Speed (mph)	75 - 80
Max Gradeability (%)	> 25
Transmission	Automatic
Range (mile)	150-200
Warranty (mile)	>150k
Emission Requirements	EPA Tier II Bin 5 CARB LEV II OBD II
Fuel Economy Requirements	NHTSA CAFE MY 2012 - 2016
GHG Emission Requirements	EPA CO ₂ (g/mi) MY 2012 – 2016 Truck standard curves CARB Fleet Average GHG Emission Standards
Alternative fuel usage	> 273 medallion must be alternative fueled
ADA compliancy	All taxis have to be 100% Accessible
Driver area	Driver zone must be separated from the passenger area
Fuel Type	Gasoline

NECESSITY FOR NEW TAXI PLATFORM

- Very big engine displacements
- Unnecessary Power&Torque capacities beyond the demand
- Poor Fuel economy & Emission Performance
- No accessibility features
- No Taxi intended design, only converted from passenger car

CONVENTIONAL POWERTRAIN DESIGN US MARKET

Vehicle Specifications	
Body /Cab Style	Mini Van
Curb Weight (lbs)	4150
Tires	215/65 R16
Frontal Area (m ²)	2,79
Drag	≈ 0,42
Length (mm)	4830
Track width (mm)	1580
Wheel base (mm)	3260
Suspension	Fr. McPherson Strut, Rr. McPherson Strut
Drive Type	Rear transversal mounted engine, Rear Transaxle, RWD
Engine	Gasoline
Transmission	Automatic
FDR	3,43
Vehicle Class	Light Duty Truck 2

CONVENTIONAL POWERTRAIN DESIGN US MARKET



CONVENTIONAL POWERTRAIN DESIGN

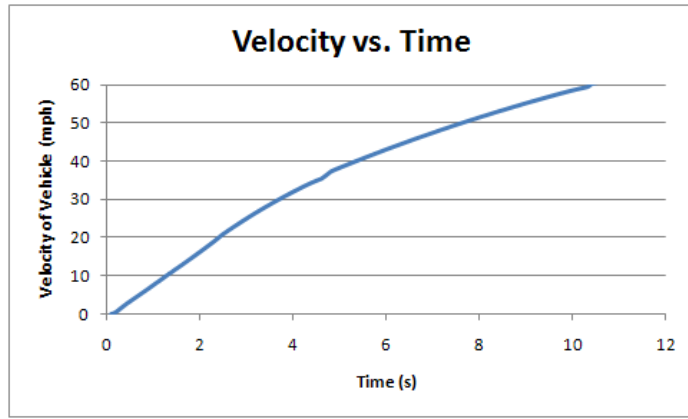
US MARKET

	KARSAN V1 1,6	KARSAN V1 2,4
Engine Origin	European	US
Engine Type	Gasoline I4 TCI	Gasoline I4 NA
Engine Displacement (l)	1,6	2,4
Power (Hp)	155	173
Torque (lb-ft)	177	166
Transmission (Gears/Type)	6 Speed/ Automatic	6 Speed/ Automatic
City FE (mpg)	26	25
Highway FE (mpg)	35	36
Combined FE (mpg)	30	29
Curb Weight (lbs)	3815	3815
0-30 mph (sec)	3,66	4,04
0-60 mph (sec)	10,32	10,47
35-55 mph Freeway Merge (sec)	6,44	4,66
55-75 mph Highway Passing (sec)	10,98	7,93
Peak Acceleration (ft/s ²)	15,48	14,45
Top Speed (mph)	109,00	109,00
Max Gradeability (1st gear) Standstill	35,21	32,85

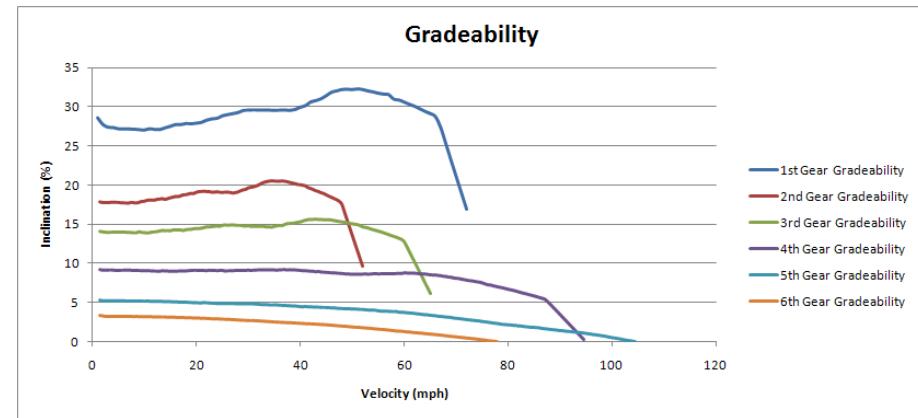
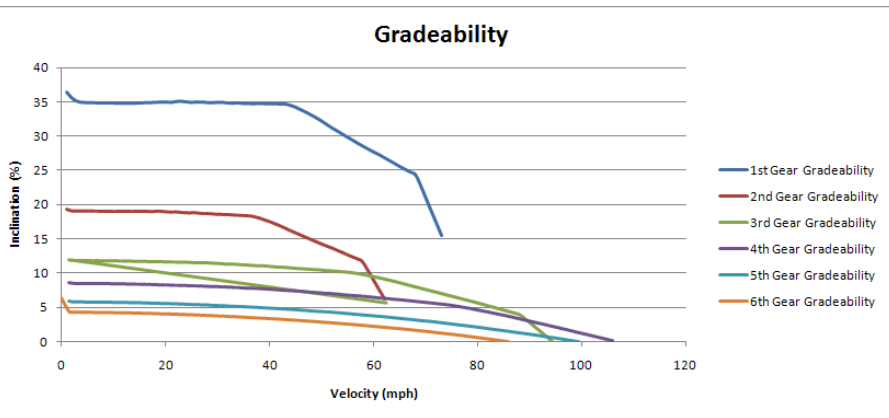
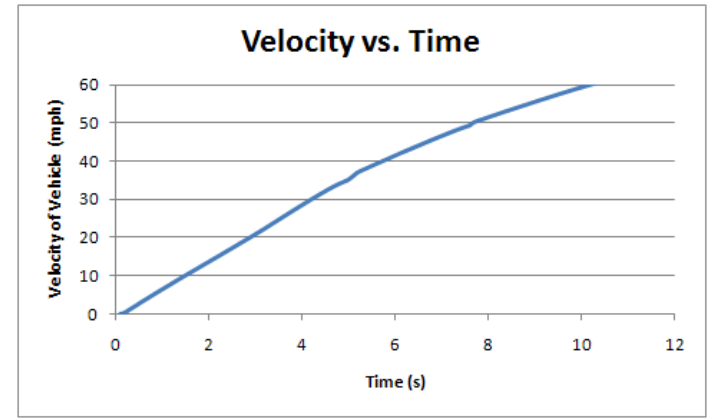


CONVENTIONAL POWERTRAIN DESIGN US MARKET

KARSAN V1 1,6

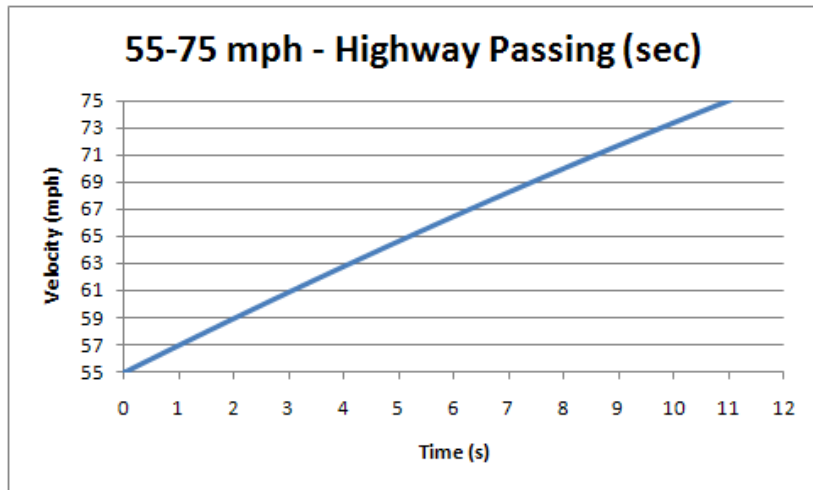
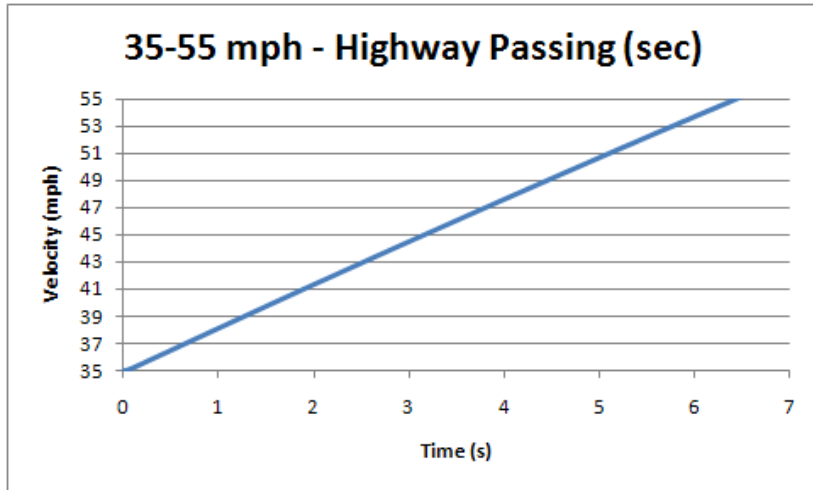


KARSAN V1 2,4

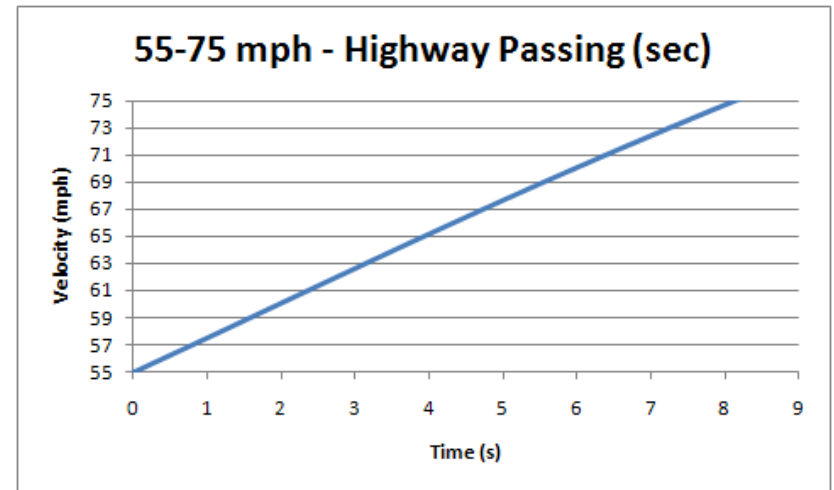
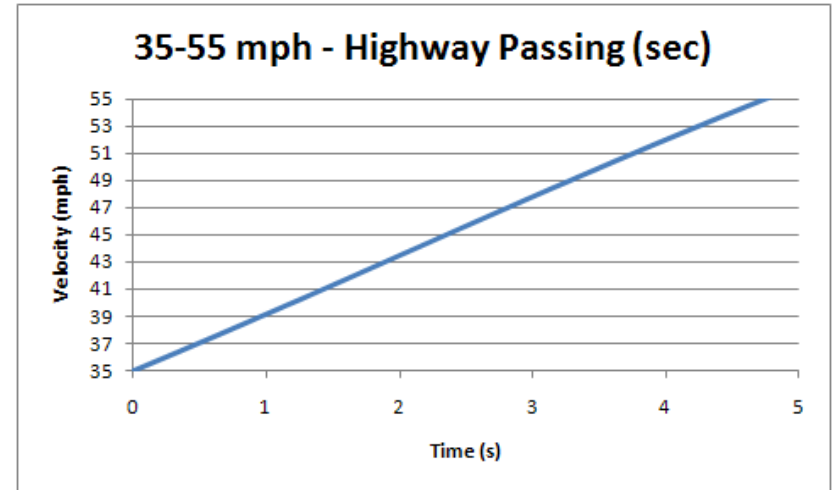


CONVENTIONAL POWERTRAIN DESIGN US MARKET

KARSAN V1 1,6

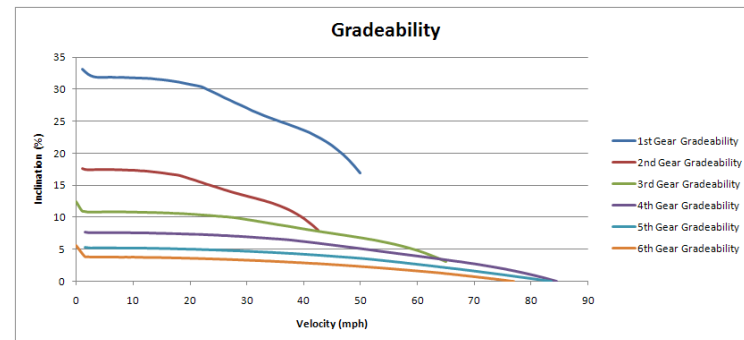
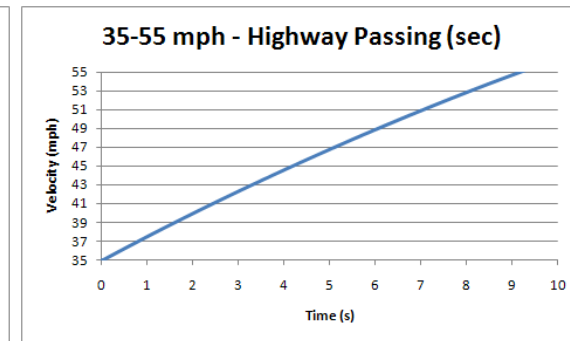
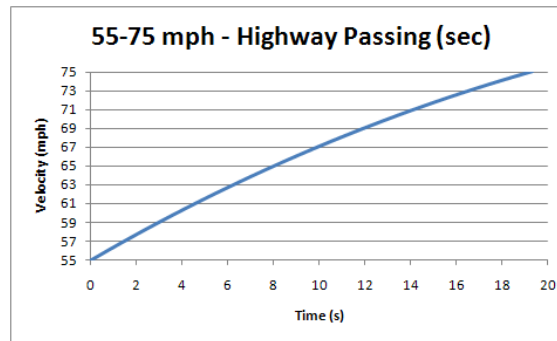
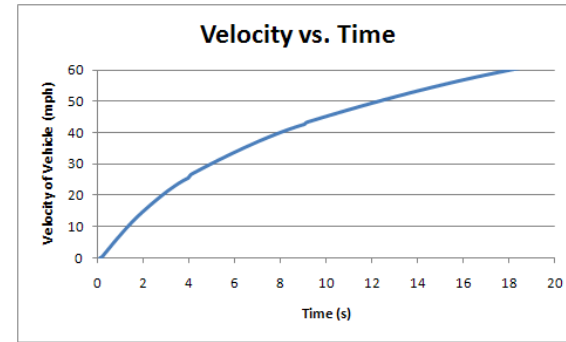


KARSAN V1 2,4



DIESEL OPTION EUROPEAN MARKET

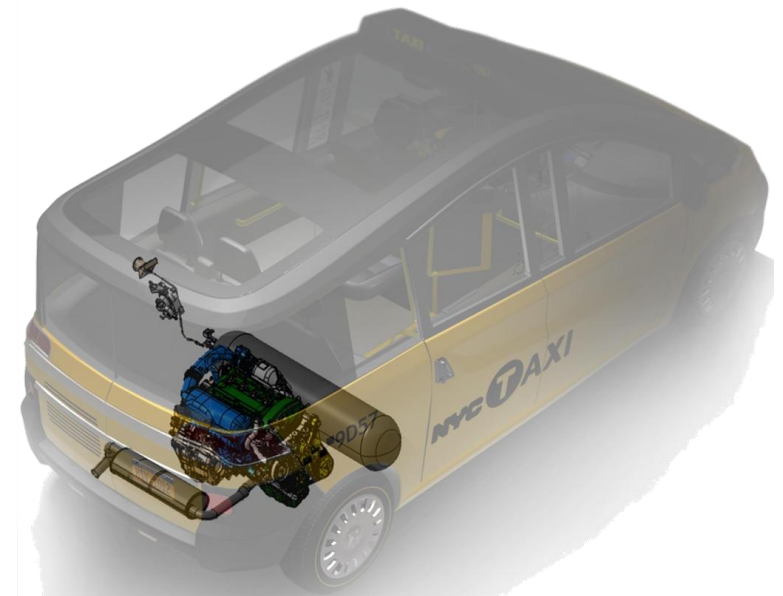
	KARSAN V1 Diesel
Engine Origin	European
Engine Type	Diesel I4 TCI
Engine Displacement (l)	1,6
Power (Hp)	92
Torque (lb-ft)	170
Transmission (Gears/Type)	6 Speed/ Manual
City FE (mpg)	27
Highway FE (mpg)	45
Combined FE (mpg)	35
Curb Weight (lbs)	3815
0-30 mph (sec)	4,89
0-60 mph (sec)	17,87
35-55 mp	9,18
Freeway Merge (sec)	9,18
55-75 mph Highway Passing (sec)	19,28
Peak Acceleration (ft/s ²)	13,07
Top Speed (mph)	87,00
Max Gradeability (1st gear) Standstill	32,28



ALTERNATIVE PROPULSION

CNG

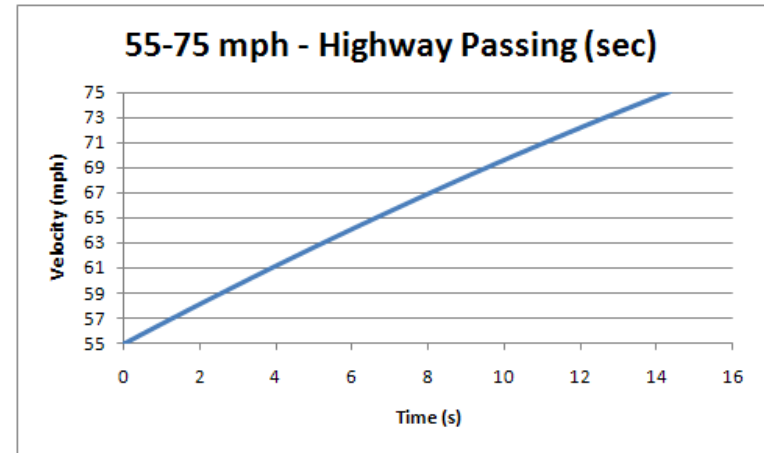
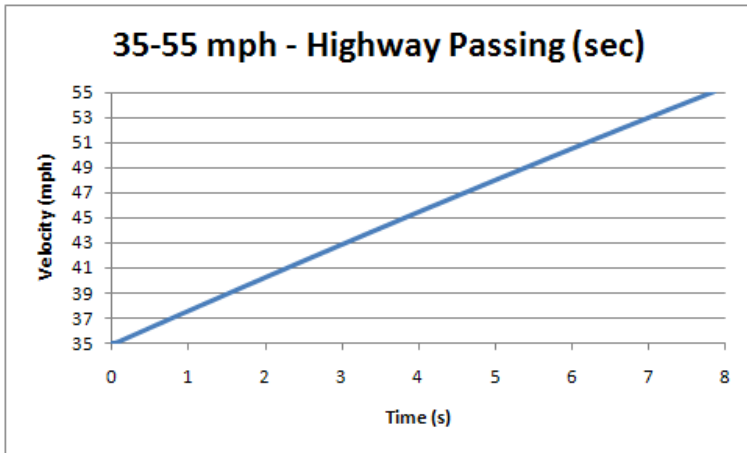
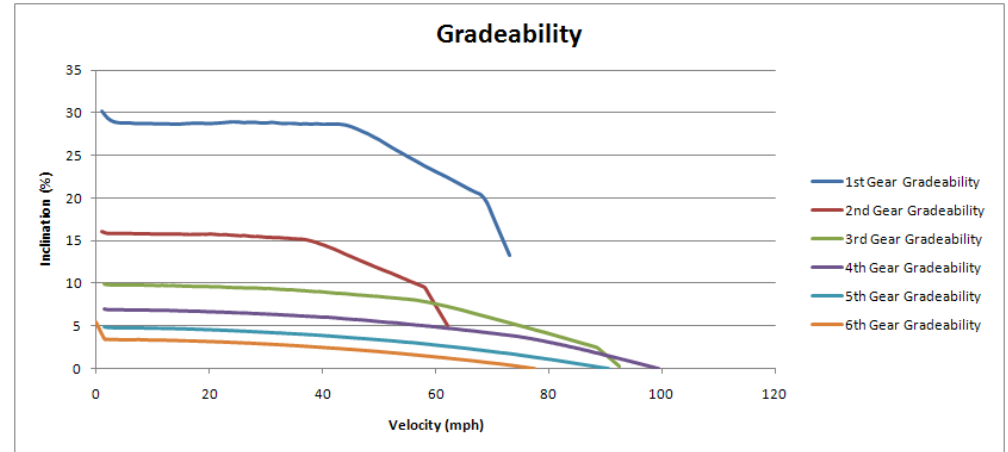
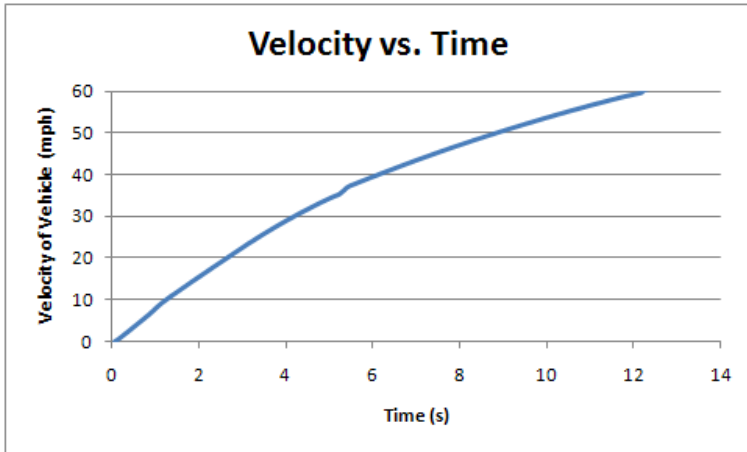
	KARSAN V1 CNG
CNG Tank Material & Capacity (L)	Composite / 90
Range (mi)	200
Engine Displacement (L)	1,6
Power (Hp)	132
Torque (lb-ft)	155
Transmission (Gears/Type)	6 Speed/ Automatic
City FE (mpg)	27
Highway FE (mpg)	37
Combined FE (mpg)	32
Curb Weight (lbs)	3955
0-30 mph (sec)	4,20
0-60 mph (sec)	12,22
35-55 mph Freeway Merge (sec)	7,84
55-75 mph Highway Passing (sec)	14,30
Peak Acceleration (ft/s ²)	15,73
Top Speed (mph)	102,00
Max Gradeability (1st gear) Standstill	29,26



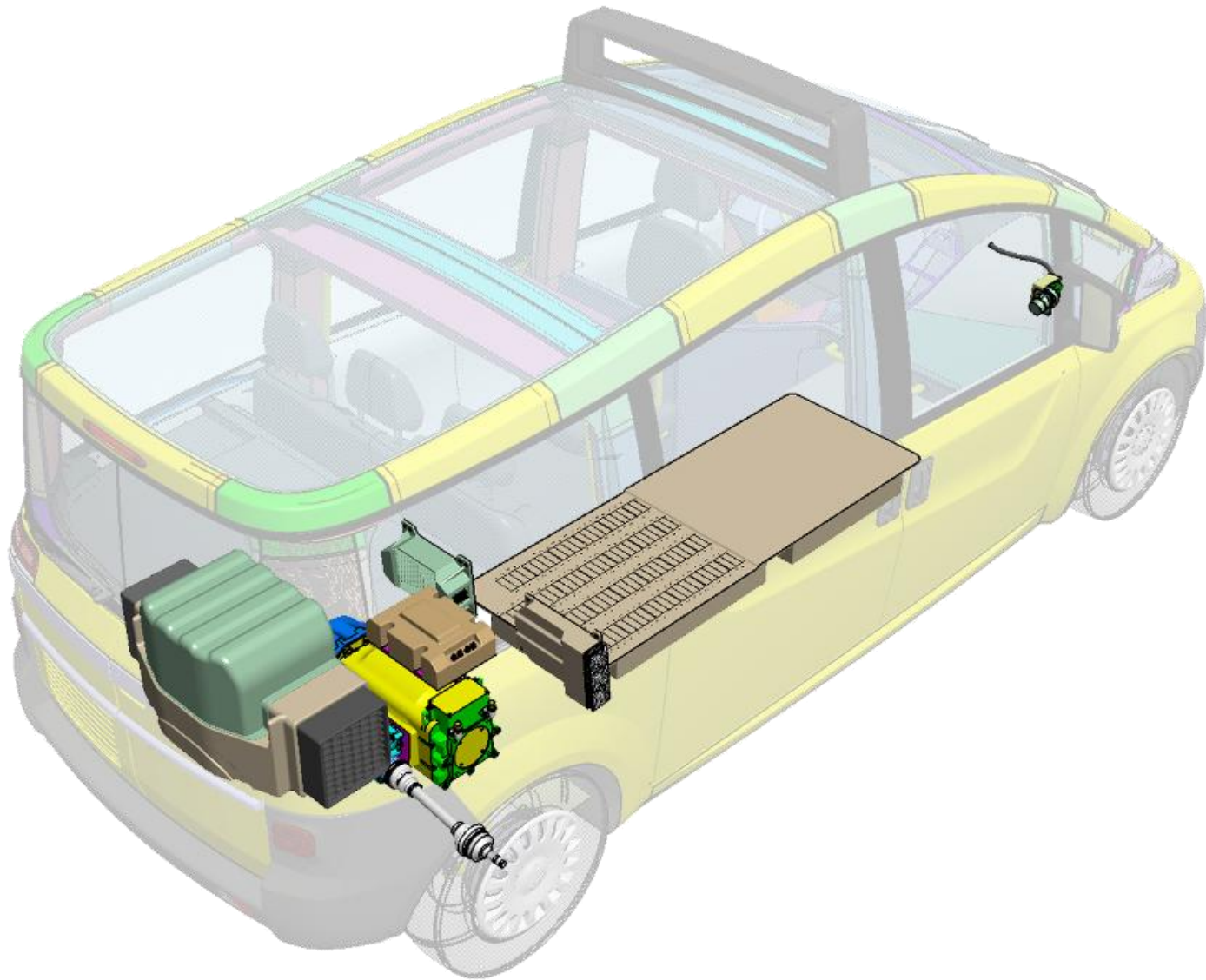
- Limited Performance
- Outstanding Emission Performance

ALTERNATIVE PROPULSION CNG

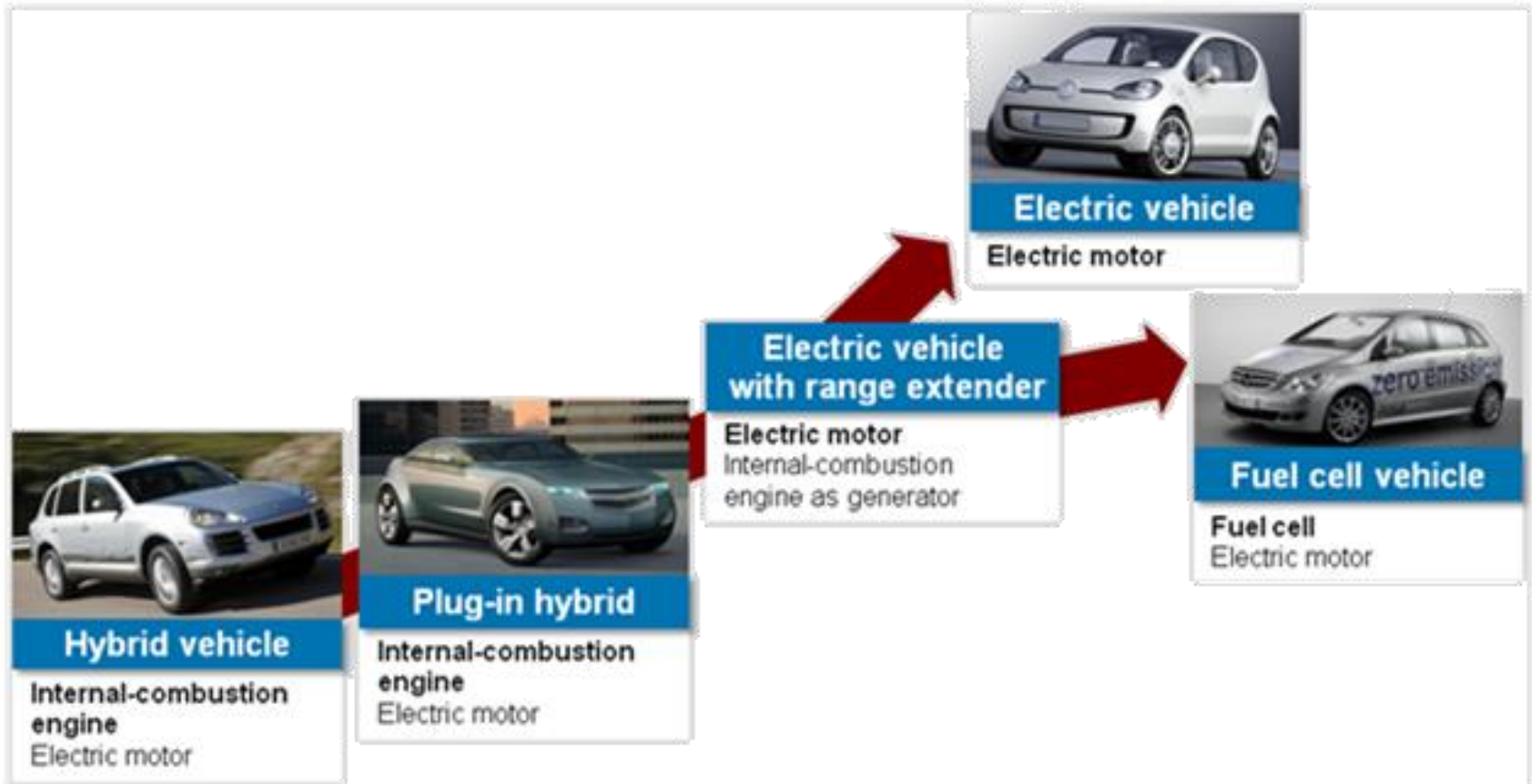
KARSAN V1 CNG



E-REV



E-REV



* Source: AVL List GmbH

E-REV

FUEL CELL VEHICLE



PLUG-IN ELECTRIC VEHICLE

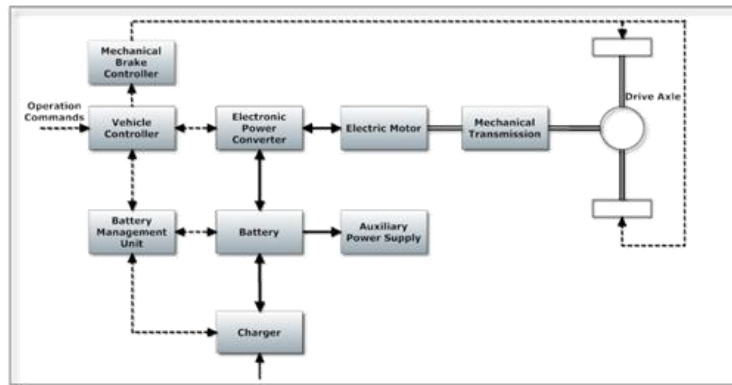


EXTENDED RANGE ELECTRIC VEHICLE (E-REV)

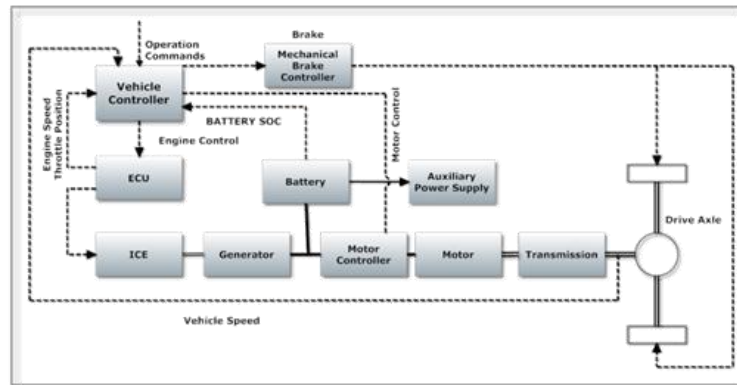
Downsizing the battery



Downsizing ICE



TYPICAL ELECTRIC VEHICLE DRIVE LINE



TYPICAL SERIES HYBRID ELECTRIC VEHICLE DRIVE LINE

E-REV



- Plug-in Capability by using Alternative Energy Source

E-REV

Vehicle Specifications	
Model	Karsan V1 E-REV
Body style	Mini Van
EPA vehicle class	Light Duty Truck 2
Drive system	electrically driven system with range extender Rear transaxle, RWD plug-in recharge capability
Suspension	Front/Rear McPherson Strut
Steering type	electric, speed-sensitive variable assist rack-and-pinion
Turning radius (curb to curb) (m)	5,5
Brakes	electro-hydraulic power assisted front/rear disc
Tires	215/65R16 low-rolling resistance
Frontal Area (m²)	2,79
Drag	≈ 0,42
Length (mm)	4830
Wheel base (mm)	3260
Track width (mm)	1580
Curb Weight (lbs)	4150

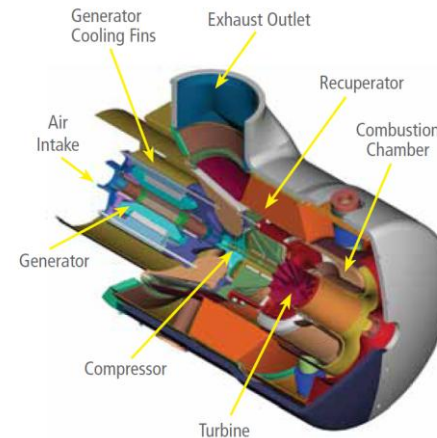
E-REV

Subsystem Specifications

Battery	
Type	lithium-ion
Energy (kWh)	24 (minimum)
Continuous power (kW)	65
Peak power (kW)	130
Voltage (V)	320 to 350
Weight (kg)	280
E. Motor	
Type	Permanent Magnet Brushless DC
Max. electrical power	130 to 140 kW
Torque	300 Nm
Max. Speed	8000 rpm
Continuous electrical power	70 kW
Microturbine engine	
Continuous mechanical power (kW)	30 kW
Drive	direct
Type	Generator integrated microturbine
Fuel	gasoline
Fuel tank (L)	40

Transmission

Type	2 Stage, helical gear, single ratio
Reduction ratio	8,3
Max. Wheel torque	2500 Nm
Charging outlet	
Type	Level 2 Charge Port
Standard 120V/15A	6 - 8 hours
240 VAC (SAE J1772-2009)	1 -2 hours
Inverter	
Type	IGBT 3-phase bridge
Voltage range	200 to 350 V
Vehicle Communications	
	Dual CAN



E-REV

Fuel Economy	
Electric mode range (miles)	50
Estimated fuel economy @ constant state of charge (mpg)	50
Combined Fuel Economy (SAE J1711) (mpg)	110
Performance	
0-30 mph (sec)	4
0-60 mph (sec)	12
35-55 mph Freeway Merge (sec)	6
55-75 mph Highway Passing (sec)	12
Peak Acceleration (ft/s²)	15
Top Speed (mph)	75
Max Gradeability (1st gear) Standstill (%)	> 25

THANKS FOR ATTENTION

FOR FURTHER DETAILS

PLEASE

COME TO VISIT

“POSTER AREA”

