

OPTIMORE - Optimised Modular Range Extender for every day customer usage

OPTIMORE

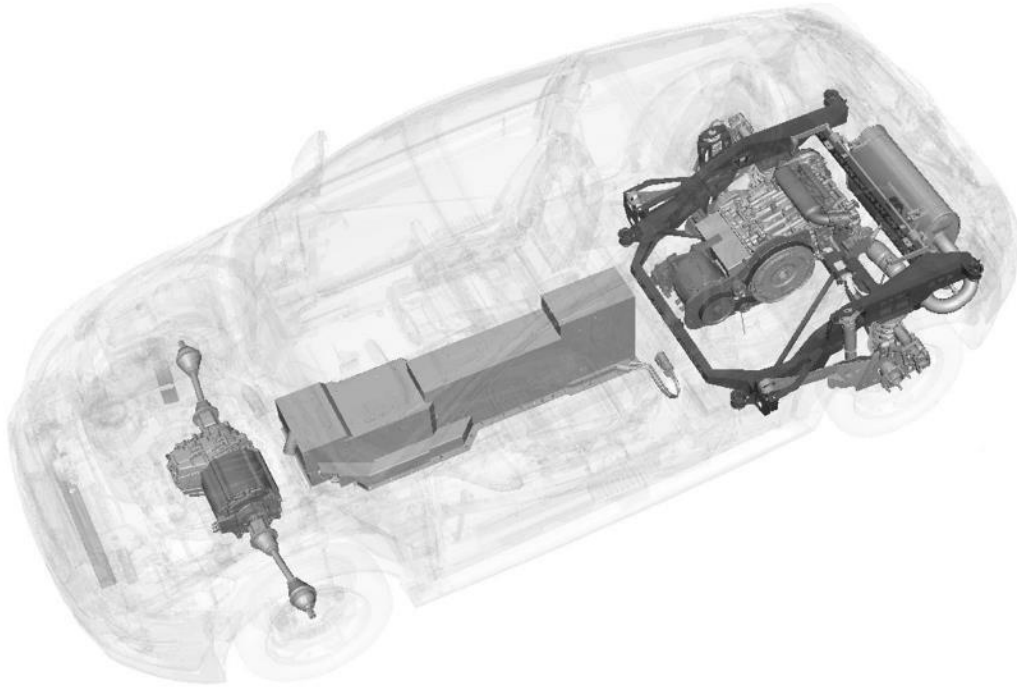
WP3 VCC Getrag / Chalmers / AVL Schrick
Modular Electric Range Extender vehicle
Final Presentation



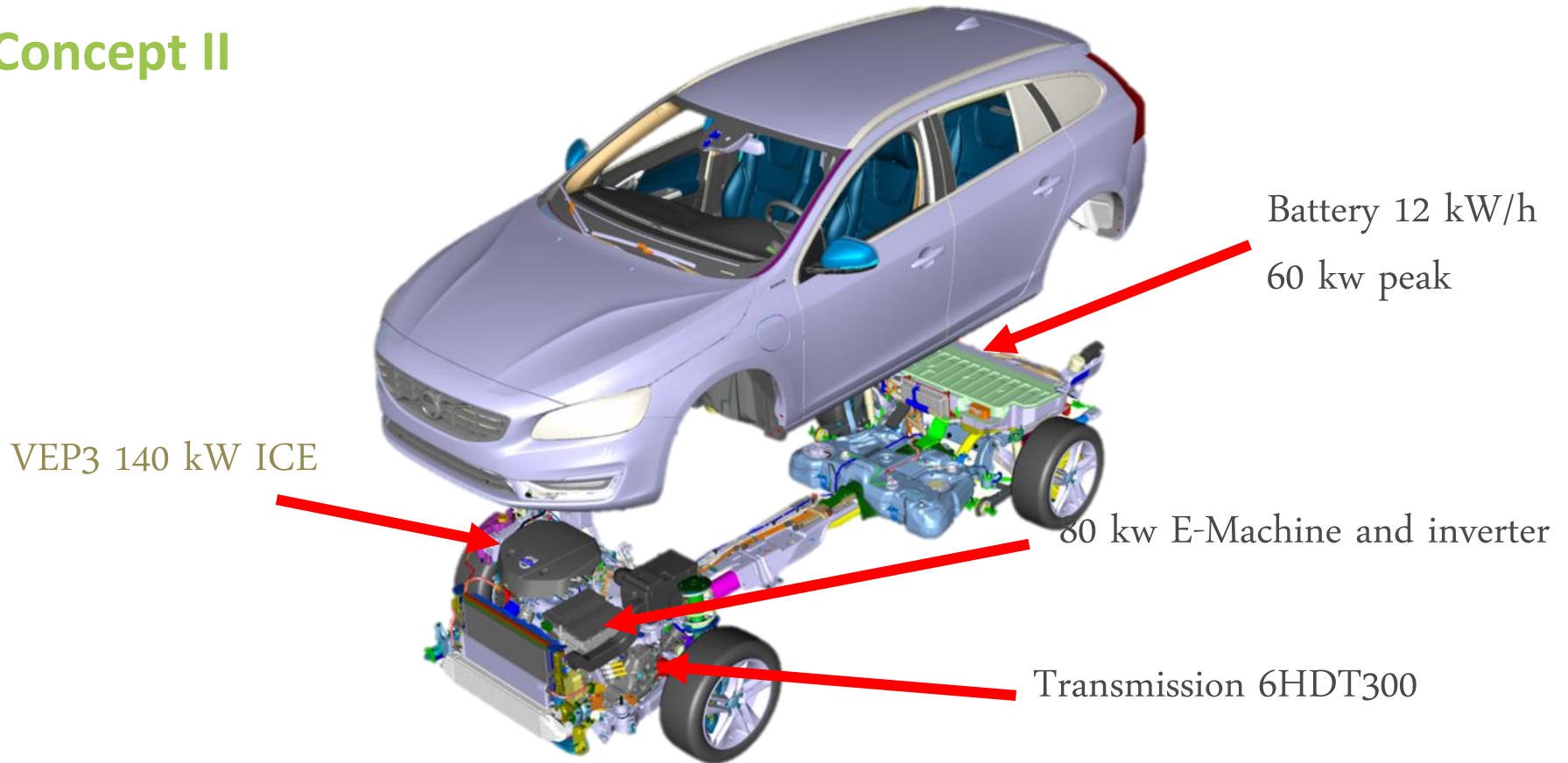
Content

- Concept I, Fuerex
- Concept II, HyRange / Optimore Low Cost
- Concept III, Optimore / High End Drivetrain
- Attribute Comparison
- Concept III, Evaluating E-motor influence of emissions considering combustion engine Transients
- Result Comparison

Concept I, Fuerex



Concept II



E-machine

Battery

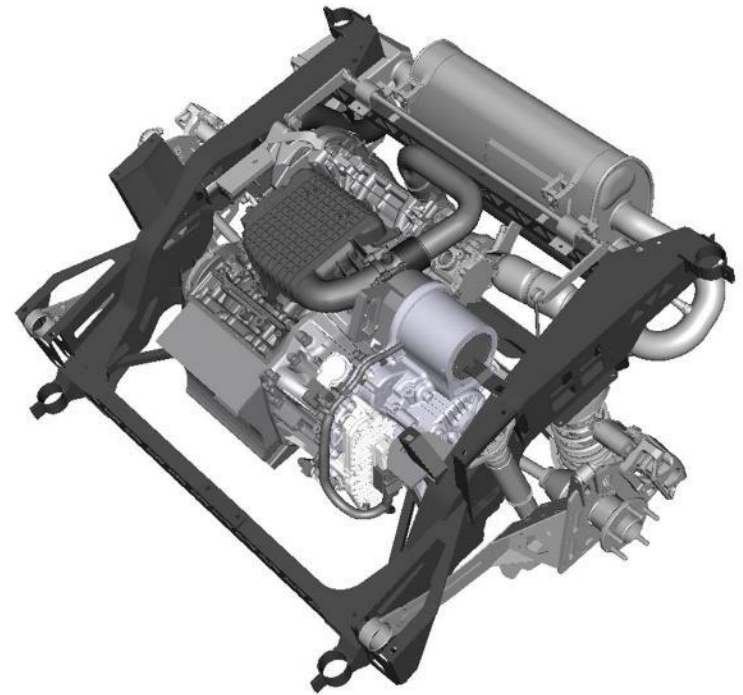
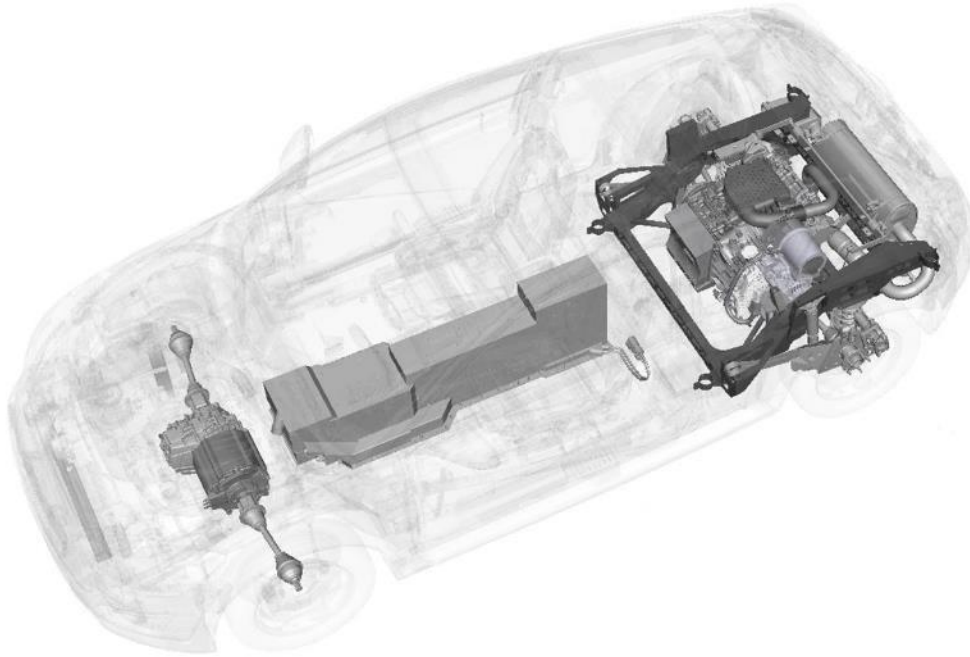
REX unit

12 kW/h

ICE 140 kW

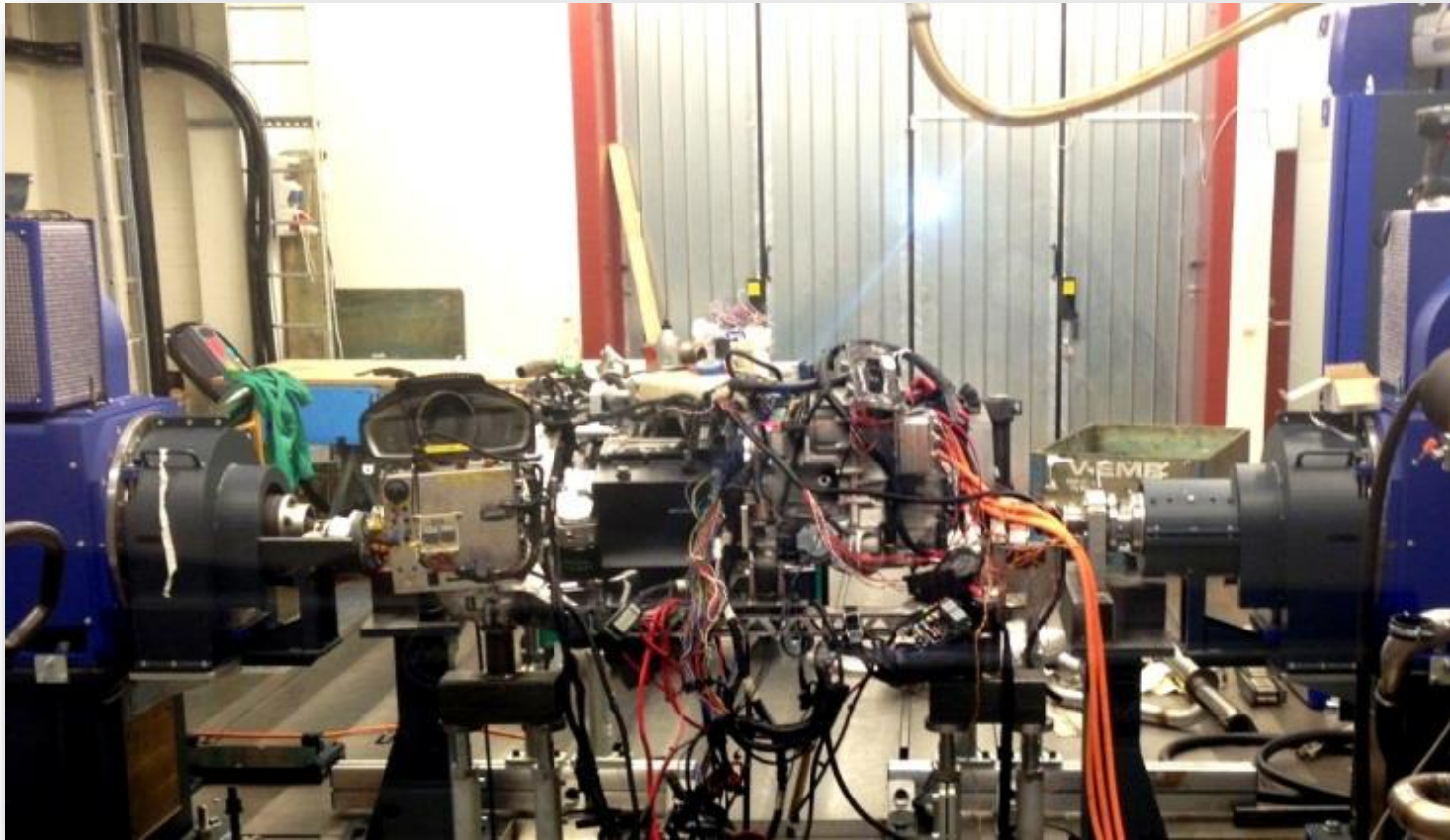
6 Gears

Concept III, Optimore



OPTIMORE - Optimised Modular Range Extender for every day customer usage

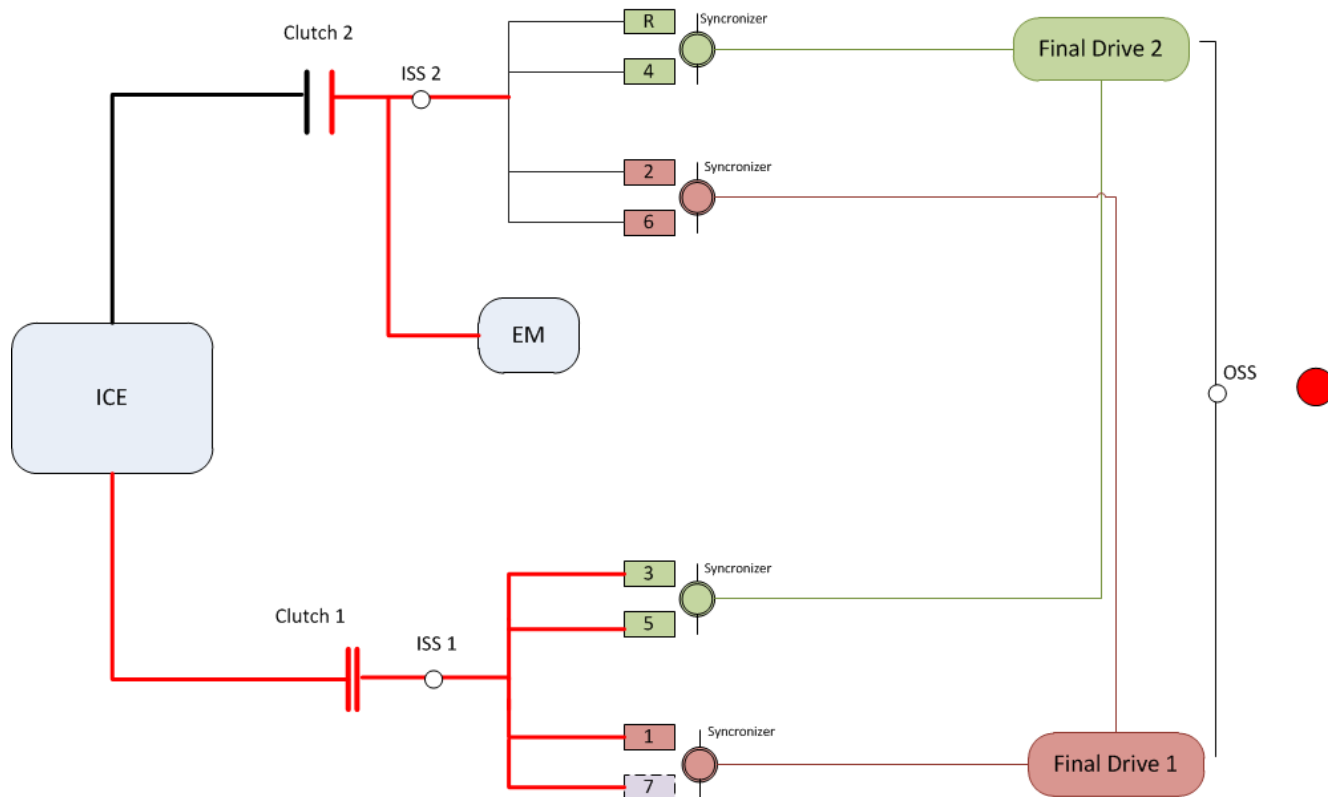
Optimore Installed for Development and Testing



Optimore Software Functions Developed

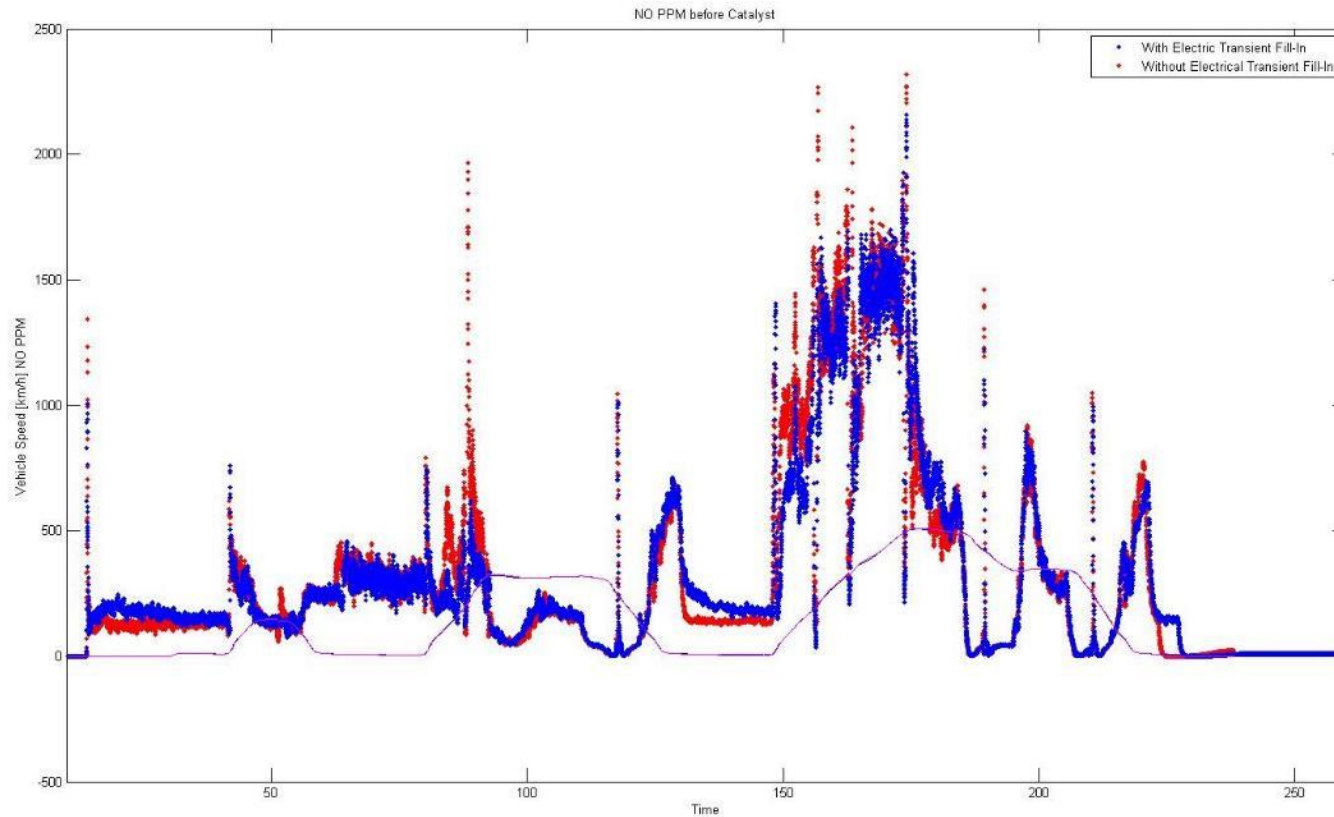
- Charge During Standstill
- Electrical Launch Support
- Clutch Start of the Engine
- Electric Motor Speed Control During Shifting
- Passive Gear Selection taking into account E-motor
- ICE Transient removal for emission evaluation

Electrical Launch Support



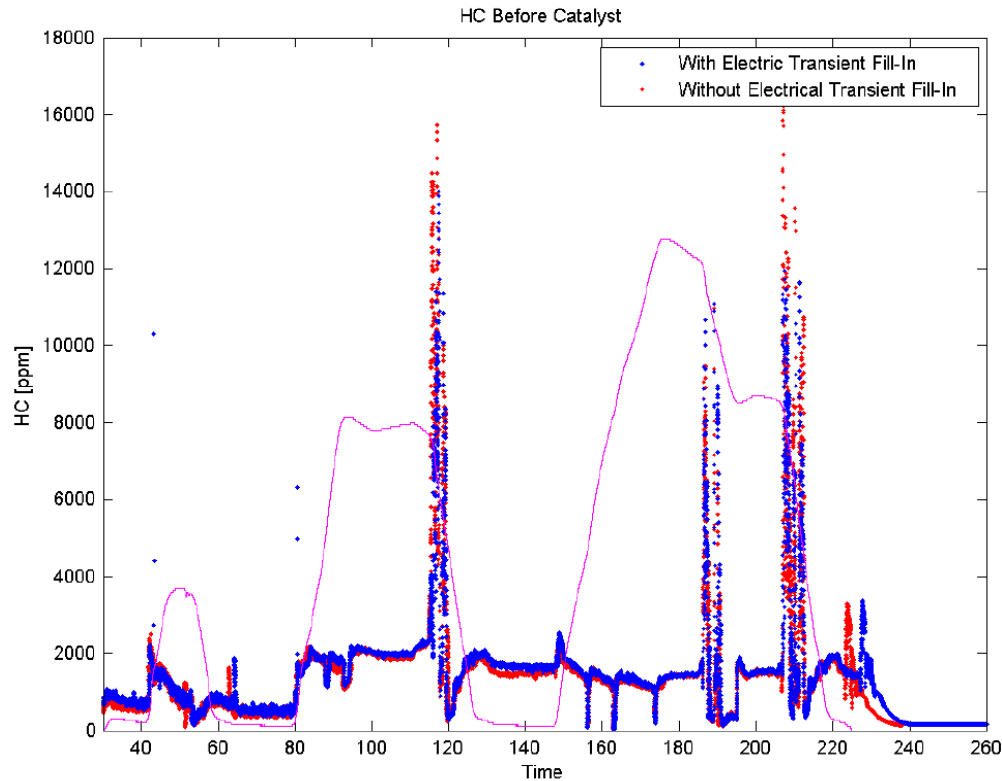
Emissions and Results comparing one Crankshaft Torque transient removal strategy for the E-motor

NO emissions before Catalyst



Using EM to compensate for torque reduction during upshifting makes larger impact on NO emissions before catalyst

HC before Catalyst



No benefit in Fast HC with electric transient fill-in can be seen in the measurements

Comparison between the Concepts

		C30 BEV	C30 Fuerex	Optimore Low Cost.	Optimore High Perf.
Specifications	Data	Baseline	Concept 1	Concept 2	Concept 3
ICE	Volume [L]	-	1,5	1,5	1,3
	Turbo and Direct Injection	-	-	1	1
	Max Power [kW]	-	40	135	125
Transmission	No Gears [-]	1	1	6	6
	First Gear Ratio	10,1	10,1	15,1	15,1
E-motor [Prop]	Max Power [kW]	85	85	120	120
	Max Speed	12000	12000	18000	18000
Battery	Energy usable [kWh]	24	12	10	12
	Max Power [kW]	105	52,5	60	52,5
	No Cells [-]	392	196	192	196
Max System Performance	Max Pure Power Propulsion [kW]	85	52,5	60	52,5
	Max Total Wheel Power [kW]	85	85	195	177,5
	Max Takeoff Torque Pure [Nm]	2222	2222	2052	2735
	Max Total Range [km]	161	600	800	600

Cost Comparison between the concepts

		C30 BEV	C30 Fuerex	Optimore Low Cost.	Optimore High Perf.
Cost Analysis	Data	Baseline	Concept 1	Concept 2	Concept 3
	Battery Cost [-]	100,0%	50,0%	50,0%	50,0%
	Power Electronics [-]	100,0%	200,0%	100,0%	200,0%
	Combustion Engine [-]	0,0%	100,0%	137,5%	137,5%
	Transmission Cost [-]	100,0%	107,1%	185,7%	185,7%
	Total Powertrain Cost	0	-5,5%	-13,2%	6,6%

Consumption Performance

		C30 BEV	C30 Fuerex	Optimore Low Cost.	Optimore High Perf.
Results and Attributes	Data	Baseline	Concept 1	Concept 2	Concept 3
Fuel Economy	Fuel Consumption @ 90 kph [l/100 km]	0	5,5	3,9	4,1
	CO ₂ @ 90 kph [g/km]	0	128	91	97
	CO ₂ NEDC depletion [g/km]	0	0	0	0
	CO ₂ NEDC sustain [g/km]	0	166	183	183
	Electric Range [km]	161	60	50	60
	NEDC CO ₂ rating [g/km]	0	26	33	28

[-]	Simulated
[-]	Measured



Thanks you for your attention