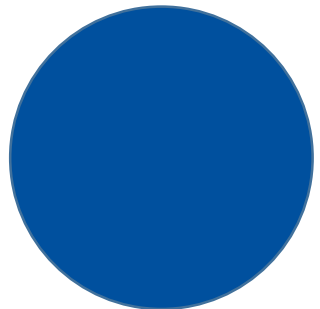
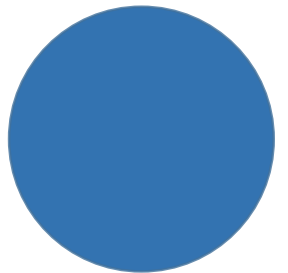
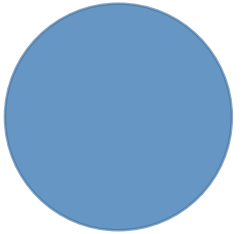
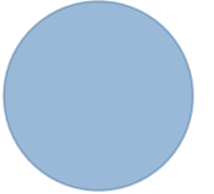


Life Cycle Environmental Impacts of Alternative Powertrain Configurations HDV: Real Scale Application

by

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Institutt for energiteknikk



Aim

- *Environmental modeling of battery electric, fuel cell and conventional HDVs*
- *Comparison of their life cycle CO2 emissions*

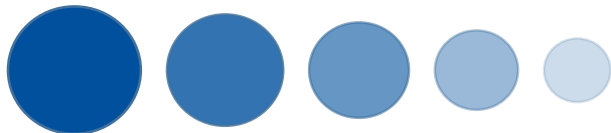
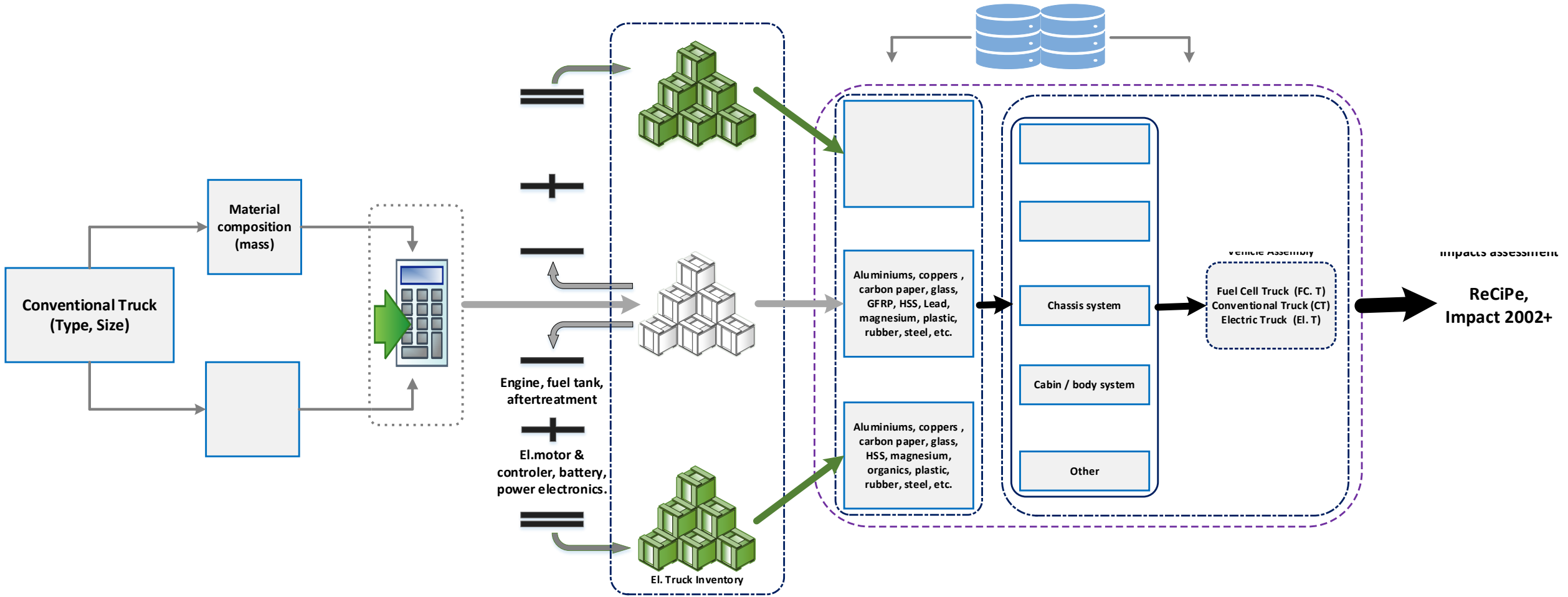


Study Characteristics

- *GVW fixed to 12 tons for all three technologies*
- *FU: Vehicle designed to drive 216240 km yearly for 10 years*
- *Technology standard: Euro VI (CT), single gear 340 kW peak, 4000 rpm BET & FCT*

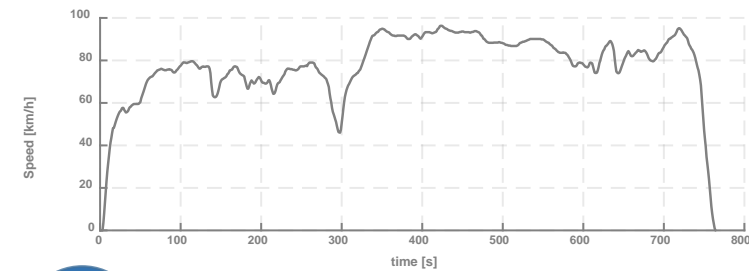
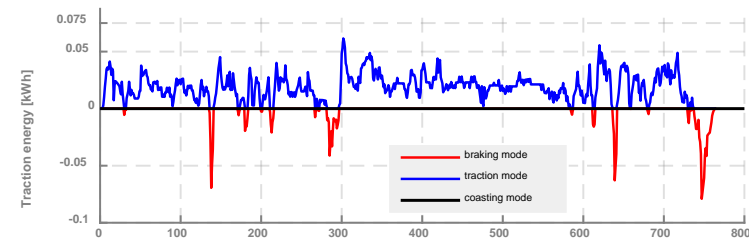
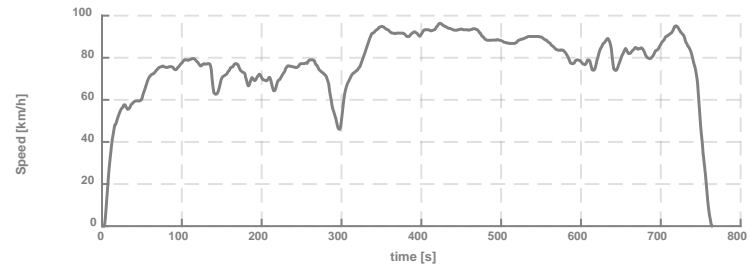
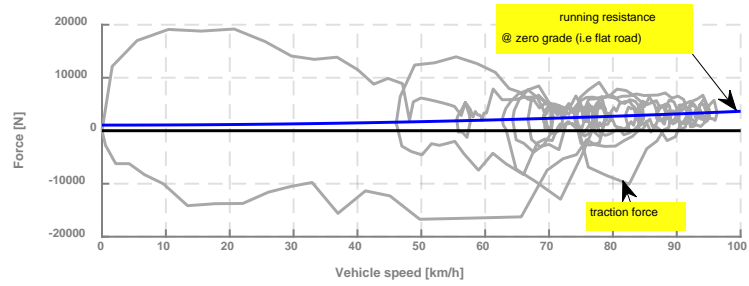


Approach

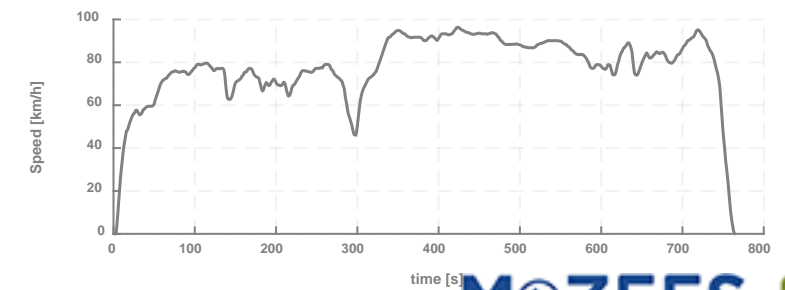
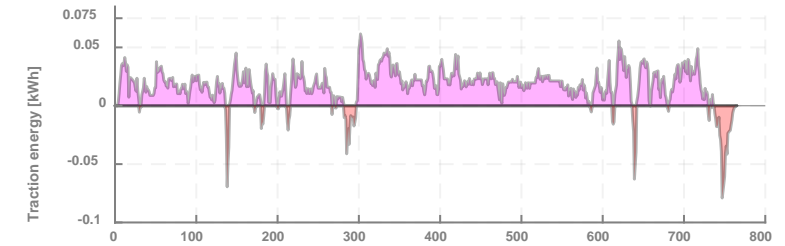
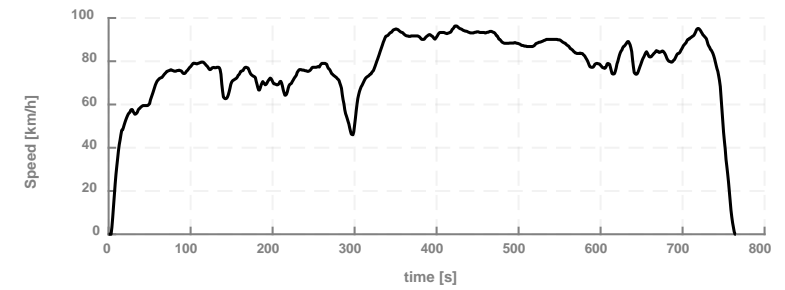
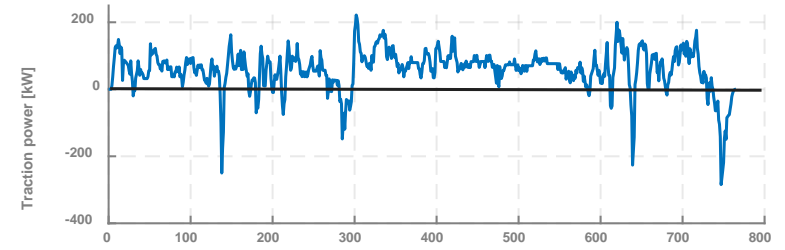


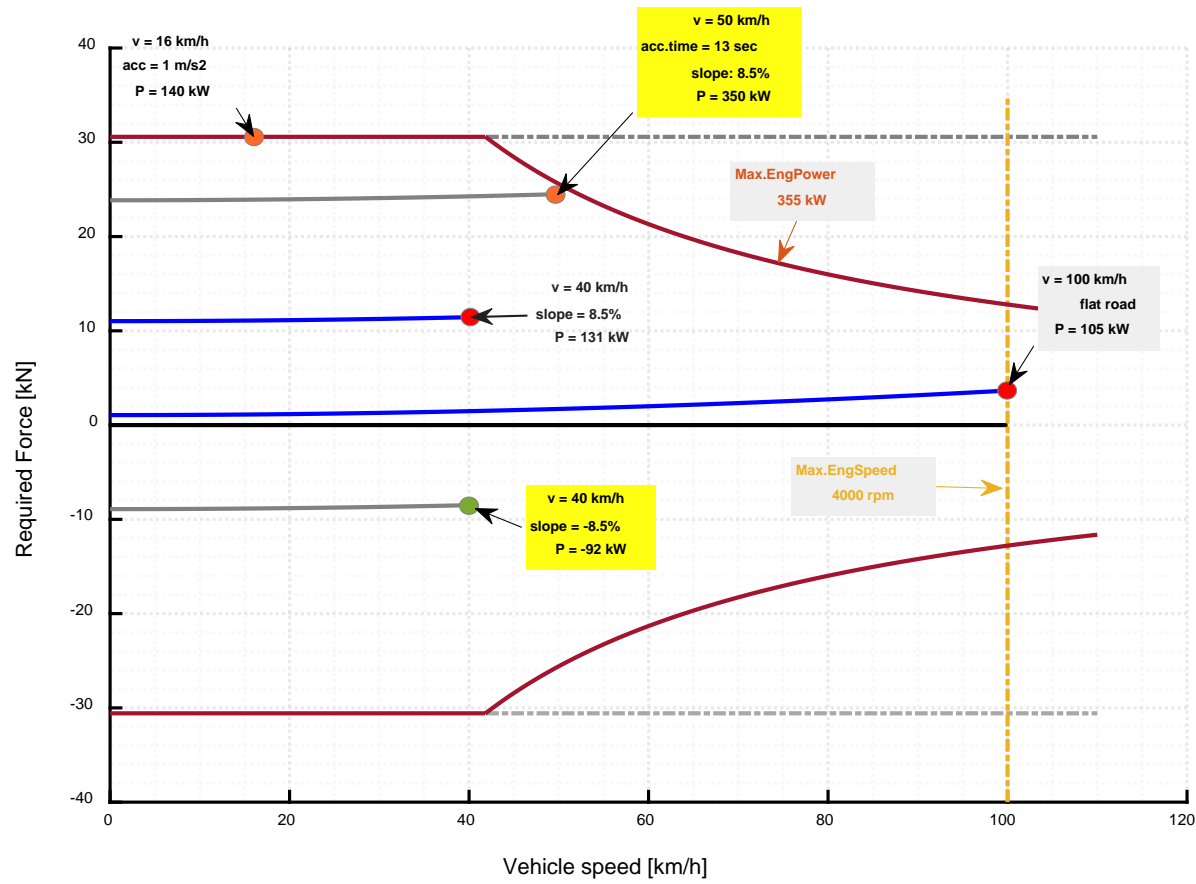
BET, FCT considerations

Force and energy

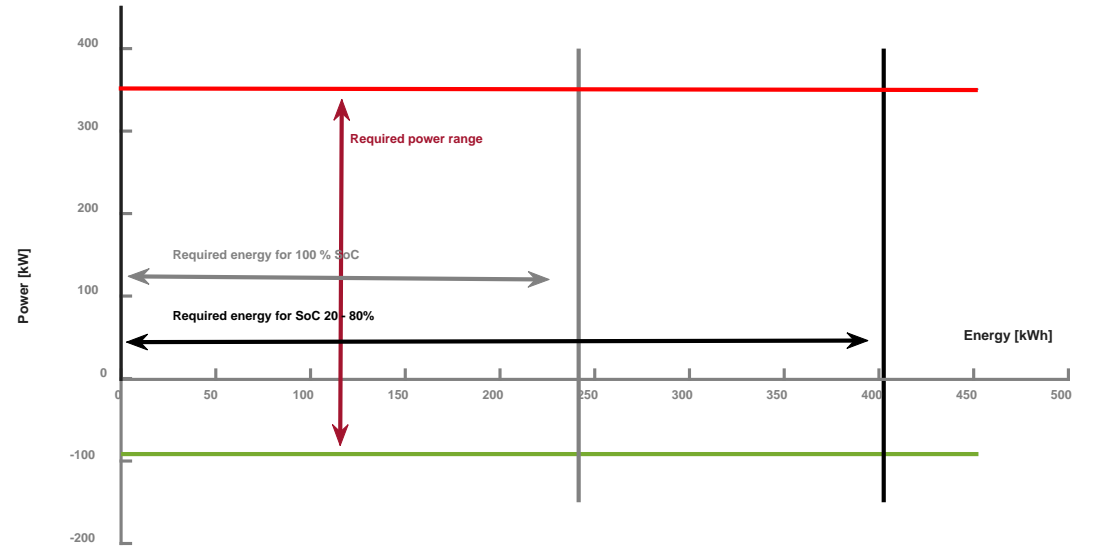


Cycle traction power and Energy demand





BET operating points based on design requirements



Battery operational range



H2 Tank specifications

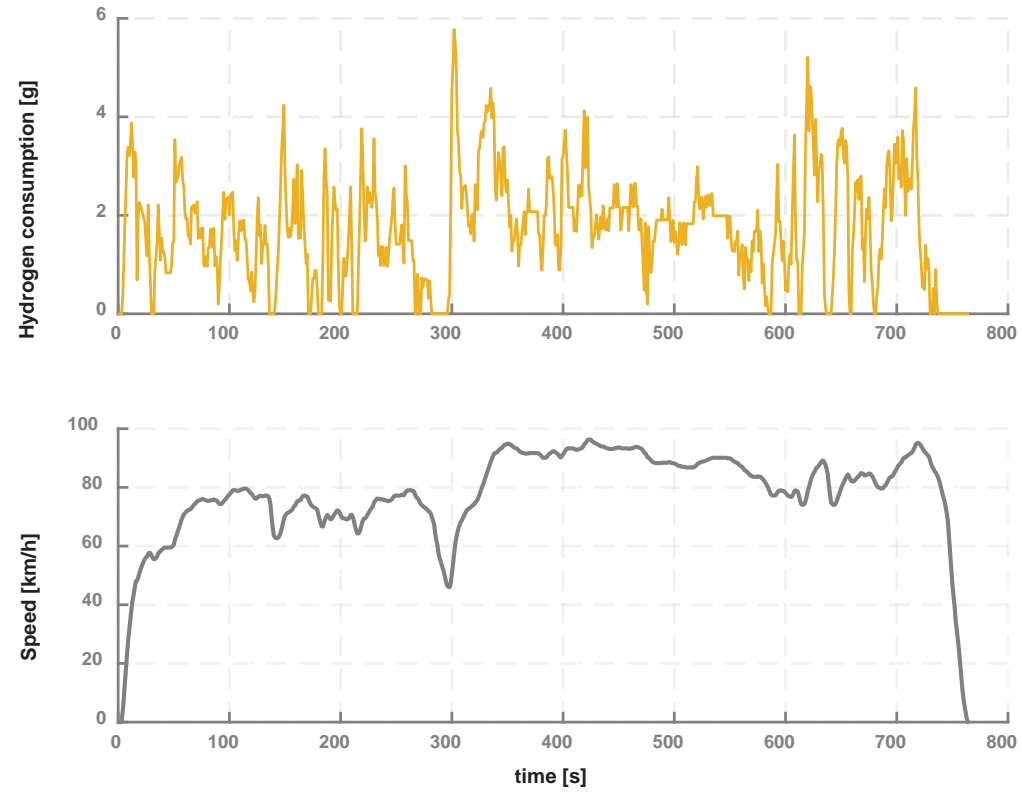
Product frame	Diameter (mm)	Length (mm)	Weight (kg)	Inner volume (L)	H2 Storing capacity (kg)
<i>Special 1S</i>	530	1800	160	198	7,9
<i>Special 1L</i>	630	1800	226	280	11,2
<i>Special 2</i>	170	2300	21	26	1,0
<i>Special 3</i>	400	2300	117	144	5,8

Benchmarking fuel cell manufacturers

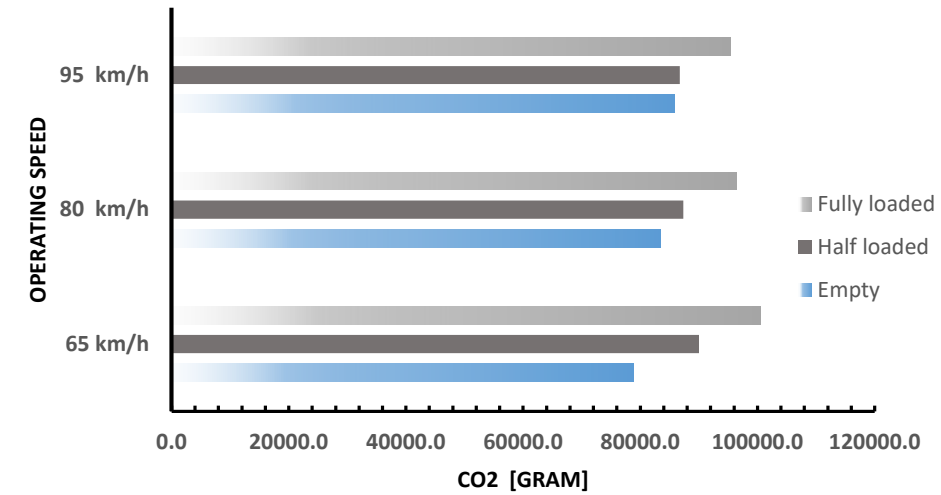
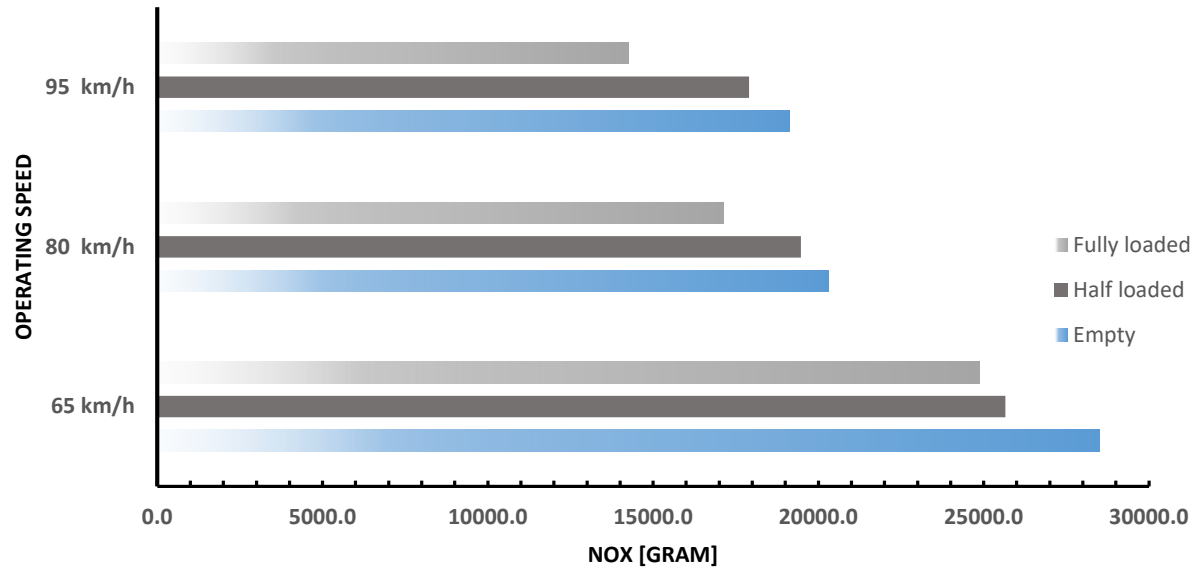
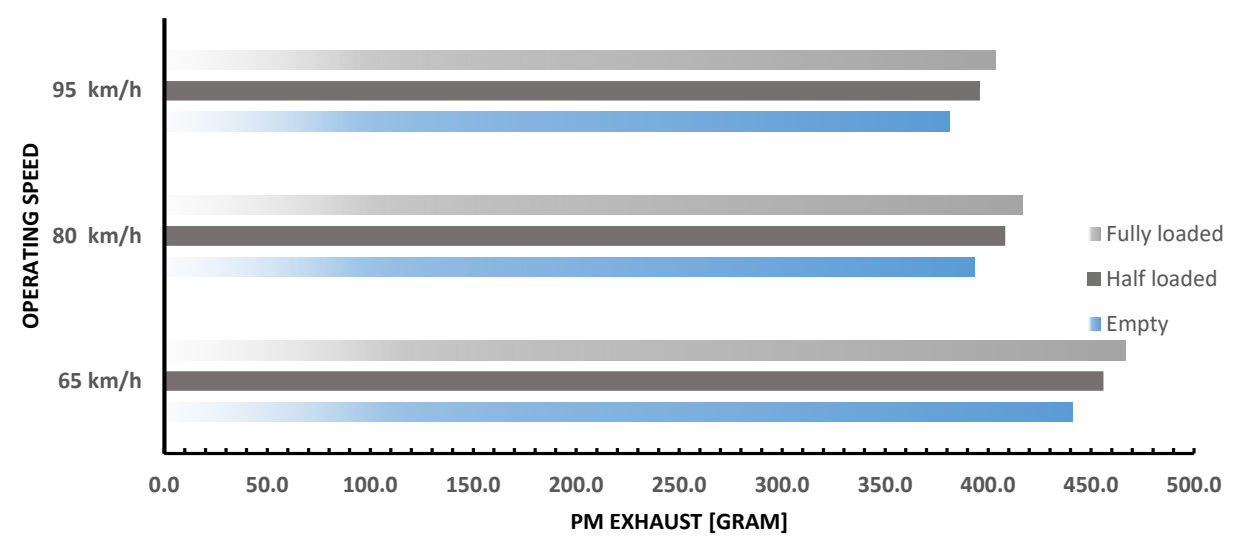
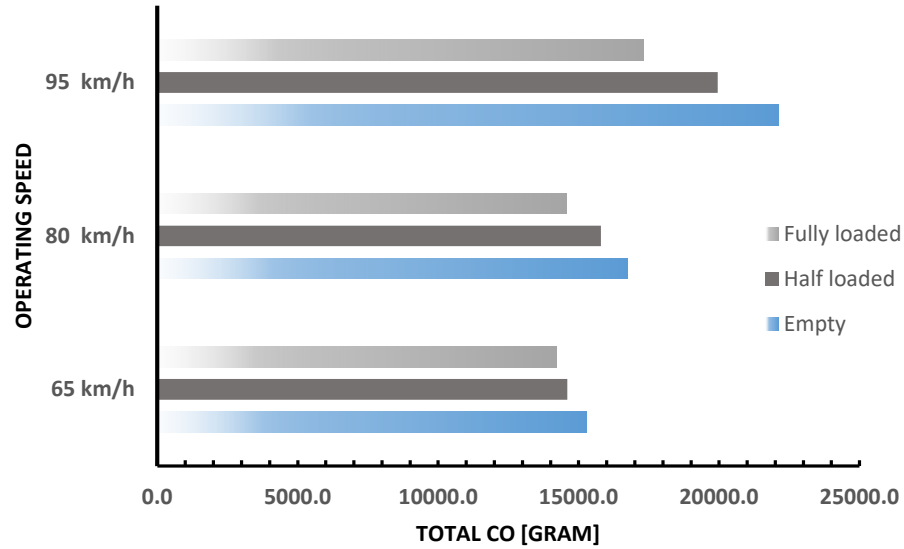
Manufacturer	Product	Characteristics				
		Volume (m3)	Mass (kg)	Power (kW)	Power density (kW/m3)	Specific power (kW/kg)
Ballard	<i>FCvelocCity - HD</i>	0,528	285,0	100,0	189,5	0,4
Hydrogenics	<i>Celerity</i>	0,294	275,0	60,0	204,1	0,2
	<i>HD90</i>	0,594	360,0	99,0	166,7	0,3
	<i>HD180</i>	1,184	720,0	198,0	167,2	0,3
Powercell	<i>S2-250C</i>	0,033	34,5	22,5	676,8	0,7
	<i>S3-335C (prototype)</i>	0,029	32,3	100,0	3437,5	3,1
	<i>S3-455C (prototype)</i>	0,029	41,6	125,0	4296,9	3,0



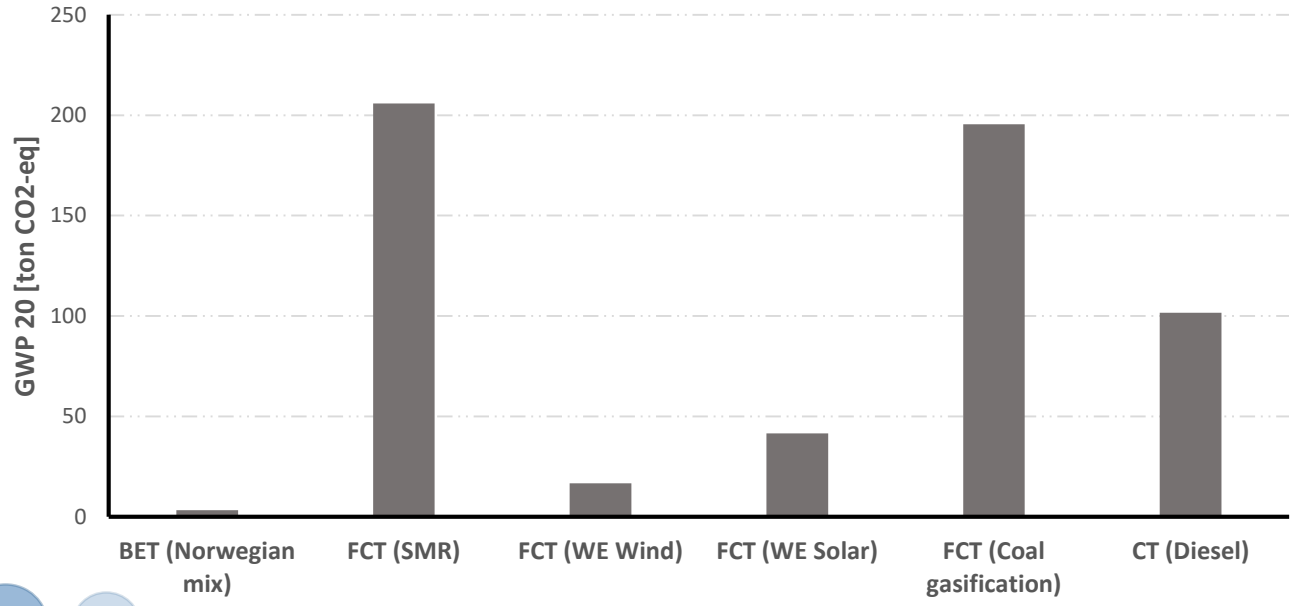
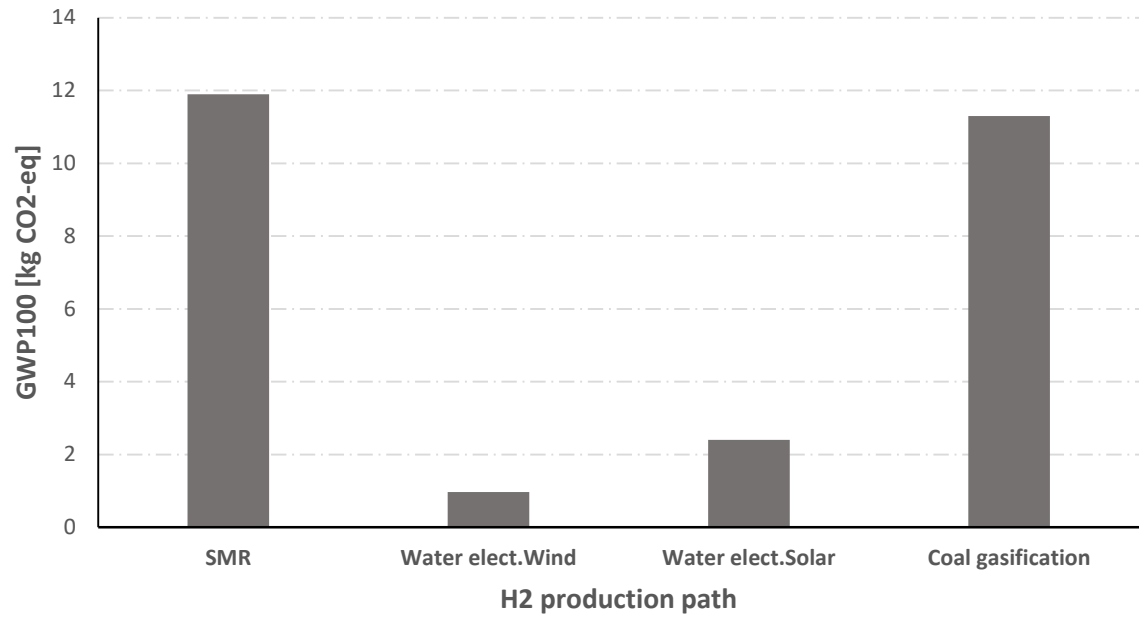
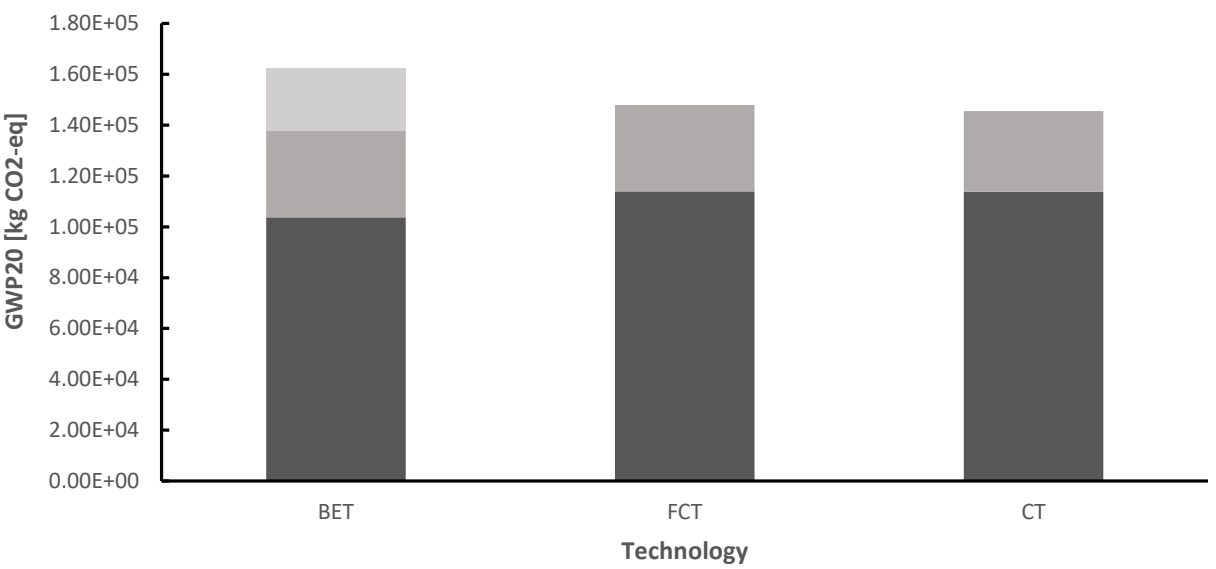
H2 consumption of the FCT for the entire FTP-Highway cycle

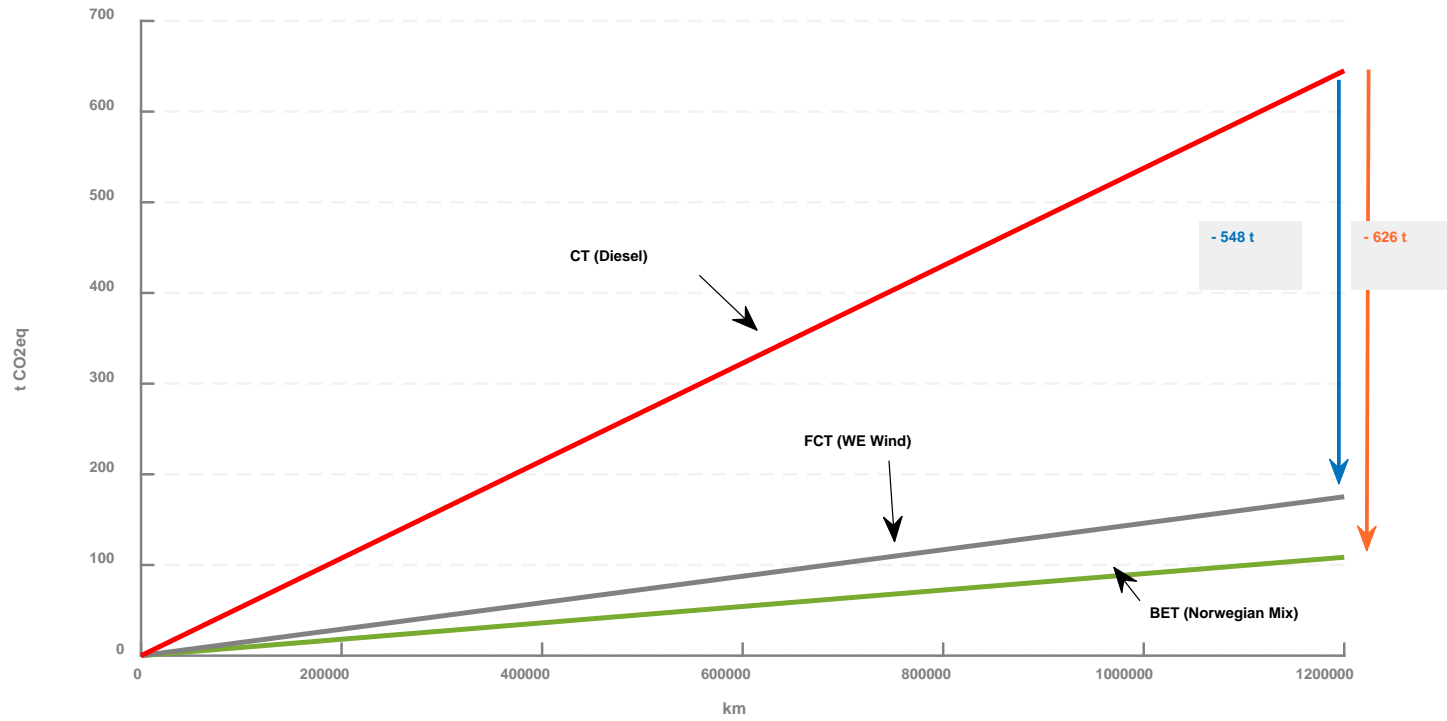


Results



■ Assembly ■ Processing ■ Battery Pack





Tusen Takk!

