STORHY
SP Evaluation

Environmental Assessment of onboard Hydrogen Storage

Workshop 3:
Storage Technologies and their
Impact on Hydrogen Infrastructure

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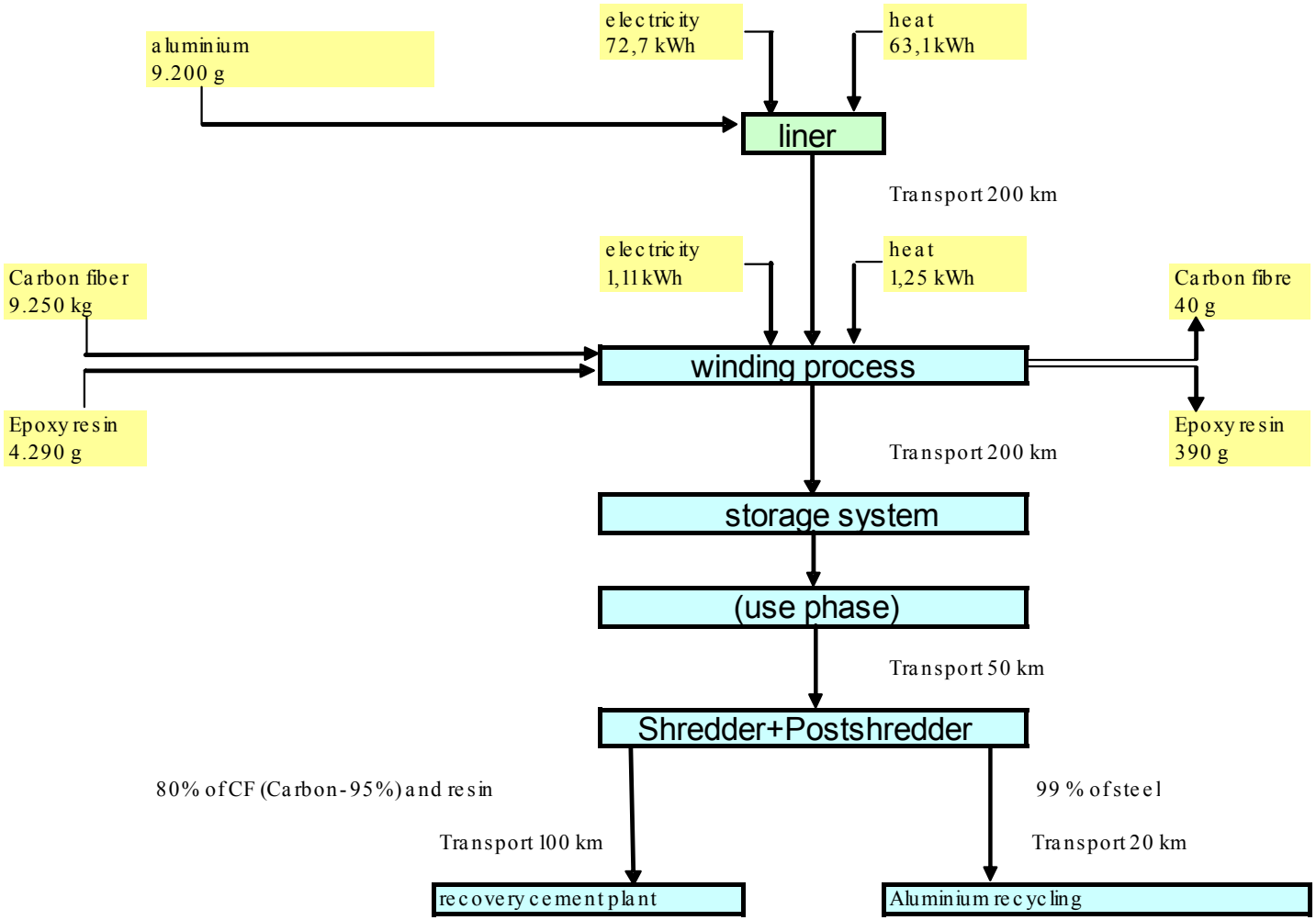
Investigation on:

-Solid state storage

-Liquid hydrogen storage
(steel, CFK cylinder & freeform)

-C-H_2-cylinder
* *type III 350 bars C-H_2 vessel*
* *type III 700 bars C-H_2 vessel*
* *type IV 700 bars C-H_2 vessel*



Flow sheet type III 350 bars C-H2 vessel

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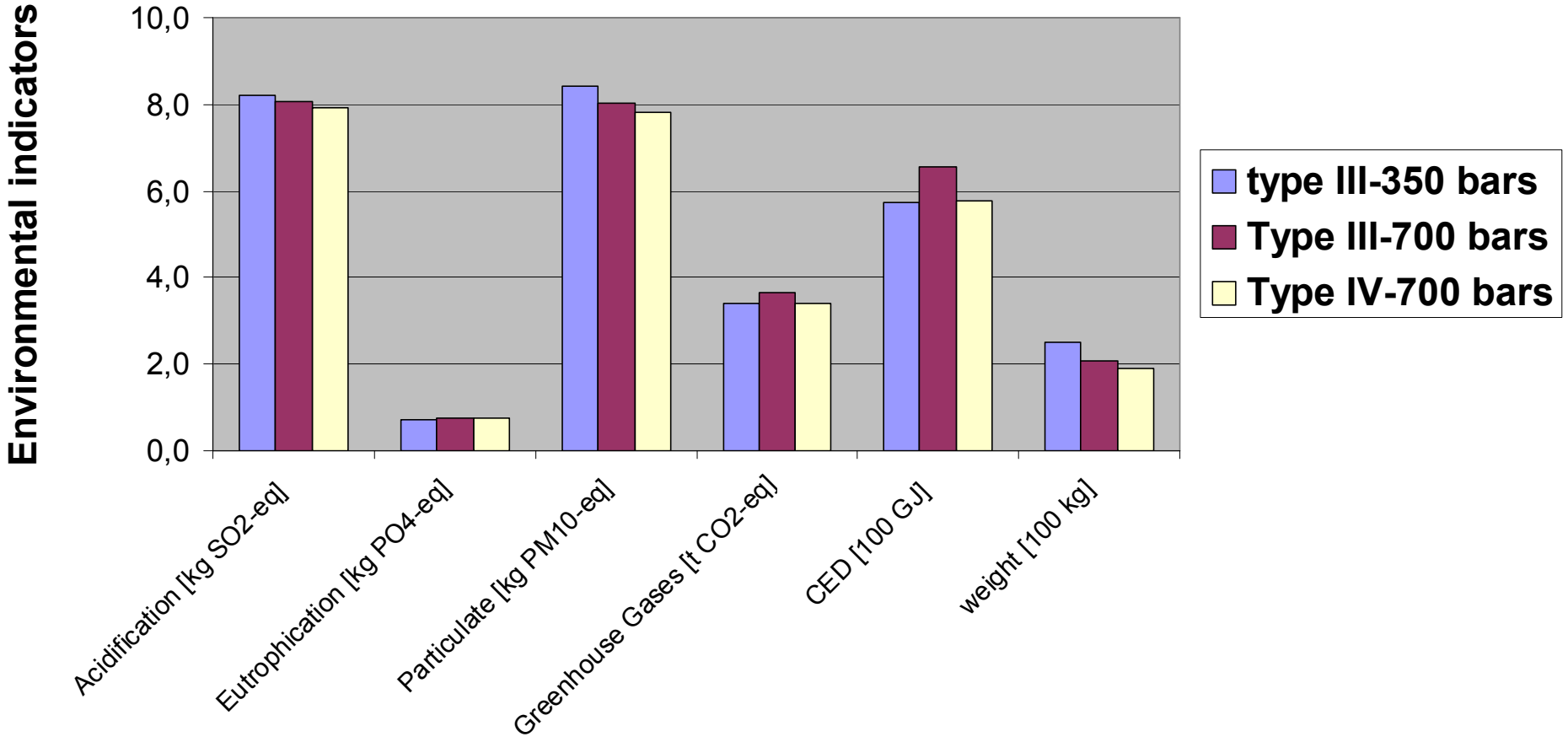
Environmental indicator for a 10 kg H2 CHG storage



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Overlook CED by material

	CED MJ/kg
typical automobile average	80-100
LH_2 CFK cylinder	190
C-H_2 CHG type IV	310

Conclusion I:

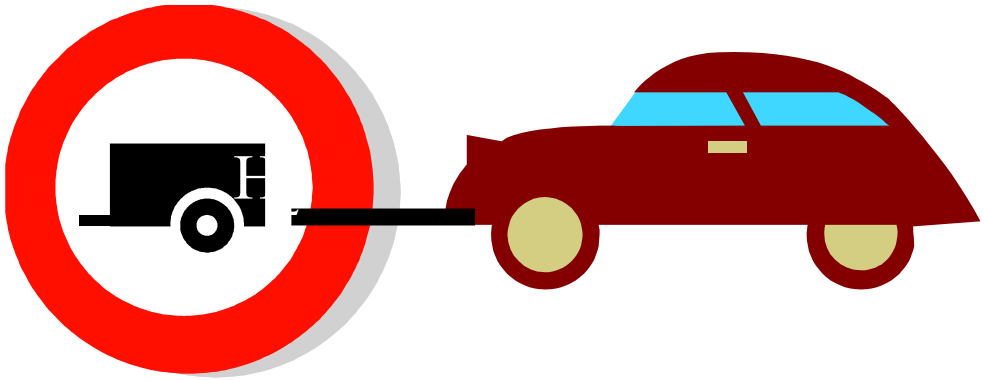
- vessels are produced from materials which carry a high environmental burden

- recycling for these materials (aluminium, stainless steel, CF) are important to reduce overall burden

- normalized for hydrogen capacity, type III 350 bar vessel is performing equal despite higher weight. Materials with lower environmental burden are used.

Automobile Energy Storage of 1200 MJ

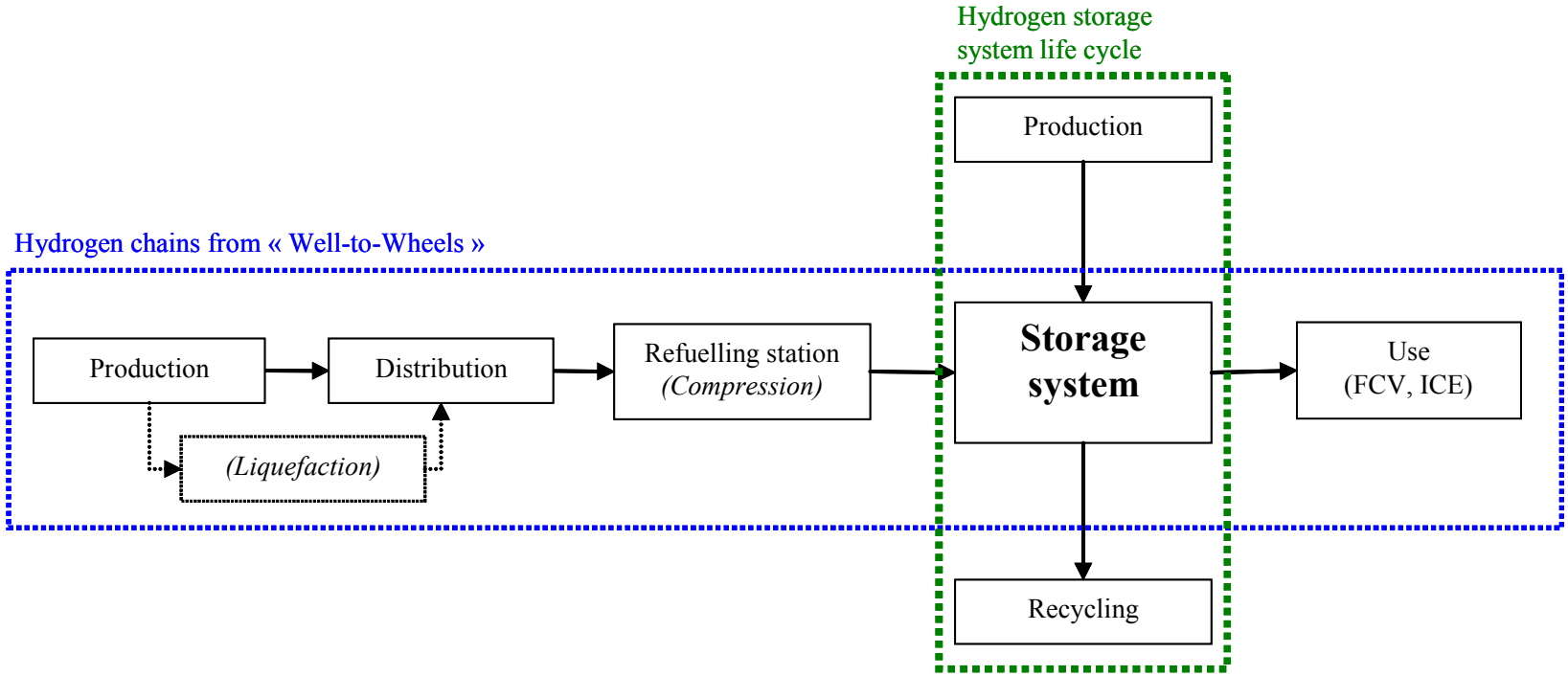
Energy	Tank	Fuel	Total
Gasoline	6 kg	28 kg	34 kg
LH_2-CFK	70 kg	10 kg	80 kg
CH2	188 kg	10 kg	198 kg

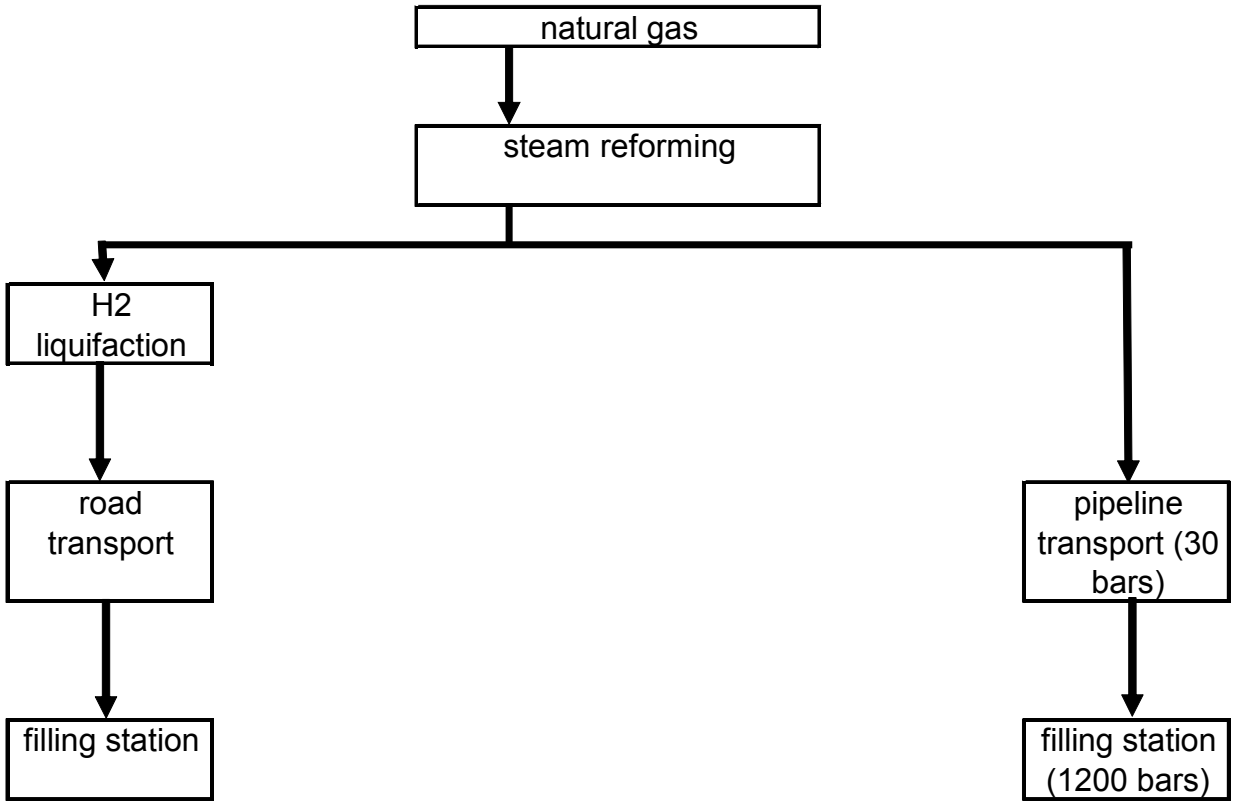


Additional weight ⟹ additional energy consumption

0,2-0,35 liter gasoline /(100 km*100kg)

(0,25 l/100km*100kg) is used


Hydrogen storage
system life cycle
Production
Hydrogen chains from « Well-to-Wheels »
Production
Distribution
Refuelling station
(Compression)
Storage
system
Use
(FCV, ICE)
(Liquefaction)
Recycling


natural gas
steam reforming
H2 liquifaction
road transport
filling station
pipeline transport (30 bars)
filling station (1200 bars)

L-H_2 C-H_2

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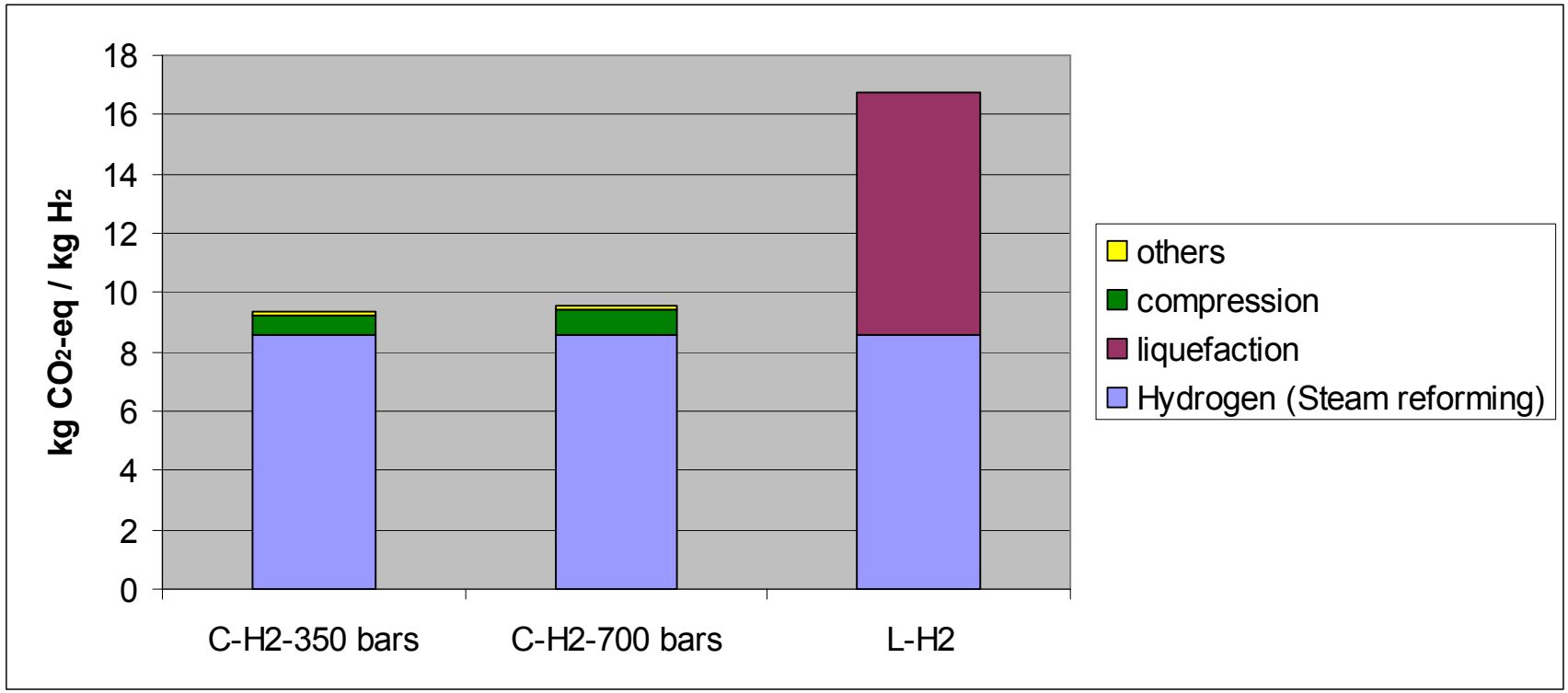
CO_2 emissions for Liquid H_2 and Compressed H_2



CO_2 emission from H_2 supply incl. Storage vessel

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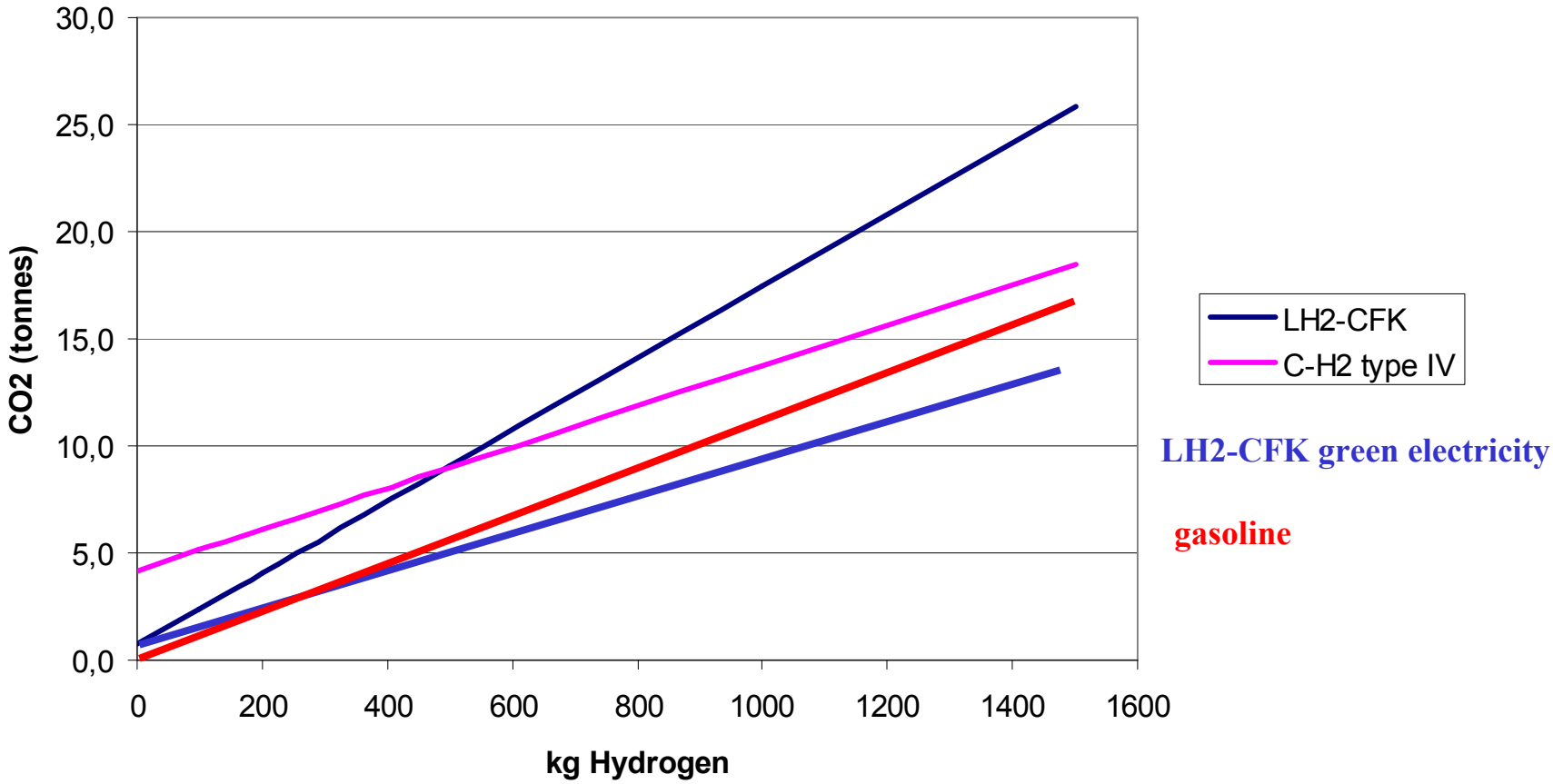

Conclusion II:

- L-H_2 vessel used less material thus a lower environmental impact
- C-H_2 vessel are higher in weight and thus have a higher environmental impact
- Additionally, higher weight cars will have a higher H_2-consumption
- Liquefaction of H_2 is energy intensive and determine the performance of L-H_2-storage

Thank You for your Attention!!