Lujien terästen käyttö autojen korirakenteissa

OHUTLEVYPÄIVÄT 2024

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Olli Oja

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Product development engineer

CR&MC Product Development, Hämeenlinna, Finland

SSAB Career

2009	Started as a trainee in Product Development, Raahe
2010 - 2014	Product development engineer, Hot rolled strip products, Raahe
2014 - today	Product development engineer, Cold rolled & Metal coated products, Hämeenlinna

"My current responsibilities involve, for example, the development of advanced high-strength steels, which were the topic of my doctoral thesis, and the R&D work of Zero and Fossil Free steels as hot-dip galvanized products.

I'm currently interested on the possibilities of using different modelling methods in product development."

Education

MSc (Tech), Mechanical Engineering, University of Oulu, 2010

DSc (Tech), Materials Science and Engineering, Tampere University, 2022

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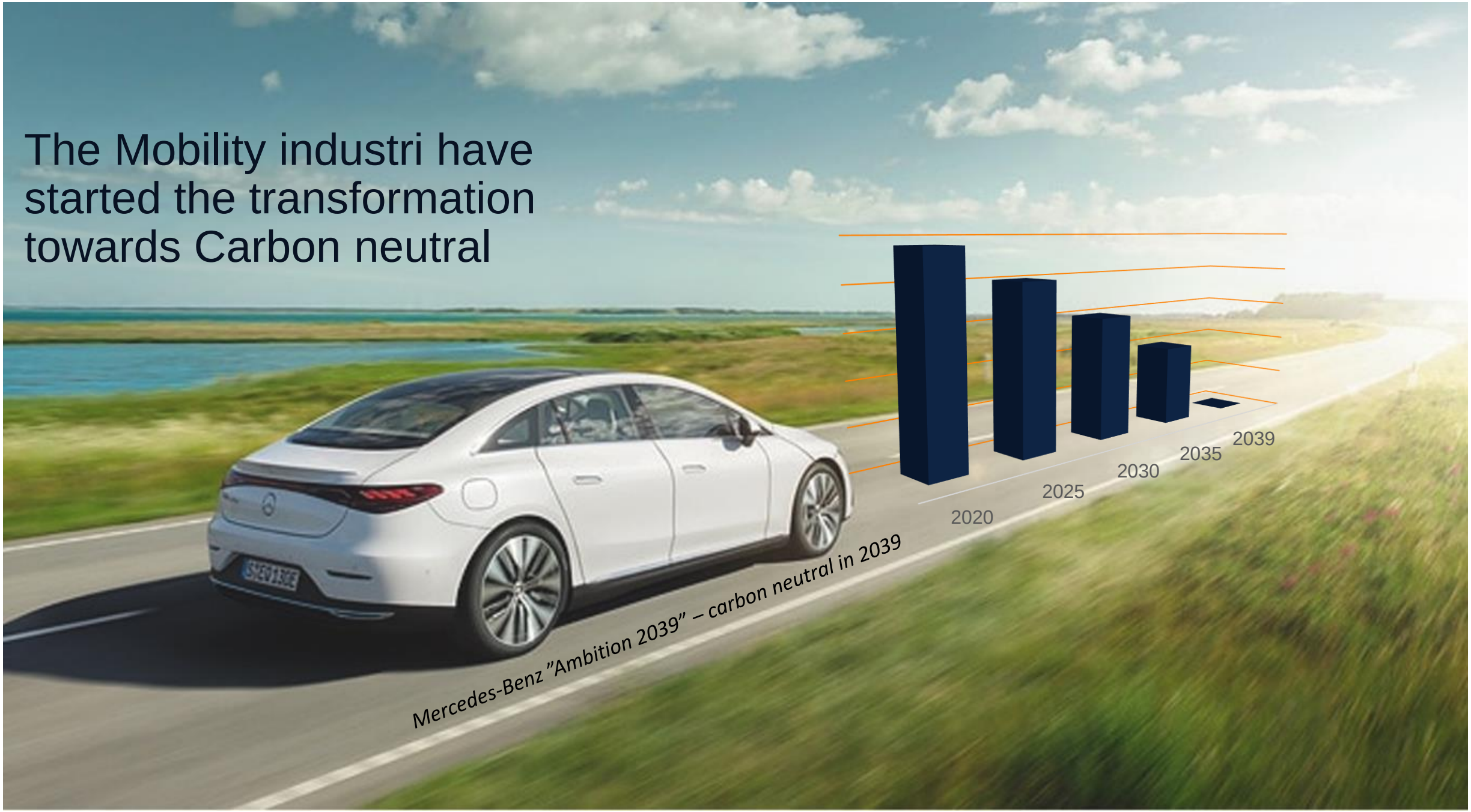
Content

1. Motivation

2. Different steel types in modern cars

The Mobility industri have started the transformation towards Carbon neutral



Electric propulsion is the future

… 100% electric by 2035 in Europe

… 100% electric by 2035 in Europe

… 50% electric by 2030

… 100% electric by 2030

… 100% electric by 2040 in Europe

… 90% electric by 2030

… 100 new EV models by 2025

… 100% electric by 2035

… 100% electric by 2030 in Europe

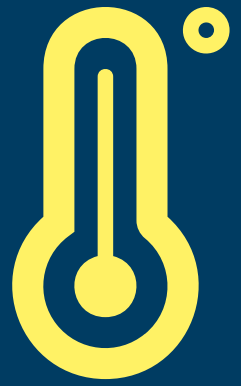
… 80% electric by 2030

Fast-growing Chinese pure EV players (100% electric fleets)

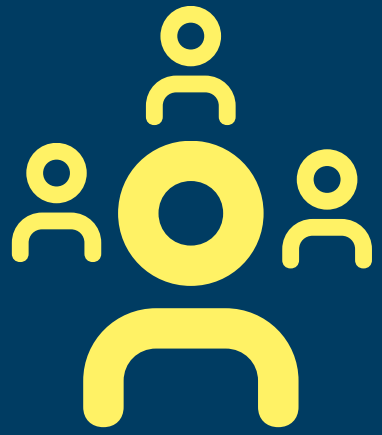
… only EV and hybrids sales from 2022 in Europe; globally 100% electric by 2040

The world has some challenges

Climate change

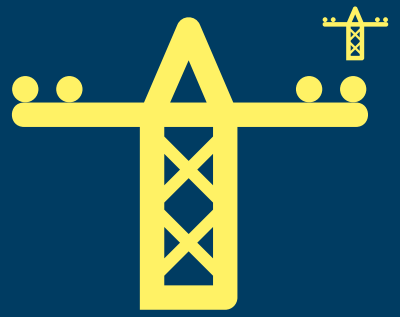


Growing world population



Urbanization

Demand for new infrastructure



Resource scarcity

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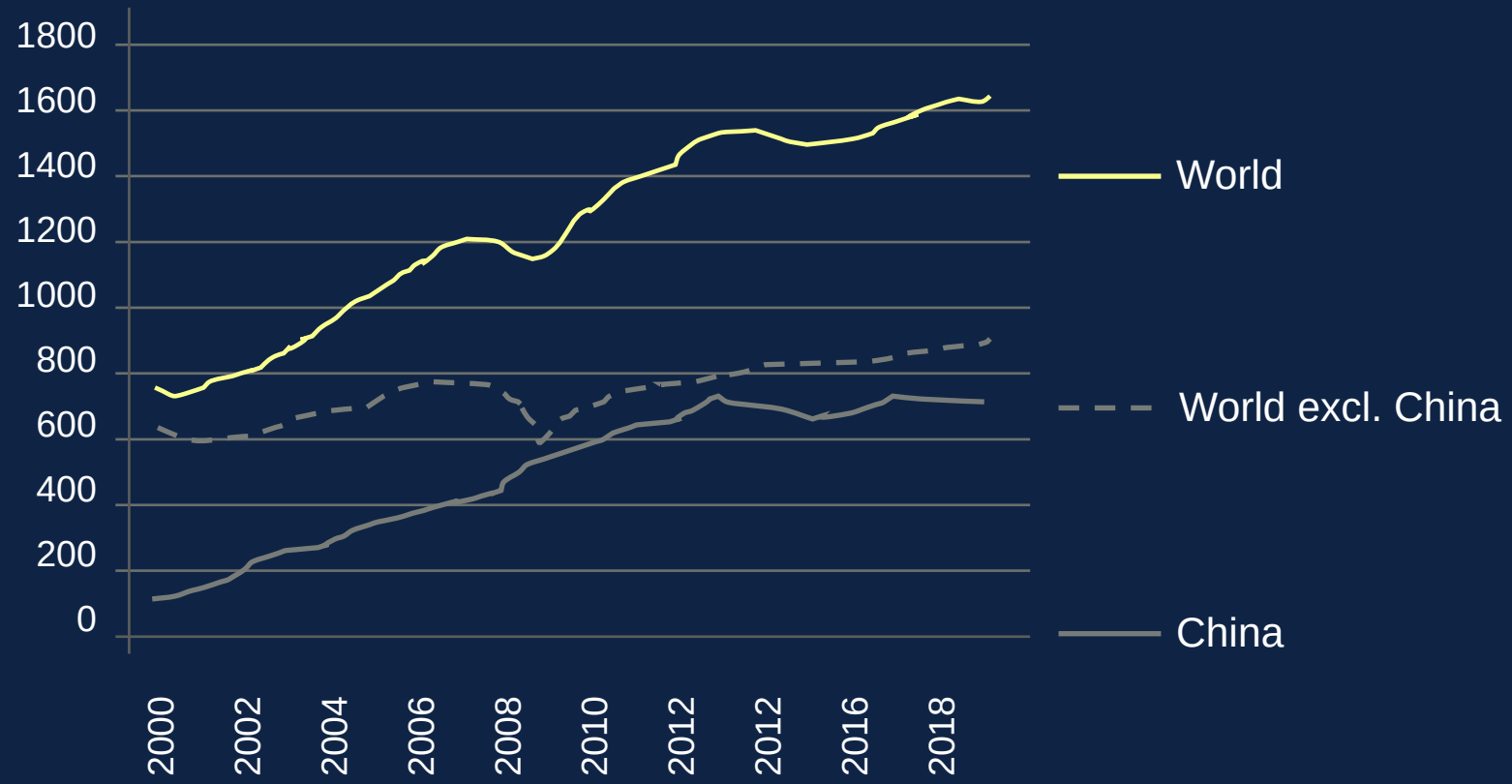
World steel consumption

Standard of living

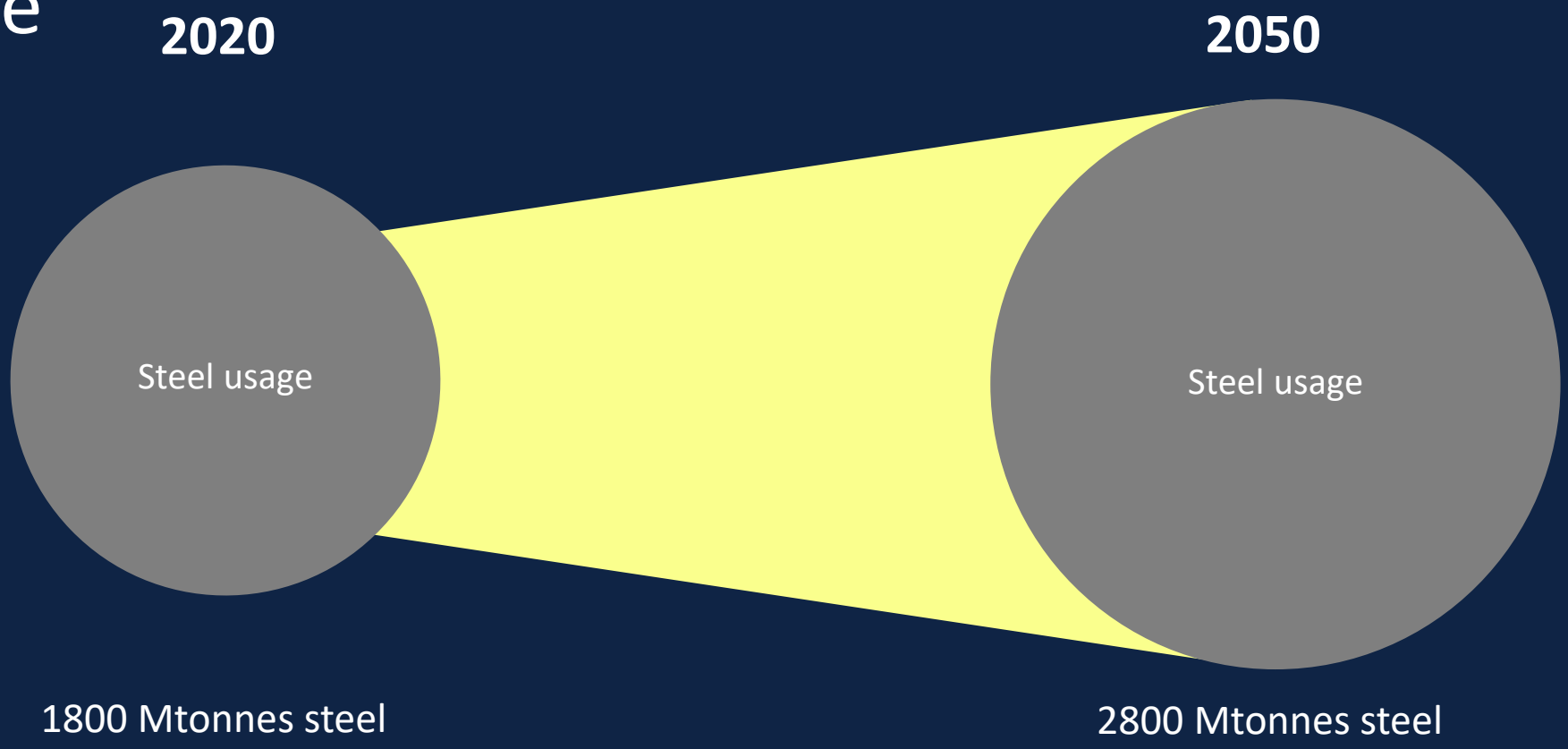
Urbanisation and infrastructure

Transportation and production



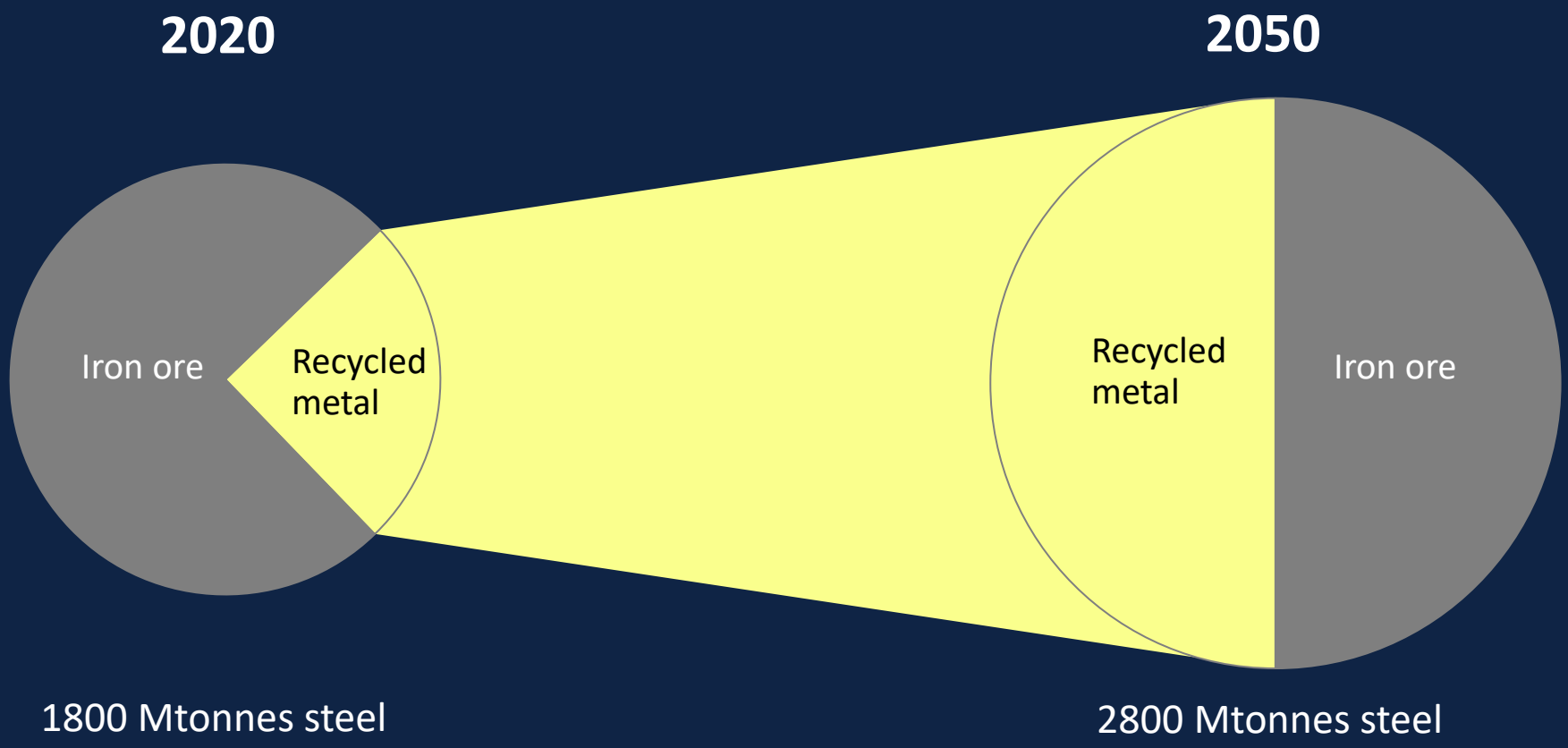
[Source: World Steel Association, worldsteel.org]

Steel usage will continue to increase



[Source: Swedish iron and steel producers' association, Jernkontoret]

Recycling will not be enough



[Source: Swedish iron and steel producers' association, Jernkontoret]

SSAB ZERO® STEEL

Carbon emission in operations
including purchased energy (scope 1-2):

0.0

kg CO_2e emissions per kg steel (target).

SSAB FOSSIL FREE STEEL™

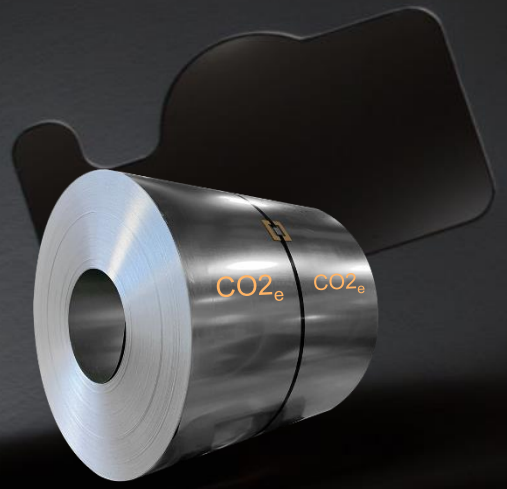
SWEDISH STEEL PRIZE

Carbon emission in operations
including purchased energy and iron ore
(scope 1-2 and iron ore of scope 3 upstream):

0.0

kg CO_2e emissions per kg steel (target).

How else can you affect the carbon footprint?



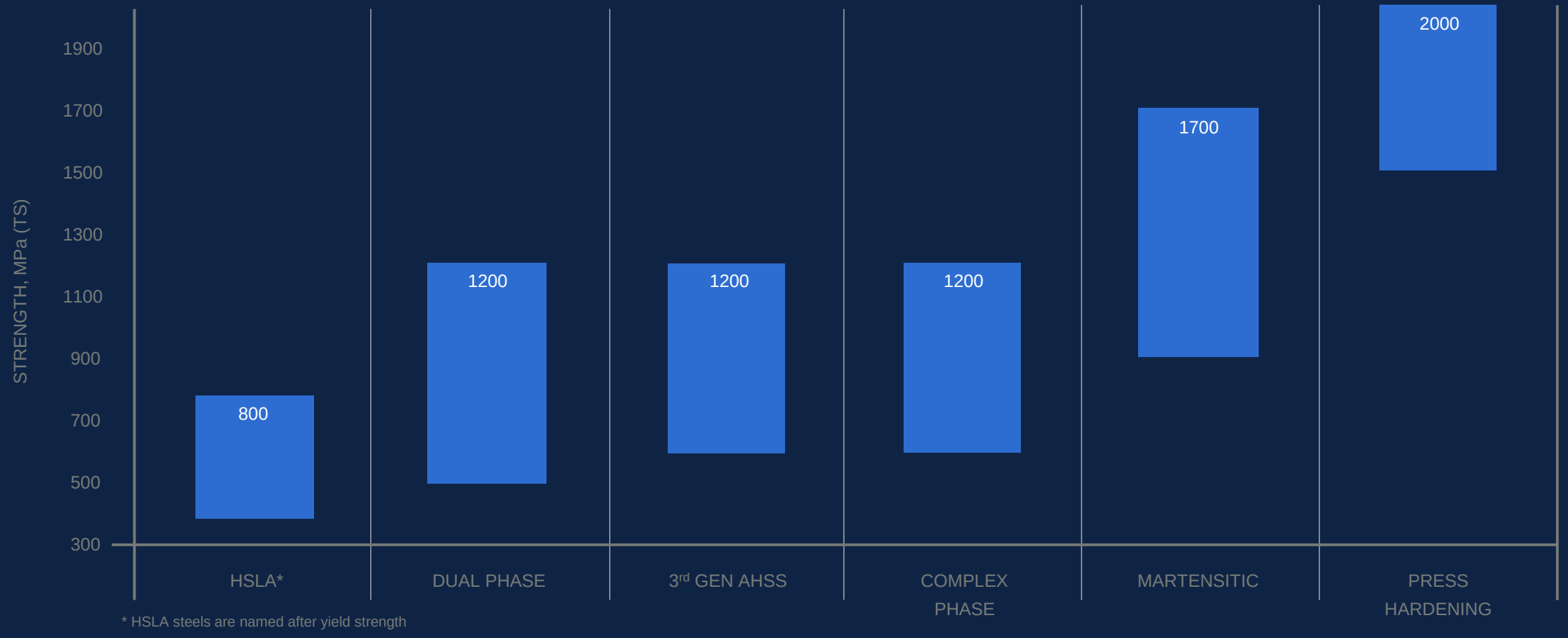
Low CO2e Material

Material Efficiency

Material Utilization

Energy Consumption

Docol® product families



* HSLA steels are named after yield strength

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Different steel types in modern cars

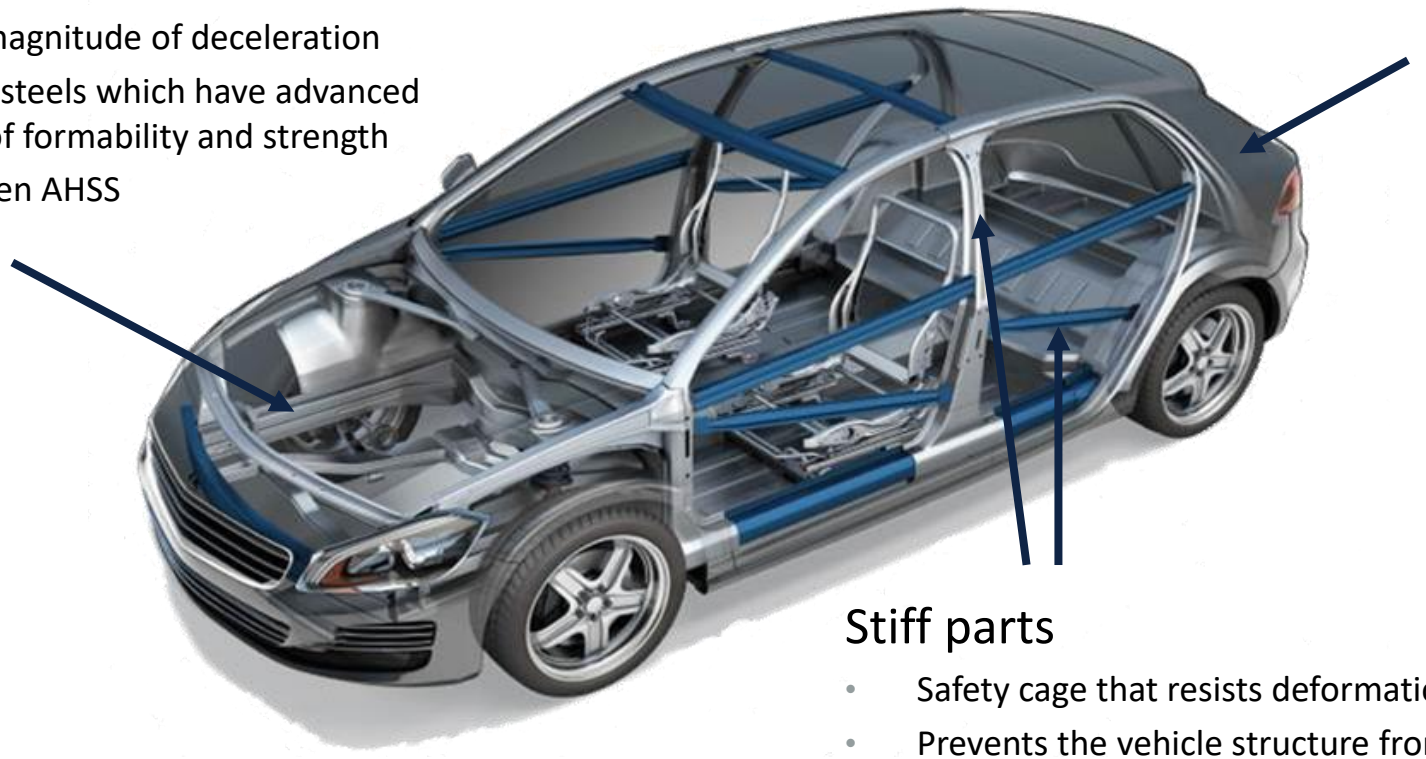
Steel types and their use in typical passenger car

Energy absorption parts

- Crumple zone that absorbs the kinetic energy during the event of crash
- Controls the magnitude of deceleration
- High-strength steels which have advanced combination of formability and strength
- DP/CP and 3Gen AHSS

Outer body panels

- Dent resistance after painting
- E.g. Bake hardening steels



Stiff parts

- Safety cage that resists deformation
- Prevents the vehicle structure from impacting occupant during the event of crash
- High yield strength, ultra-high tensile strength
- Rm > 980 MPa (DP/CP, M, PHS)

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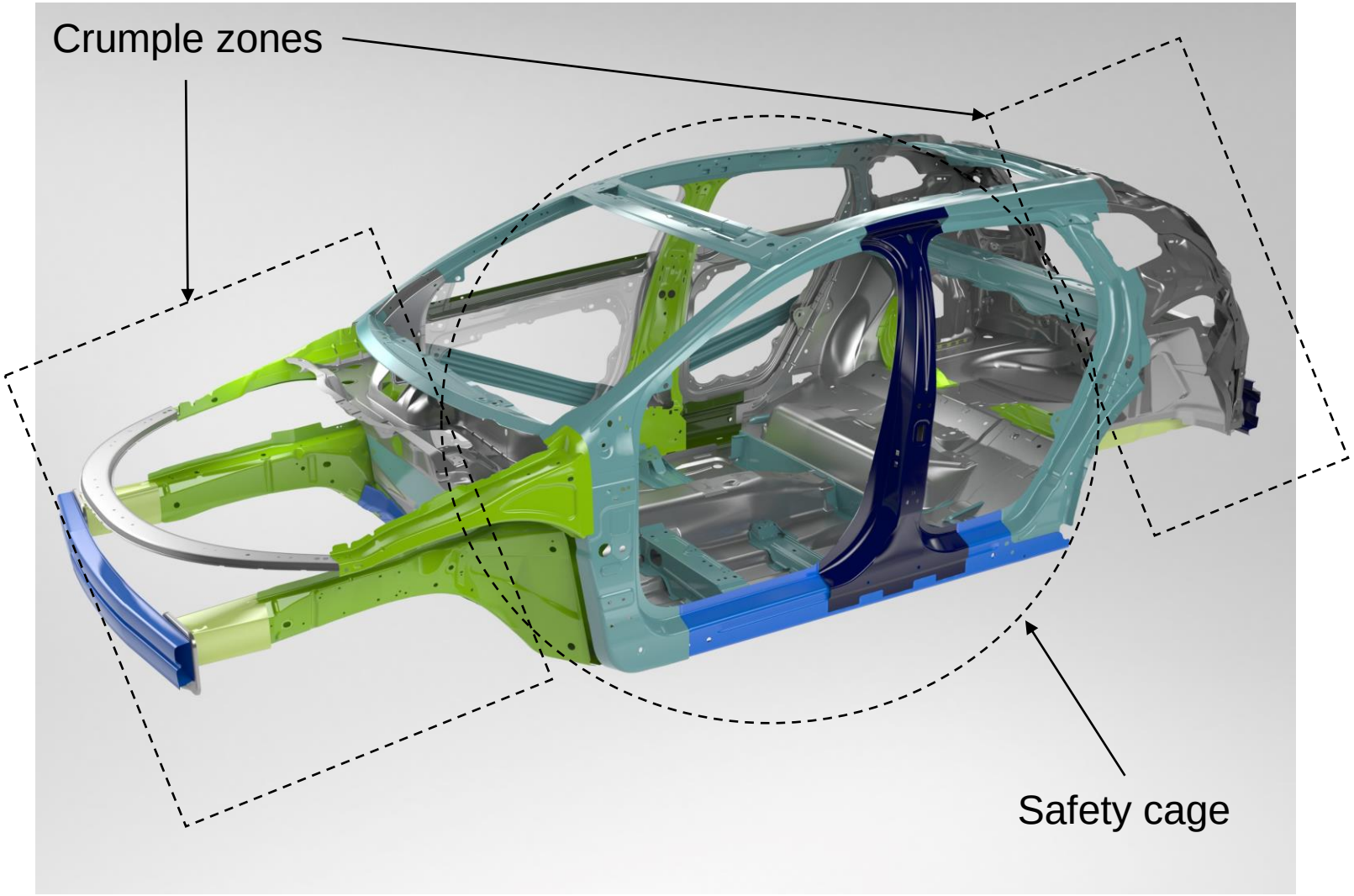
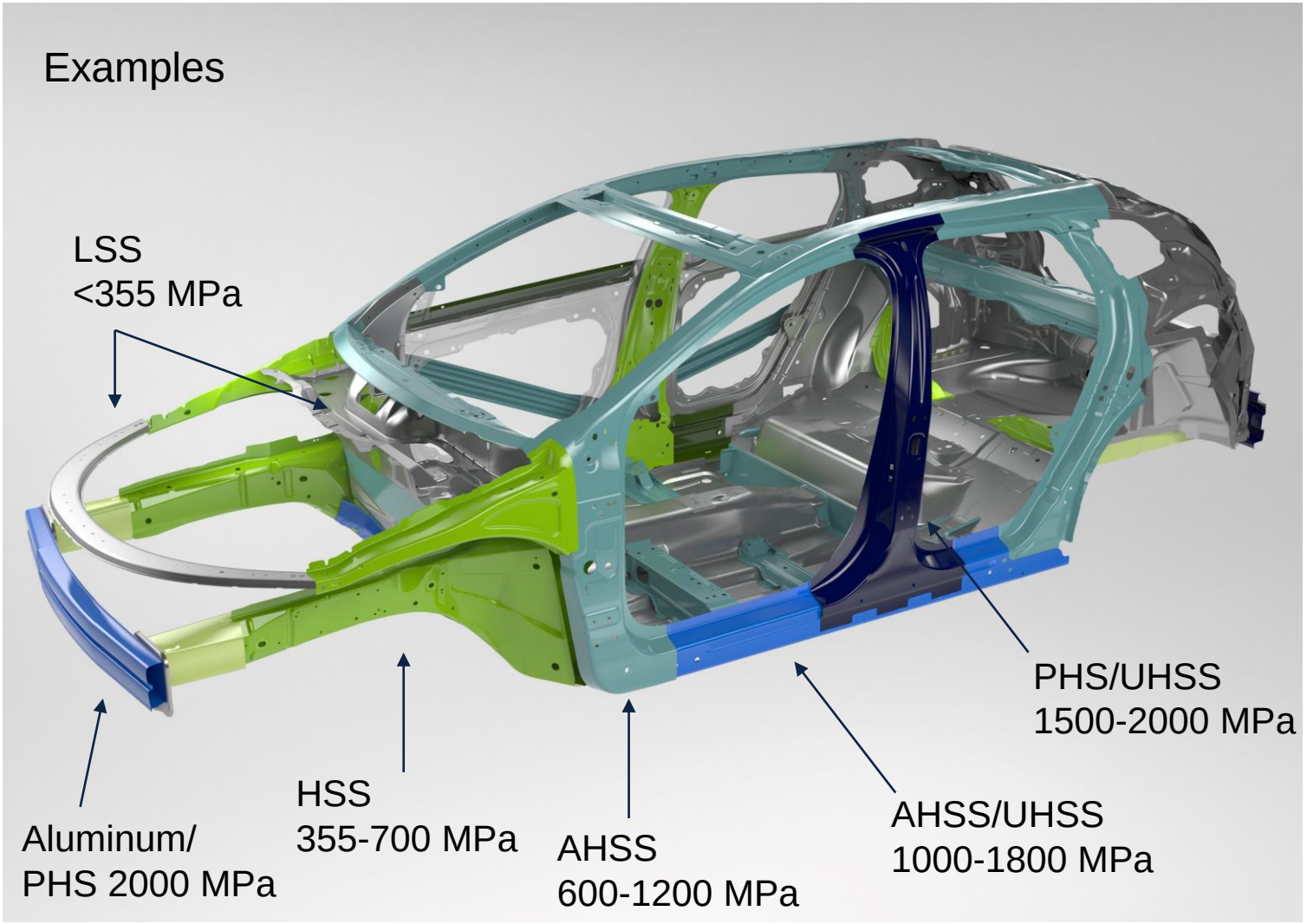
Protective sections in the typical body-in-white



Protective sections in the typical body-in-white

Low-strength structural steels (LSS)
High-strength steels (HSS)
Aluminum
Advanced high-strength steels (AHSS)
Plastics
Press-hardening steels (PHS)
Ultra-high strength steels (UHSS)
Others
Magnesium
Stainless steels



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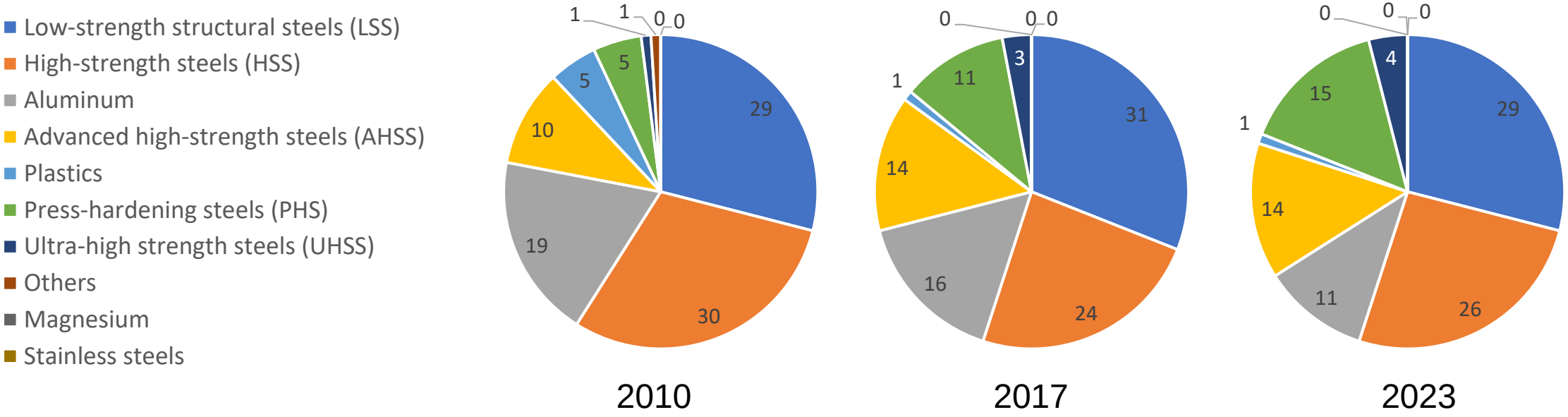
Steel types in the vehicles presented at EuroCarBody conference in 2010, 2017 and 2023

- Material distribution in the vehicle body including closures
- High-strength steels (incl. HSS, AHSS, UHSS and PHS) have increased whereas aluminum and plastics have decreased



Battery protection – Inspiration example

EV-concept for cars

Energy absorbing and load transfer

Protecting the battery cells

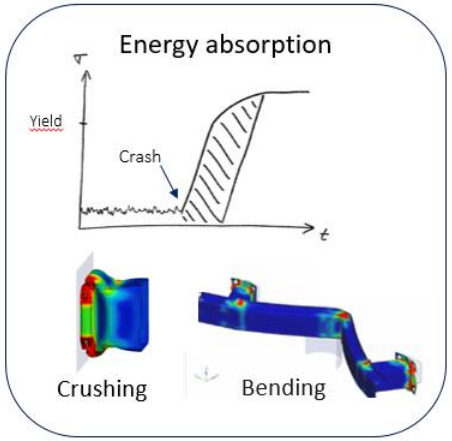
Highest strength with lowest weight and cost

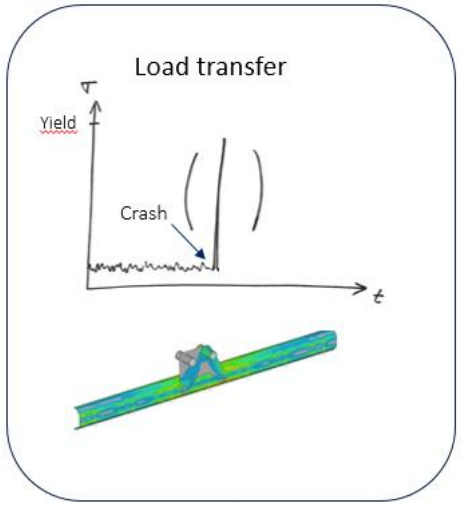
Adoptable for fuel cell technology

Battery protection – Inspiration example

Seat cross beam

e.g.
PHS1900 (MPa)





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