The Fuel Science Center

Adaptive Conversion Systems for Renewable Energy and Carbon Sources
Cluster of Excellence at RWTH Aachen University

Strategy Workshop
Key-Topic: Drop-In Fuels

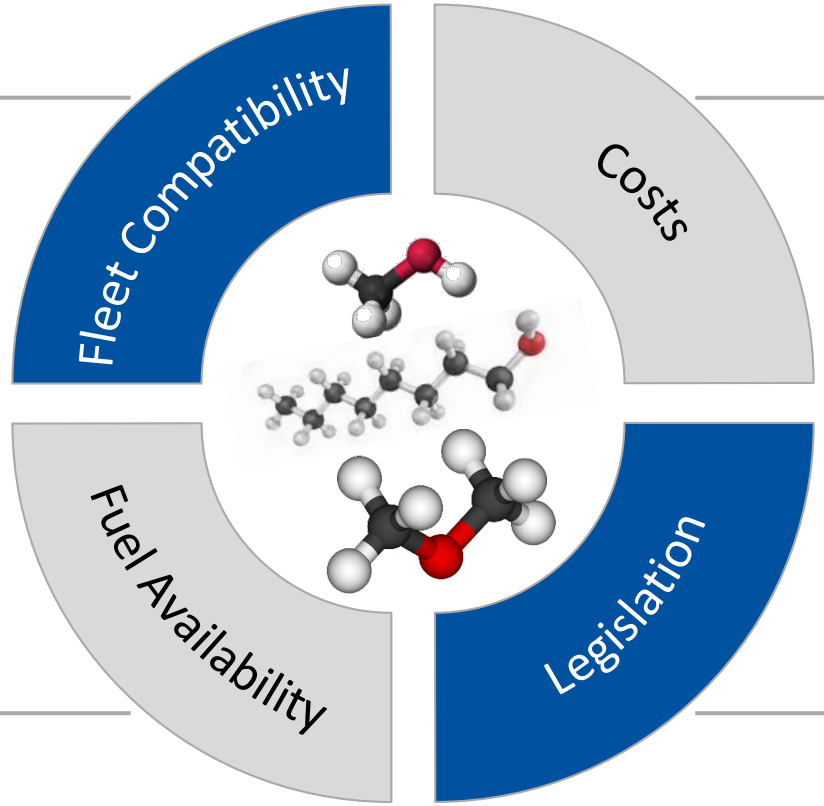
06.06.2023

FSC The Fuel Science Center | RWTH AACHEN UNIVERSITY

The Biggest Challenges to Achieve a High Share of Renewable Fuels on the Market are Fleet Compatibility, Costs, Fuel Availability and Legislation

PARTICULARLY IN SHORT TO MEDIUM TERM PERSPECTIVE

Solution for usability in most vehicles to achieve well-to-wheel CO_2 reduction quickly



Decreasing production costs to become an attractive option for CO_2 reduction

Scale-up of well known production processes for renewable fuels

Adaption of fuel norm and consideration of CO_2 incentive for industry and / or consumer

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PARTICULARLY IN SHORT TO MEDIUM TERM PERSPECTIVE

CO_2 – Legislation

- Tank-to-Wheel vs. Well-to-Wheel
- Sector Coupling

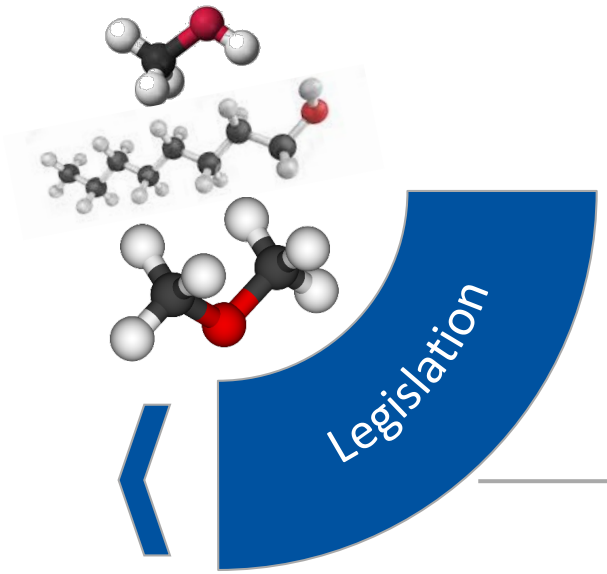
→ The current legislation hinders the achievement of the CO_2 targets

Fuel Specification

EN590 / EN 228 / EN 14214 / EN 15940:

- Established in the 90's (EN 14214: 2004, EN 15940: 2016)
- Based on fossil fuels

→ Changes are very time-consuming



Adaption of fuel norm and consideration of CO_2 incentive for industry and / or consumer

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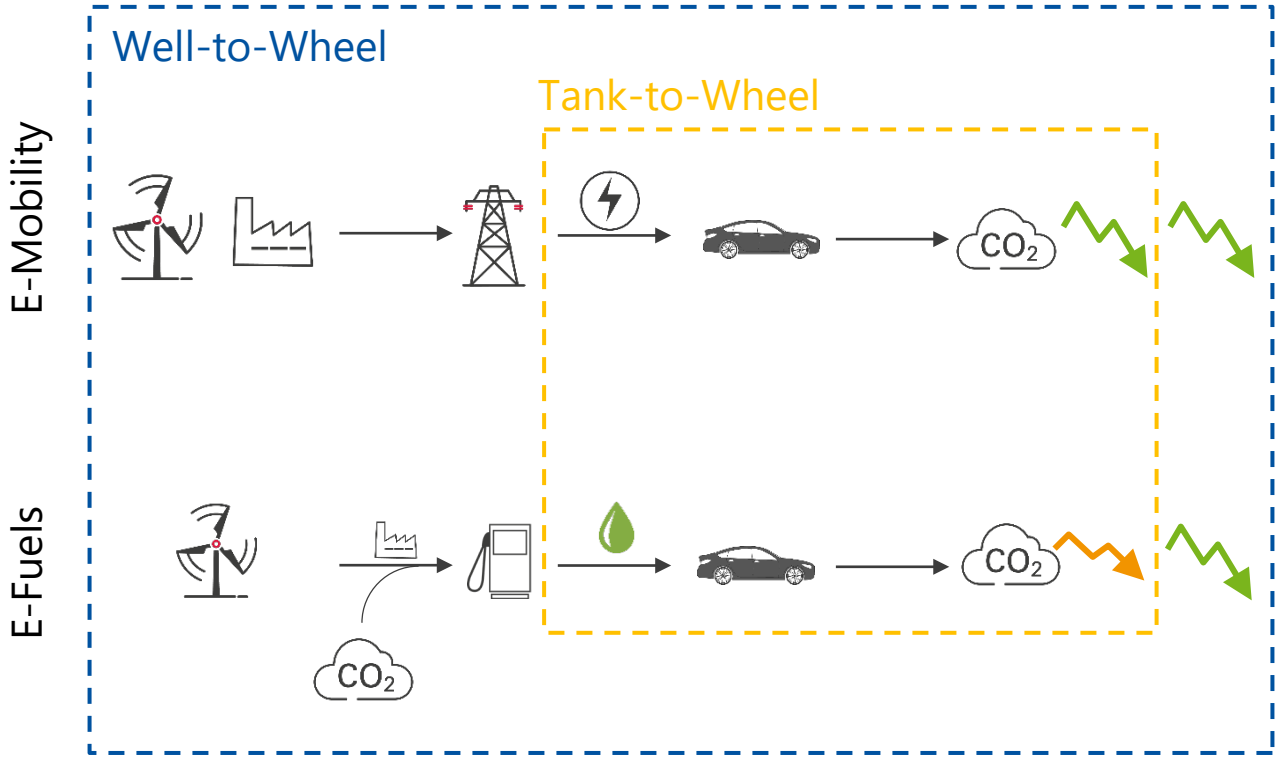
Current Tank-to-Wheel Legislation Favors E-Mobility and Hydrogen
No OEM-Credit for CO_2 Reduction by E-Fuels

LEGISLATION HAS TO ACCOUNT FOR WELL-TO-WHEEL CO2 OR OTHER MEASURES HAVE TO BE ENACTED



- Tank-to-wheel promotes E-Mobility and Hydrogen
- E-Fuels are not recognized by Tank-to-Wheel regulation

- Planned CO_2 reduction in 2050 not achievable without E-Fuels

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Free Engine Ability vs. Legislation to Achieve a High Share of Renewable Fuels

Standard Conformity vs. Compatibility, Cost, Fuel Availability and Versatility

COMPATIBLE WITH WHAT?

CO_2 – Legislation

- Tank-to-Wheel vs. Well-to-Wheel
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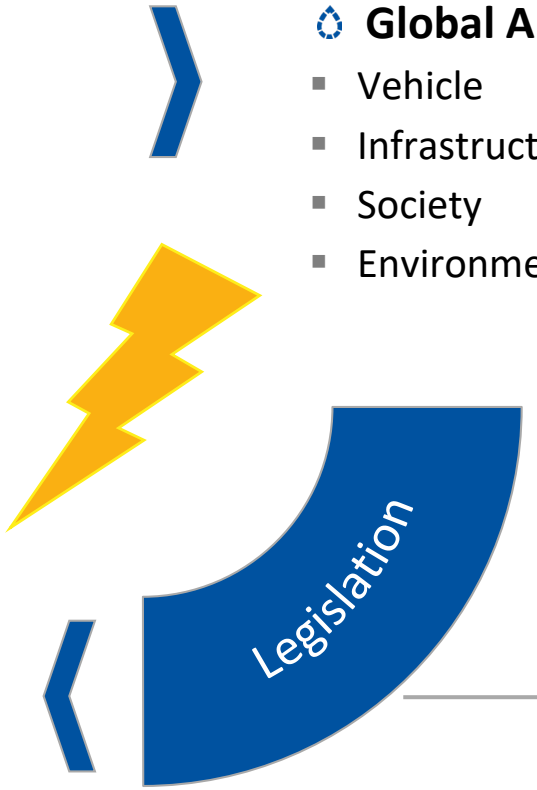


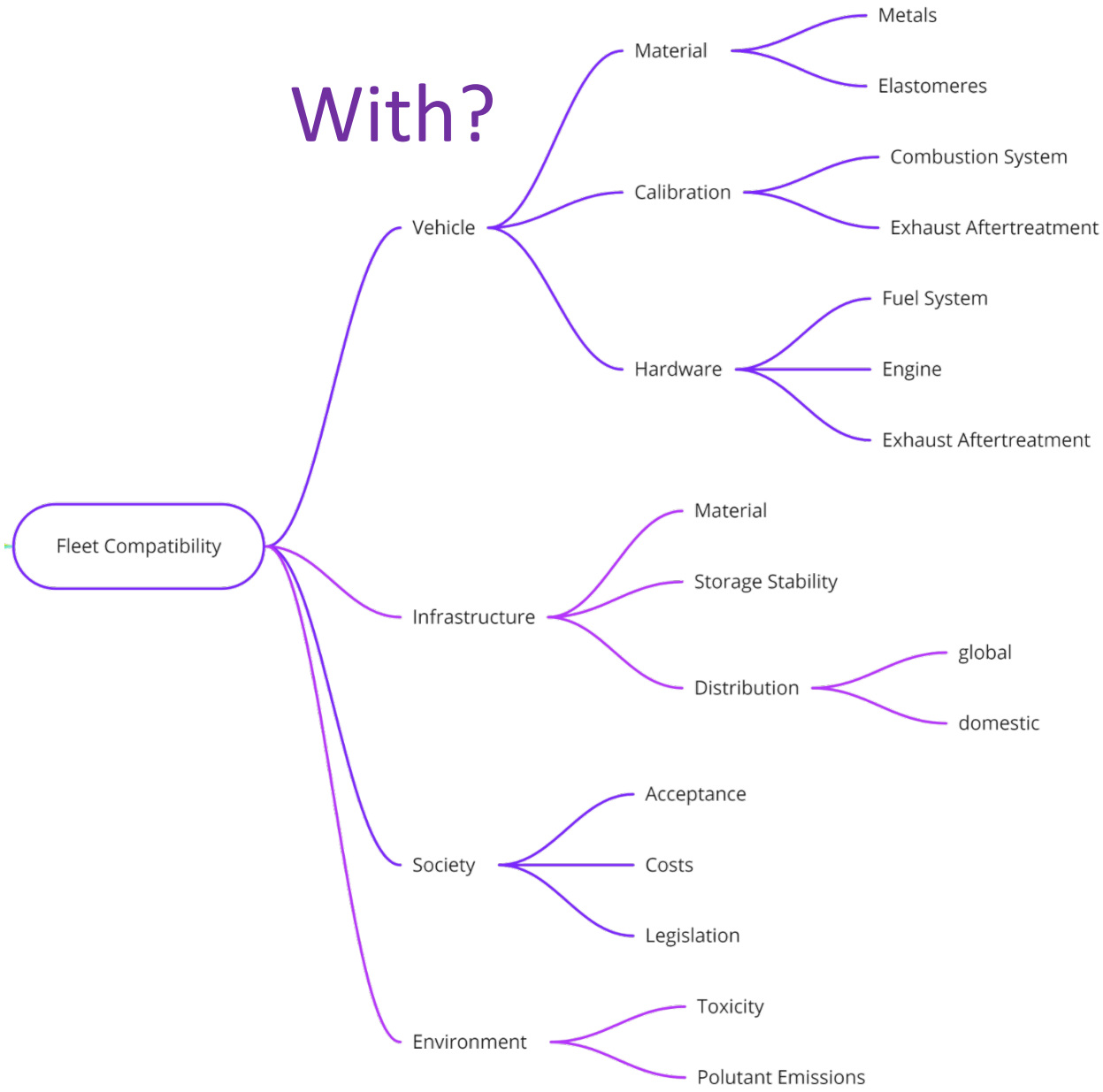
Global Application

- Vehicle
- Infrastructure
- Society
- Environment

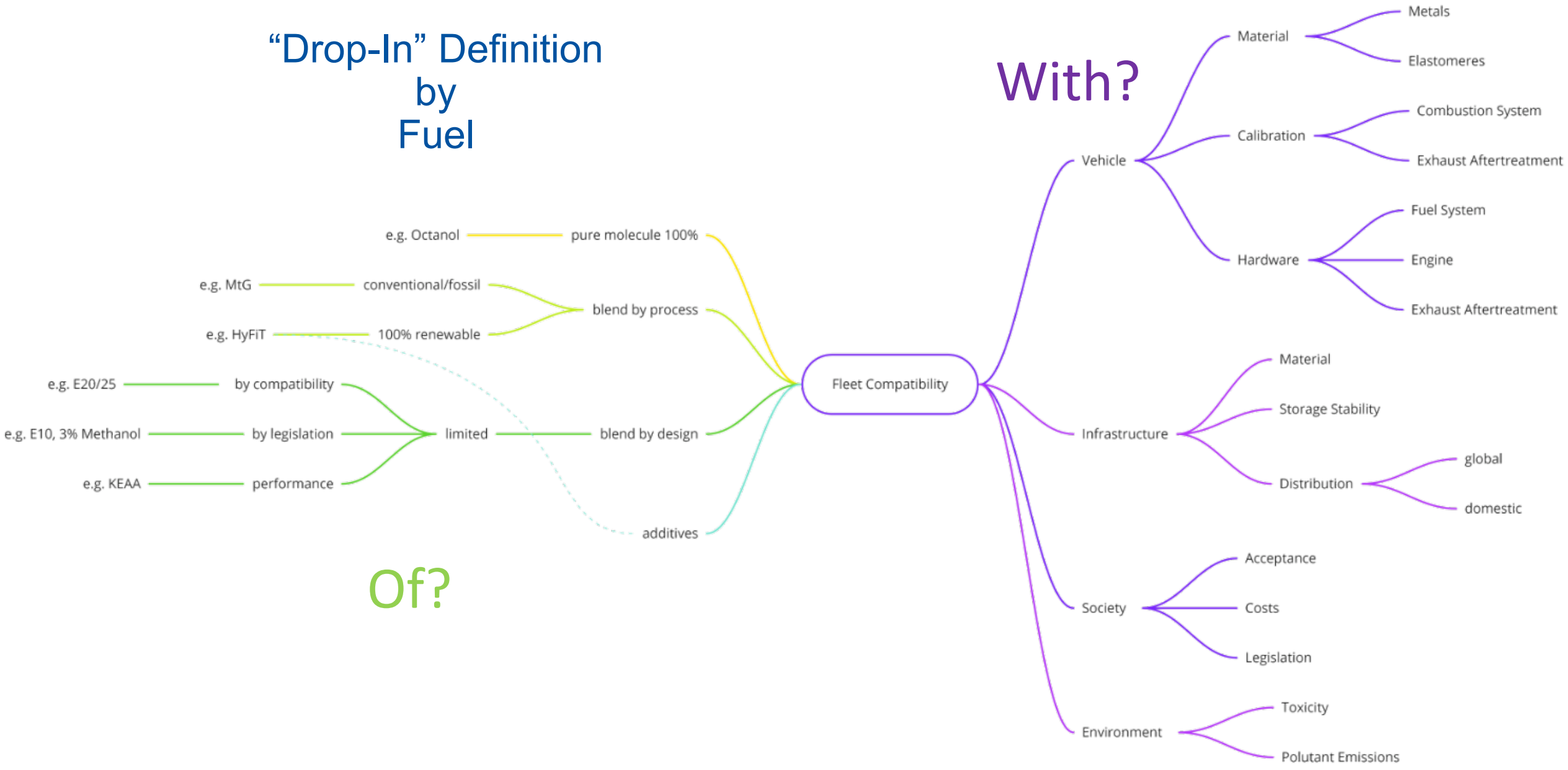
Adaption of fuel norm and consideration of CO_2 incentive for industry and / or consumer

Global Fleet Compatibility Parameters

With?



“Drop-In” Definition by Fuel



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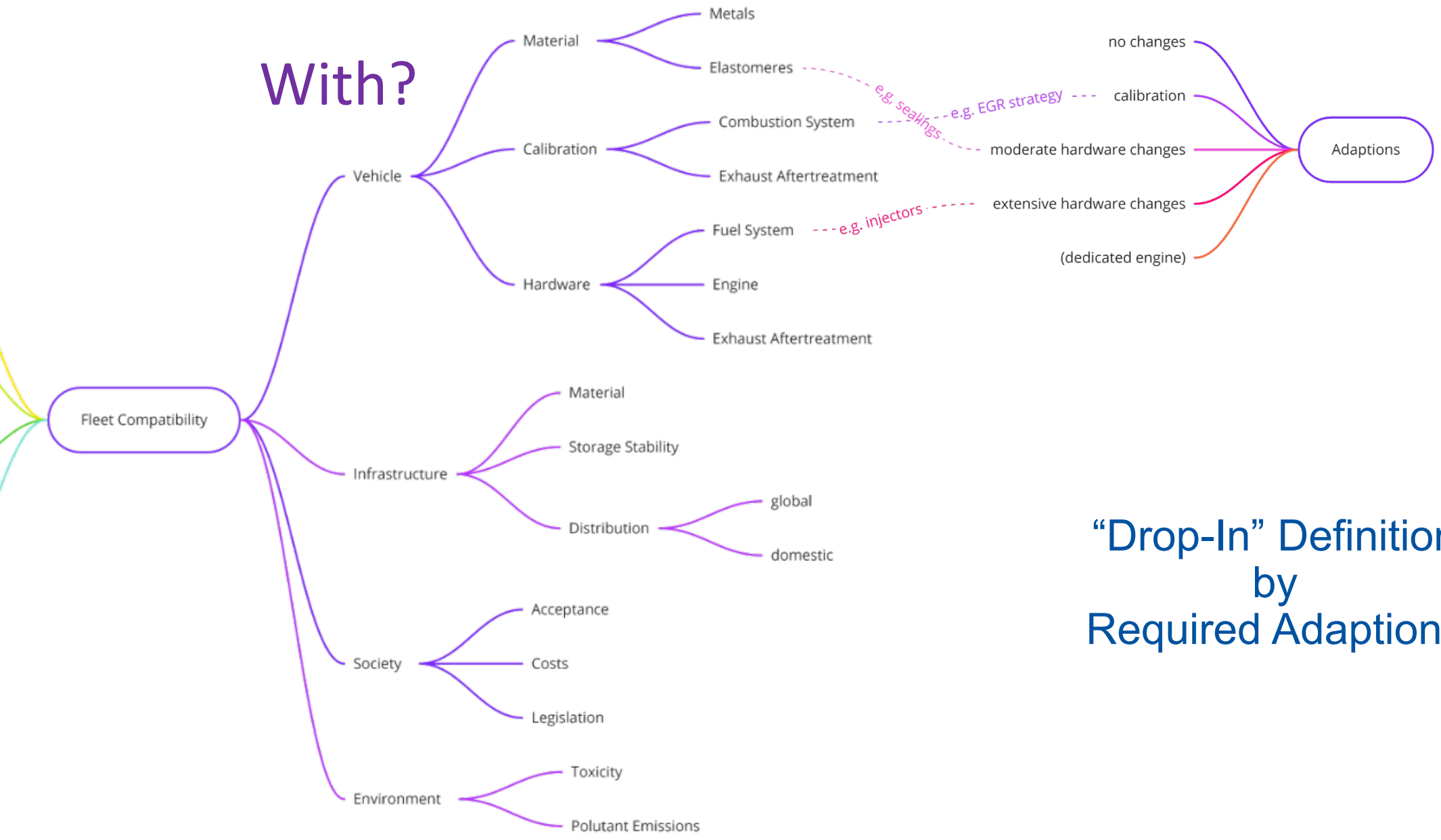
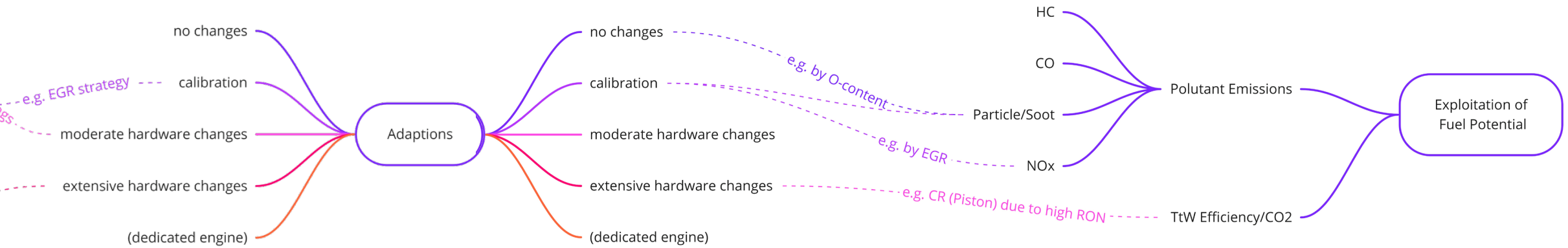


“Drop-In” Definition by Required Adaptions

“Drop-In” Definition by Potential Improvement

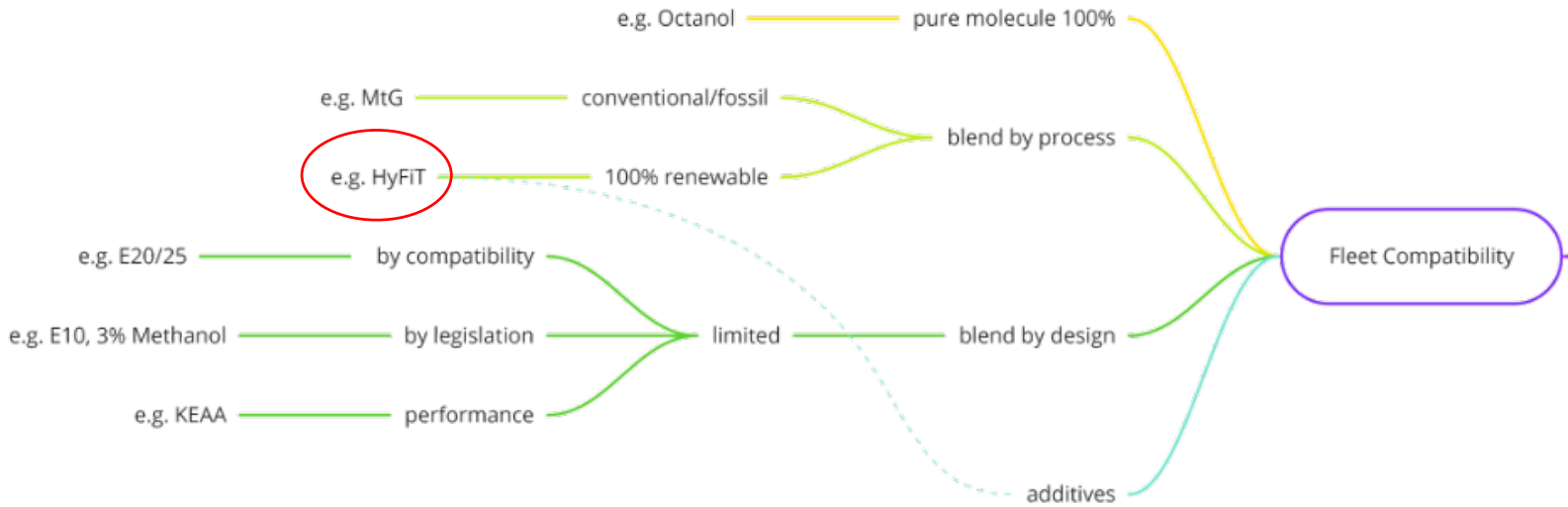


Examples

Towards carbon-neutral and clean combustion with hydroformylated Fischer-Tropsch (HyFiT) fuels
(Völker et al., Joule (submitted))

- **Hollistic FSC Fuel Design Approach**
  - Synthesis
  - Fuel Properties
  - Engine/Vehicle Performance
  - LCA

- LTT, TME, IFAS, MPI CEC, ITMC, EPSE ETH Zürich, FZJ IEK-10



Of?

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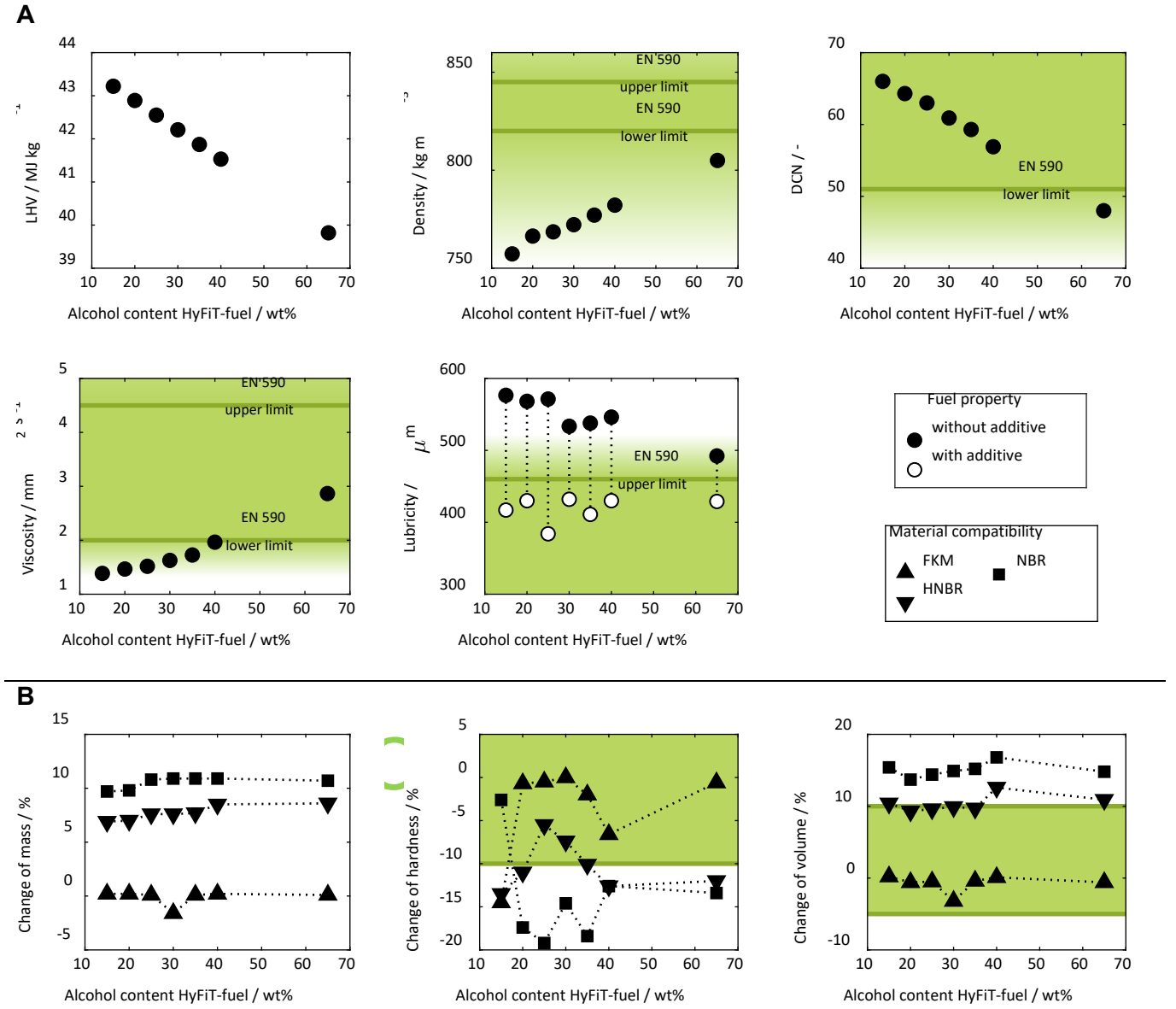
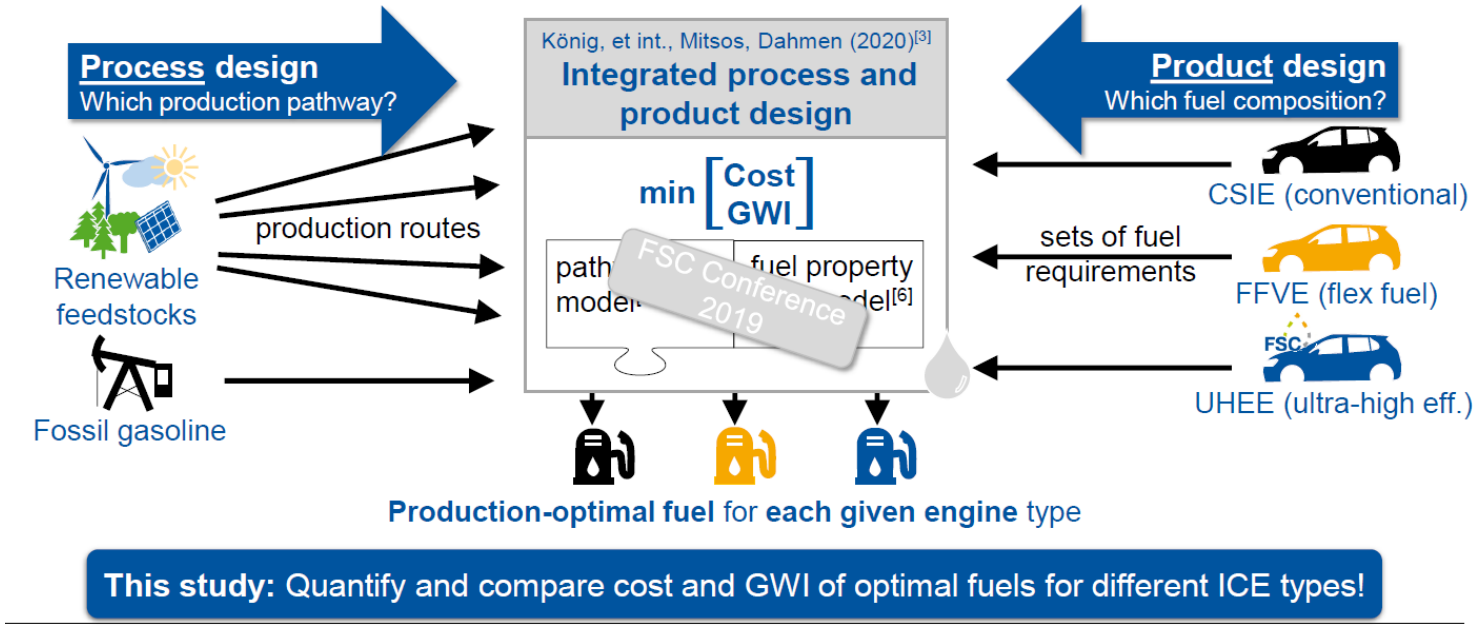


Examples

Model based Design of Gasoline/Renewable Fuel Blends by Simultaneous Product and Process Optimization
(König et al., FSC Conference, 2020)

- **Fuel Design Approach including "Conventional" Engine as Boundary Conditions**
  - SI
  - Integrated process and product design
  - AVT.SVT; FZJ IEK-10

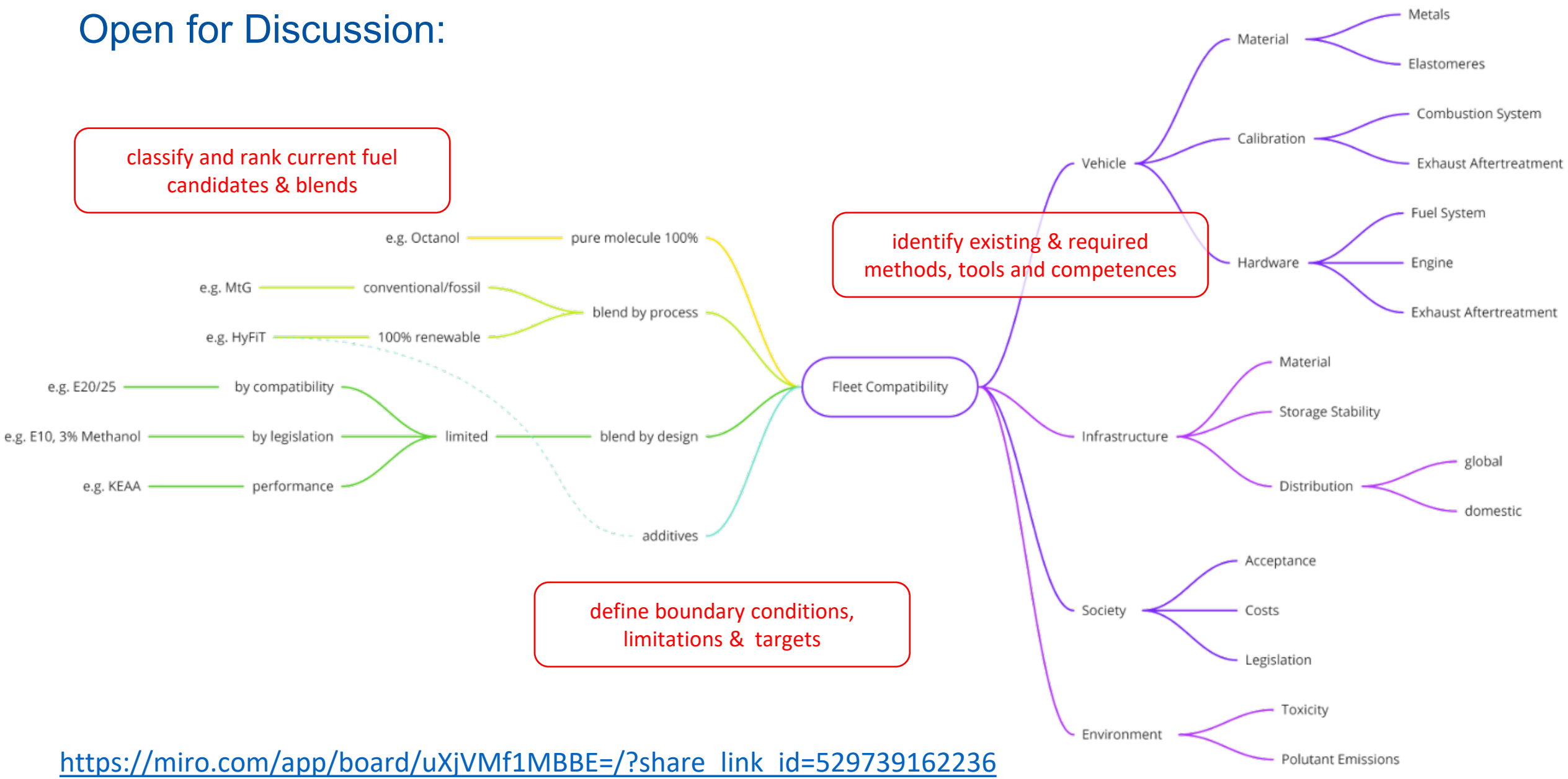


Open for Discussion:

classify and rank current fuel candidates & blends

identify existing & required methods, tools and competences

define boundary conditions, limitations & targets



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