Circle K – UNITI expo 18.05.22

Towards carbon neutrality in road transportation – a retailer's perspective

Stuttgart, Germany



Circle K Global Network





COUNTRIES & TERRITORIES

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OUR SITES ~14,200





Lets get some basic 2022 facts right

- Global oil consumption: 99,8 Mill bbl/day
- Oil consumed in road transportation globally: approx. 48,5 MMbl/d
- Global CO₂ emission from road transportation: approx. 6,2 Gigaton
- Global number of vehicles: approx. 1.446 million
- Global number of motorcycles: approx. 200 million
- Alternative fuel vehicles: approx. 120 million
- Expected lifetime of can in EU: 18 years



Sources: Statistica / EIA / IEA / Hedges & Company / Journal of the Society of Automotive Engineers of Japan /European Transport Research Review

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EU GHG Emissions – Road Transportation Sector: 21%



EU27 GHG emissions split by aggregated sector in 2019





CO₂ is a life sustaining gas but

We need to bring down the emissions of CO₂ from <u>FOSSIL</u> sources of energy

Therefore we need: <u>CARBON NEUTRALITY</u>

OEM's – Tailpipe Emission Focus

Ignoring upstream emissions is an indirect technology neutrality breach

OEM's LDV

• EC 443/2009 & EU 631/2019

EXHIBIT 1: Development of the European emission target from 2006 to 2030

- OEM's Tail pipe emissions only
- No life cycle focus on emission from fuels



Notes: LVC= new light commercial vehicle; PC = new passenger car Source: Regulation(EC) No. 443/2009, Regulation (EU) 2019/631 **OEM's HDV**

A timeline of policies on heavy-duty-truck emissions standards and electrification



Emissions-reduction targets for 2030 require fleet electrification to comply. Tighter CO₂ emissions targets beyond 2030 expected.



GHG-reduction targets nationwide until 2027, CARB with high ZEV sales targets beyond 2035.



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Source: EU and Future Bridge

Fuel Retailers – Renewable Energy Directives EU FIT FOR 55 – EU COMMISSION PROPOSAL (RED III)

- Reduced carbon emissions by **55%** (vs. 1990) within 2030
- Carbon **neutrality** by 2050

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- Proposed Renewable Energy Directive (RED III)
 - o 13% WtW GHG reduction
 - $\circ\,$ Renewable fuels with min. 50% GHG reduction
 - 7% limit on 1st. Generation feedstock
 - Phase out of high ILUC risk fuels
 - Advanced feedstock (but limited availability)
 - **RFNBO** (if at least 70% GHG reduction)
 - New vehicles from 2035 to be zero emission vehicles





What Fuel Alternatives Do We Have?



E-Mobility (Zero Emission ?)



Bio Fuels (Partially carbon neutral)

RFNBO aligned



Hydrogen (Zero Emission ?)



RFNBO (P2X / RCF) (Partially or fully carbon neutral)





Circle K Leading the way in e-Mobility

Locations: 250 charging sites# chargers: 1001# CK chargers: 372

All renewable electricity

Home chargers: 6803

Worldwide number of battery electric vehicles in use from 2016 to 2020 (in millions)



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Zero Emission vs. Carbon Neutral Emission Free – the ideal solution





- > Hydrogen and Electricity requires replacing the existing vehicle fleet (Large CO₂ emissions and a slow process)
- > Can only be realized via new car sales



Zero Emission vs. Carbon Neutral

Are these really "Zero Emission" Vehicles?





- > IEA 2019: Global average carbon intensity is 475 g CO₂ emission per kWh
- EU: 255g CO_{2eq}
- > Wind and Solar not the marginal power production source



Emission Free vs. Carbon Neutral

Examples of solutions NOT defined as «emission free» transport





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POSSIBLE CO₂ REDUCTION HERE AND NOW



From Current EU electricity mix
With most common usage
Average from ED95 suppliers

Date / Month / Year Info class internal Department / Name / Subject



Green Hydrogen – a key ingredient in future fuels



But not as a stand-alone global fuel alternative

- Key in renewable diesel and RFNBO production
- Can not be produced from fossil hydrocarbon (95%+ of todays H₂ is)
- No global distribution or retail infrastructure available
- <u>VERY</u> high CAPEX and OPEX
- Low volumetric energy density Extreme storage and dispensing pressure (700 bar)
- Serious safety concerns
- Been there, done that!



Renewable Fuel from Non Biologial Origin

P2X / Electrofuel – a potential solution for fully displacing fossil fuels From Alcohols (Methanol) to Diesel





otipetrosmart









Environmental Legislation - The right way

It is not the car that is fossile – its the fuel!

- Vehicle manufacturers
 - $\circ~$ Local emissions:
 - Euro 6 / Euro 7

- Fuel suppliers
 - $\circ~$ Local emissions:
 - Fuel specifications
 - Aromatics
 - Sulphur

• Global climate:

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- Energy efficiency
 - MJ / Weight / Distance

• Global climate:

- Renewable energy
- WtW GHG reduction





Realistic solutions

High share of renewable fuel components in gasoline and diesel



Plug In Hybrids with RFNBO as range extender fuel

Getting to Carbon Neutrality in the Road Transporation Sector

- Harmonized legislation
- Well to Wheel perspective
- Carbon neutrality NOT zero emission
- Technology neutrality
- Holistic and Global approach