DAIMLER TRUCK

Austausch [redacted] zu Wasserstoff- und Batterie-LKW

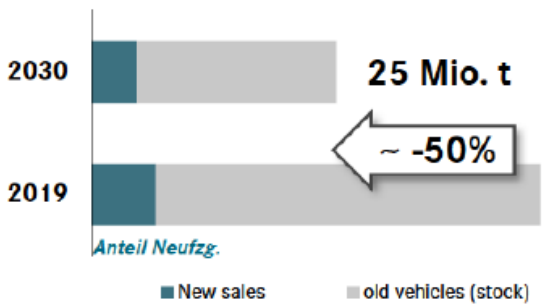
Berlin, 19. April 2024

Disruptive Decade: To achieve the German HDV CO_2 targets, ~80% of newly registered trucks and buses would need to become Zero Emission by 2030

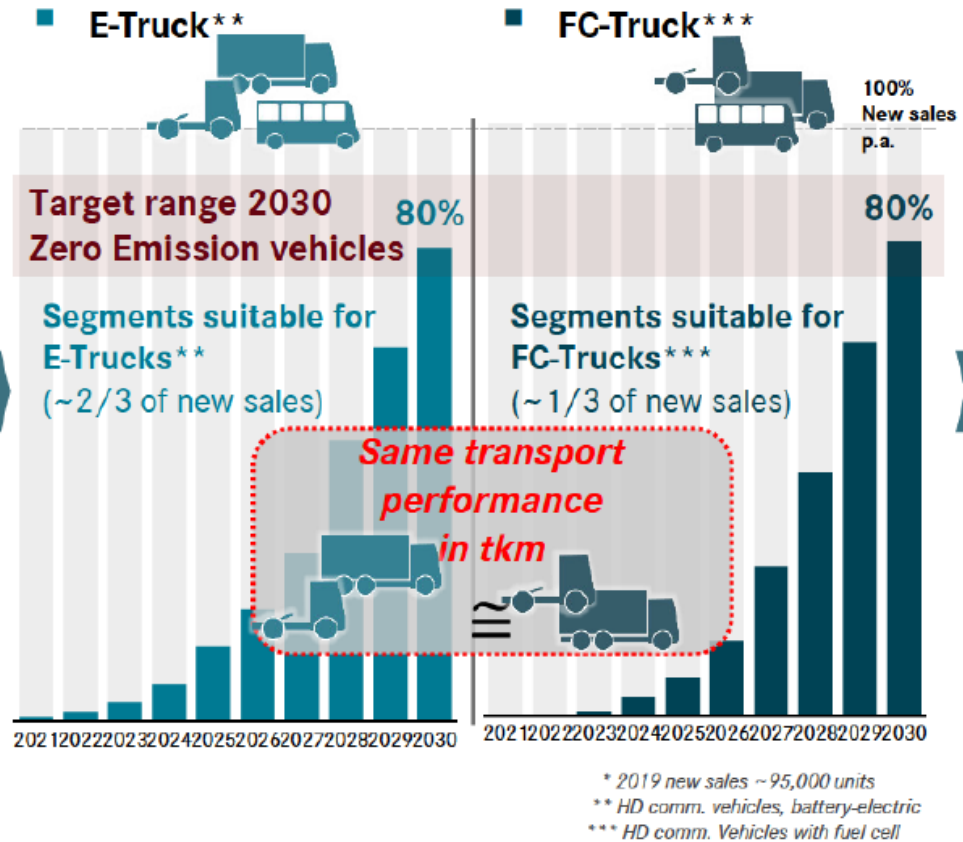
EU fleet targets (new sales)

DE Climate Action Law (veh.-fleet)

CO_2 emission target by 2030 p.a. (share HDV)



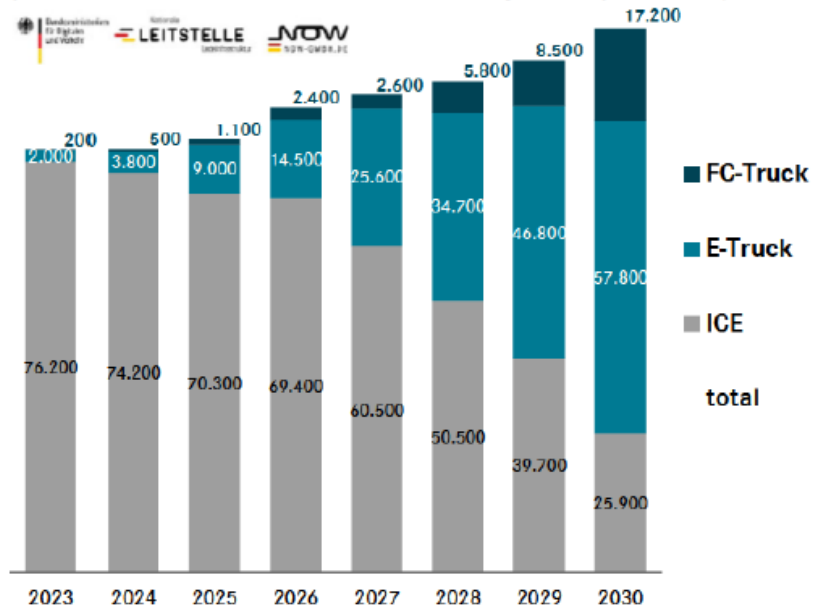
Required uptake ZEV in % of new sales 2021 – 2030*



* 2019 new sales ~95,000 units
** HD comm. vehicles, battery-electric
*** HD comm. Vehicles with fuel cell

Green H_2-Demand ca. **400.000to p.a. by 2030!**

Forecast new sales per year of heavy trucks in Germany
(results of bilateral talks between OEM and Ministry of Transport in 2022)



- **A massive ramp-up of Zero Emission Trucks would be necessary to achieve the German CO_2 reduction ambition !**

Real CO_2-neutral transport only works on the basis of CO_2-neutral drive systems – we are focusing on **battery-electric *and* hydrogen**

GENH2

Gross weight	40 to / payload 25 to
H_2 storage capacity	80 kg
Fuel-cell system	2 x150 kW
Battery	400 kW temporarily
Two electric motors	
Power	2 x 230 kW continuous / 2 x 330 kW max.
Range	***1,000 km***

eActros LongHaul

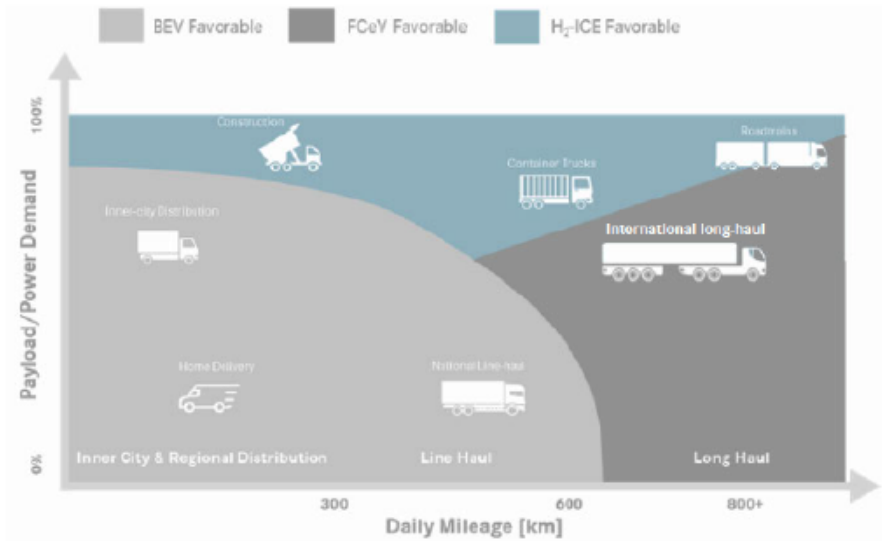
Gross weight	40 to
Total battery capacity	600 kWh
Two electric motors	
Power	400 kW continuous / 600 kW max.
Range	***500 km***

Why hydrogen for heavy-duty applications?

eActros 600

Gross weight	40 to (44 to techn. permissible)
Curb weight	ca. 11.7 to
Total battery capacity	600 kWh (3 LFP battery packs)
Two electric motors	
Power	400 kW continuous / 600 kW max.
Range	500 km

Positive: **Lower TCO for shorter distances out of depots**



Positive view on Hydrogen Trucks

- With around 4.5 €/kg H2 positive business case
- Better payload ratio than BEV
- Much easier and quicker refueled
- Daily range of > 1,200 km w/o refueling very close to today's diesel trucks
- H2 station network much easier to be built-up
- Large scale production of H2 and global trade will bring costs down

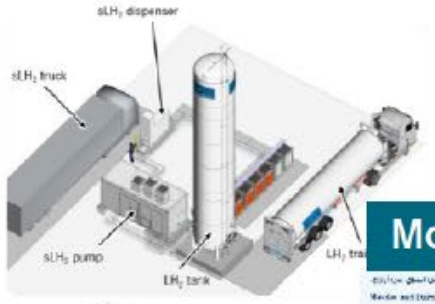
Negative view on Battery Electric Trucks

- 10,000 high power charging points > each 1 MW, just for GER
- Network built-up too challenging
- 500 HP chargers (>700kW per charger) per month necessary
- Public chargers @ 0.4 to 0.5 €/kWh too expensive -> 0.2 €/kWh sweet spot !
- High power grid connections with a very long lead-time > 7 a
- Very much dependent on Asian battery supply

To build-up this ecosystem, DAIMLER TRUCK is working on all parts of the hydrogen ecosystem

Hydrogen infrastructure

Layout of sLH_2 fueling station



collaboration

Lighthouse projects & Standards
H2MOBILITY
Shell
TOTAL
bp
H2Accelerate

MoU Masdar (VAE)

Green Hydrogen Supply

Fuel Cell System

cellcentric
A Daimler Truck & Volvo Group Company

Hydrogen engine

- H_2-ICE as new option for certain segments

Standardization

ISO/TC 197
Hydrogen Technologies

and others

Fuel Cell and H_2-ICE trucks

MB GenH2

H_2-ICE Unimog

Infrastructure is key to develop the Hydrogen Ecosystem: A sLH2-hydrogen refueling station (HRS) with only 1/10th of the energy consumption of a 700bar HRS station

Vehicle offers

Mercedes-Benz GENH2 - already started in 2017: **full dedication to heavy-duty long-haul**

Other OEM activities*

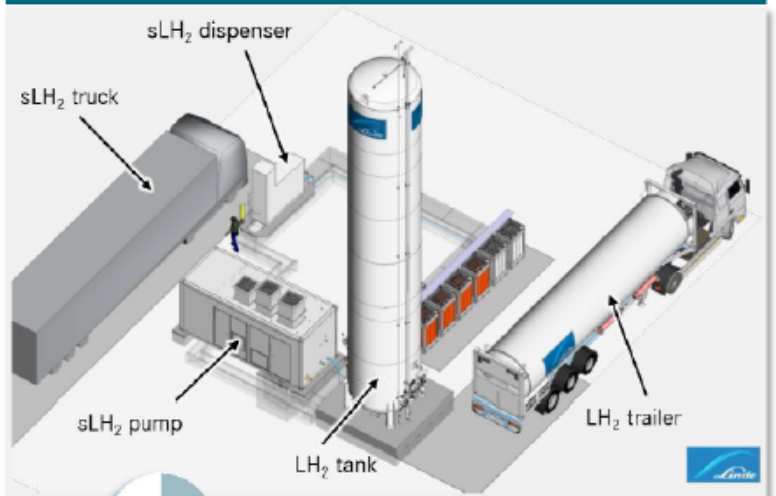
* status Dec. 2022

Steep ramp-up expected from 2025 onwards

Record Run

1,047 km without refueling

H_2 infrastructure



12 min. @ 80 kg H_2

AFIR (Alternative Fuel Infrastructure)

AFIR requirements in numbers of chargers and H_2 stations

	AFIR 2030	ACEA 2030
Charging points		
TEN-T		
800 kW	-	30,000
350 kW	17,000**	15,000
Urban node*		
150 kW	5,000	5,000
Parking Areas**		
100 kW	3,800	not quantified***
H_2	cH_2 only	
TEN-T	200*	2,000**
Urban node*	424	

Liquid hydrogen as additional solution especially for large scale demand:

Targets way to low to achieve -45% CO_2 fleet target in 2030

The **energy efficiency** story: BEV and FC/H_2 not far away and still a lot of optimization potential on the FC/H_2 side …

Comparison of energy demand

Size of PV (Germany) 170 m²	Size of PV field (Middle East) 210 m²
grid loss	H_2 electrolysis
charging station	liquefaction
charging vehicle	transport)
vehicle (85%)	station
	vehicle (46%)

110 kWh/100 km @wheel
BE trucks
long-haul

110 kWh/100 km @wheel
FC electric trucks
long-haul

Fuel Cell Technology: 30 years fuel cell know-how

Creating Customer Value

- Optimized for efficiency, longevity and high-volume production
- Vehicle tests running in Europe – >1,000km w/o refueling
- First prototype vehicle for US in build-up

Creating Scale

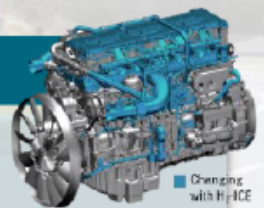
Commonality

- One global platform for all Daimler Truck brands
- Same electric drivetrain between BEV and FCEV

Partnership

- cellcentric as 50:50 JV with Volvo – open for other customers

H_2 combustion engine as complementary technology



Creating Customer Value

Advantages

- Similar vehicle packaging as Diesel
- Higher payload than BEV & FCEV
- Lower vehicle price than BEV & FCEV

Disadvantages

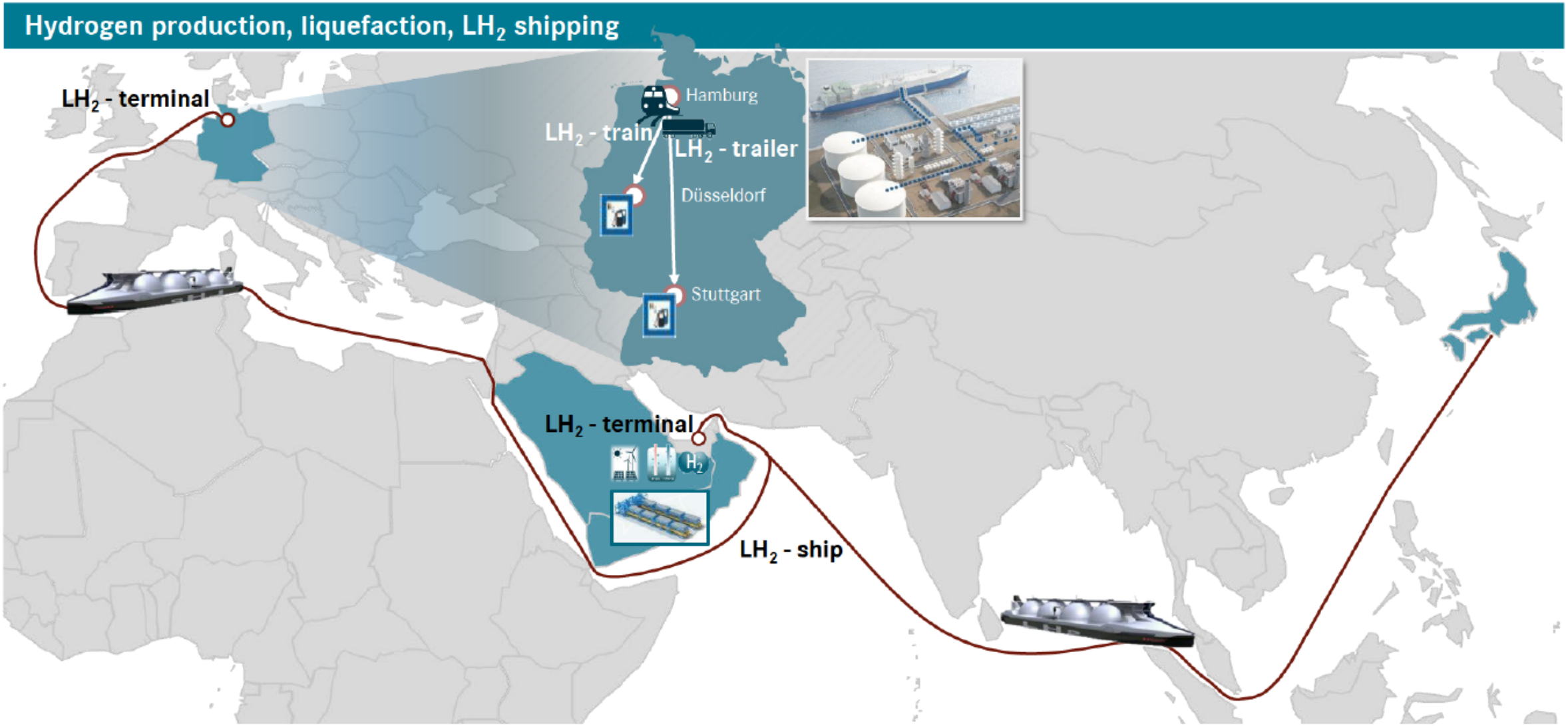
- Higher energy consumption

Creating Scale

Commonality

- Relevant core engine parts and assets stay the same
- Established supplier landscape can be leveraged
- Same refueling infrastructure and vehicle tank as FCEV possible

Daimler Truck and Masdar signed a MoU on the supply of LH2, but collaboration with Japan would even generate a win-win-situation for both countries

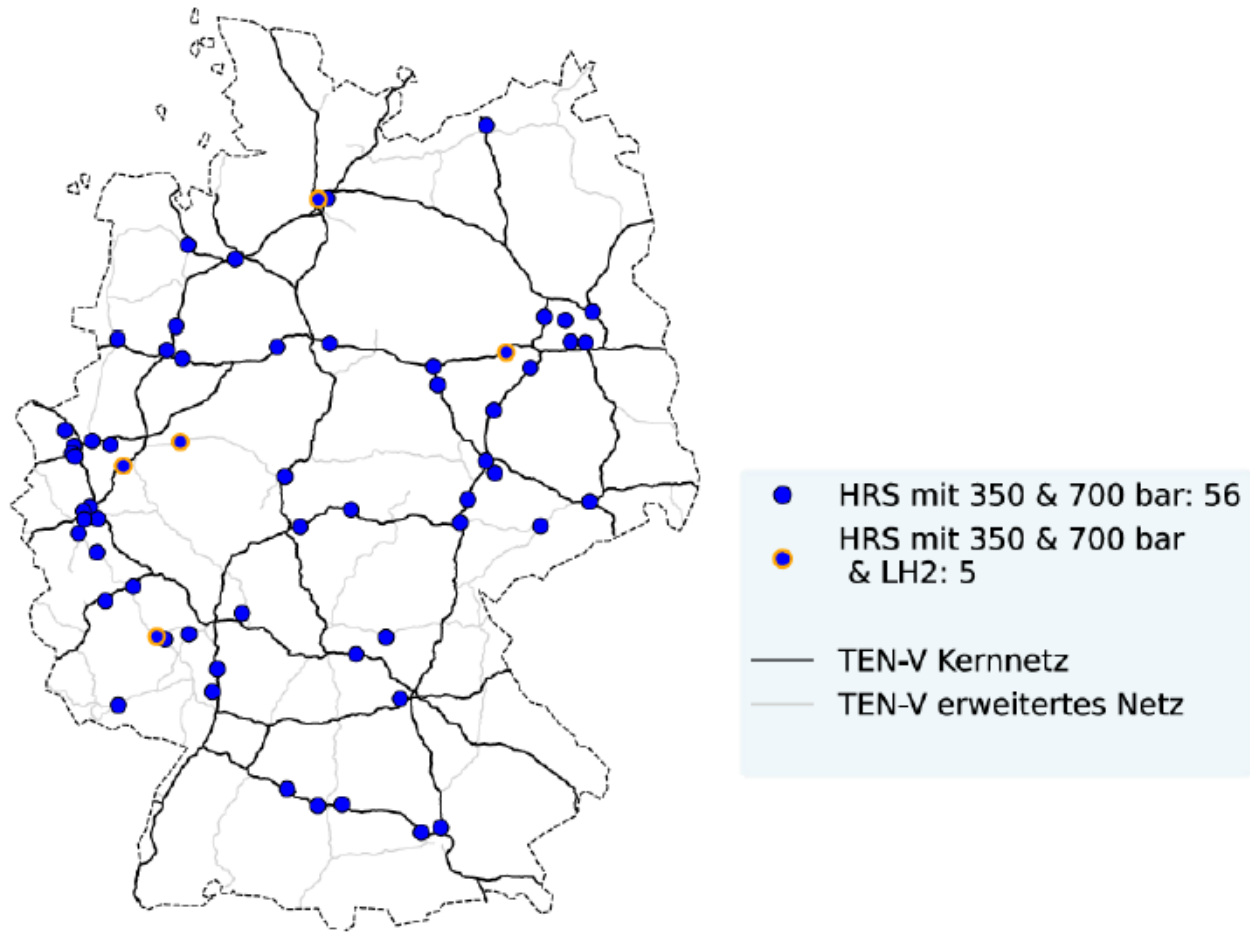


Light at the End of the Tunnel ? Plan published in Sept. 2023, but due to financial situation in BMDV everything is unclear – What happens with Germany's AFIR obligations ?

Ergebnis HRS-Call

Standorte und Befülloptionen

Aufruf 2023 Wasserstofftankstellen
(Stand 09/23)



Source: BMDV, Berlin 18.9.2023

BEV: Masterplan II Meilensteine zur LKW-Ladeinfrastruktur mit einem Jahr Verzug. Insbesondere Depotinfrastruktur wichtig für die Marktaktivierung

Initialnetz auf bundeseigenen Flächen

Q1/2023
Konzept für den Aufbau eines initialen Ladenetzes

- 351 Standorte (211 bewirtschaftete, 140 unbewirtschaftete Rastanlagen)
  - ➢ Ursprüngliche Planung: 2100 MCS, 7900 CCS Ladepunkte
  - ➢ Abgesenkte Umsetzungsquote (Platzbedarf Rastanlagen) 1.750 MCS & 2.450 CCS

Q3/2023
Ausschreibung eines initialen Ladenetzes

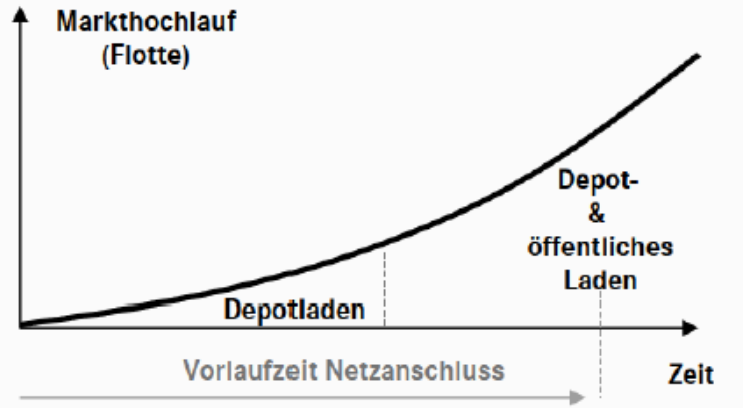
- Ausschreibung verschoben auf Q3/2024 (nur unbewirtschaftete Flächen wegen EuGH-Verfahren gegen Tank&Rast)
- Parallele Bestellung Netzanschlüsse für unbewirtschaftete UND bewirtschaftete Flächen
  → Staat geht hier in Vorleistung (implizite Förderung)

Förderung von Ladeinfrastruktur in Depots & Logistik-Hubs

Q1/2023
Finanzierungs- und Fördermaßnahmen für Depots & Ladehubs

- Förderkonzept existiert laut NLL aber aufgrund KTF-Mittelstreichung aktuell zurückgestellt
- Gleichzeitig fehlt Planungssicherheit für Logistiker
  - Kosten für Depotladeinfrastruktur abhängig von Netzauslastung
    - ➢ Logistiker 1: CCS Ladesäule ~ 100.000 €
    - ➢ Logistiker 2: CCS Ladesäule ~ 450.000 €

Was ist erforderlich



- ➢ **Förderschema für Depotinfrastruktur** zur Marktaktivierung und Dämpfung des Kostenrisikos für Logistiker – Planungssicherheit gewährleisten!
  - Fördergegenstand & Förderhöhe analog KsNI
  - mehr Effizienz und Transparenz bei Beantragungs- und Bewilligungsverfahren
- ➢ **Bis 2030 4.000 MCS/ 6.000 CCS** = 700 Mio. /a
- ➢ **Ausschreibung auf Autohöfe erweitern** (beidseitig anfahrbar, vielfach besserer Netzanschluss und Flächenverfügbarkeit)

KTF-Mittel: Richtige Allokation zur Dekarbonisierung notwendig. Klassisches Sektorendenken führt zu höheren Kosten für die Volkswirtschaft !

Heizungssysteme

"Maßnahmen zur Energieeffizienz und erneuerbaren Energien im Gebäudebereich" ***16.8 Mrd. €***

CO_2-Kosten (20a):	**~ 150 €/to CO2**
Förderung Wärmepumpe:	~ 30.000 €
Ø CO_2-Reduktion pro Haus: (ohne Strombedarf)	~ 10 to CO_2/a
Lebensdauer Wärmepumpe:	20 a

Lkw

"Lade-/Tankinfrastruktur": ***~ 1.8 Mrd €***
Keine *Fahrzeugförderung*

CO_2-Kosten (10a)	**~ 60 €/to CO2**
Angenommene Umlage Infrastruktur:	40.000 € pro Lkw
Ø CO_2-Reduktion pro Lkw:	~ 70 to CO_2/a
Lebensdauer Lkw:	~ 10 a

Nach ca. 3 Jahren erreicht der Zero Emission Lkw dieselbe CO_2-Reduktion wie eine Wärmepumpeninvestition nach 20 Jahren