Vety talouden moottorina

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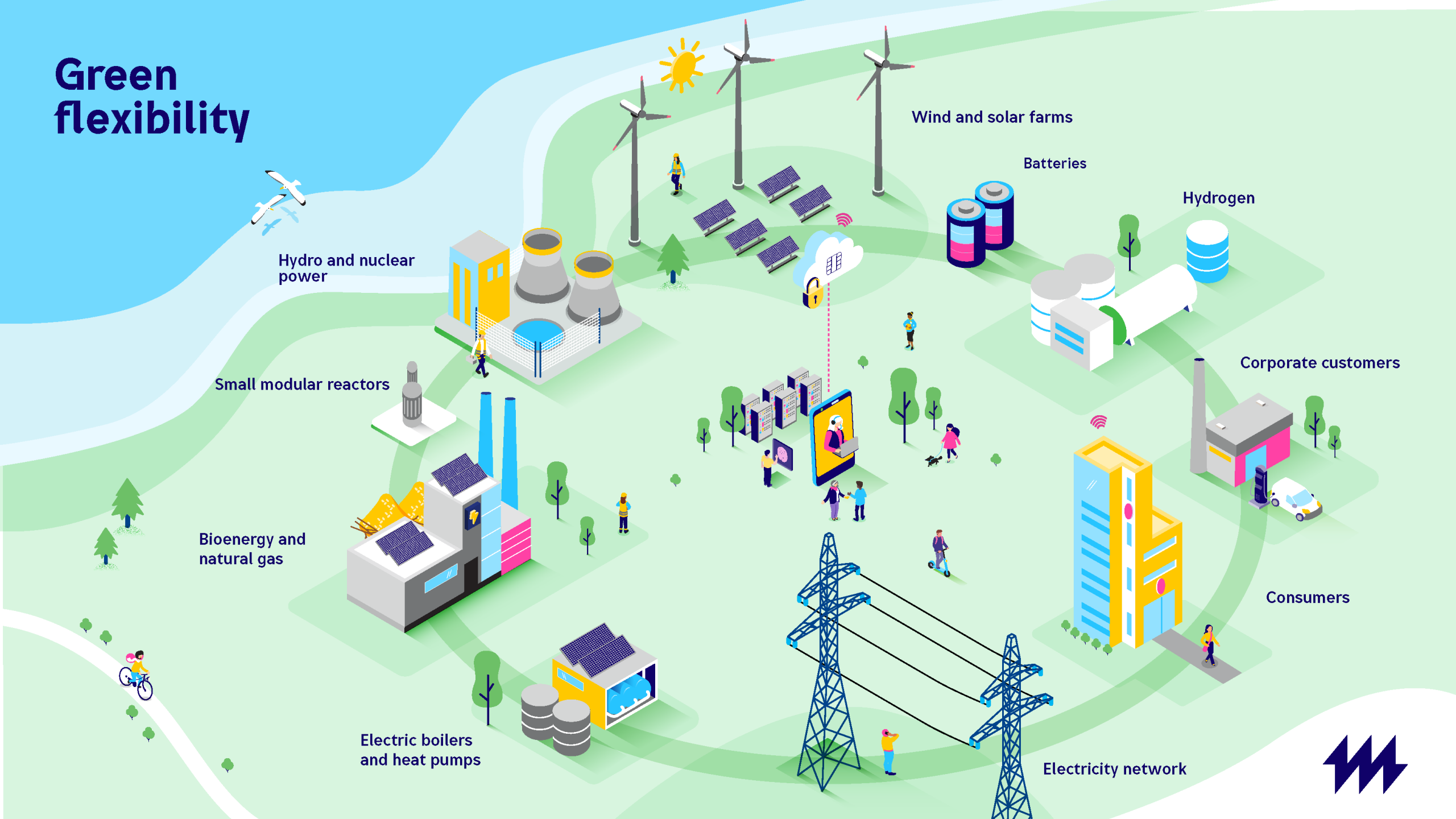
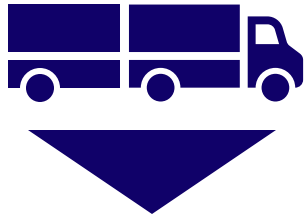
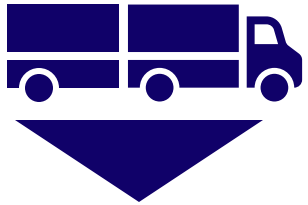
Helen x Huoltoasemapäivät
1.10.2025

Green flexibility



Road logistics system requires multiple solutions, no single solution will solve all the use cases

Battery electric trucks are the most energy-efficient solution, but they are not always feasible.

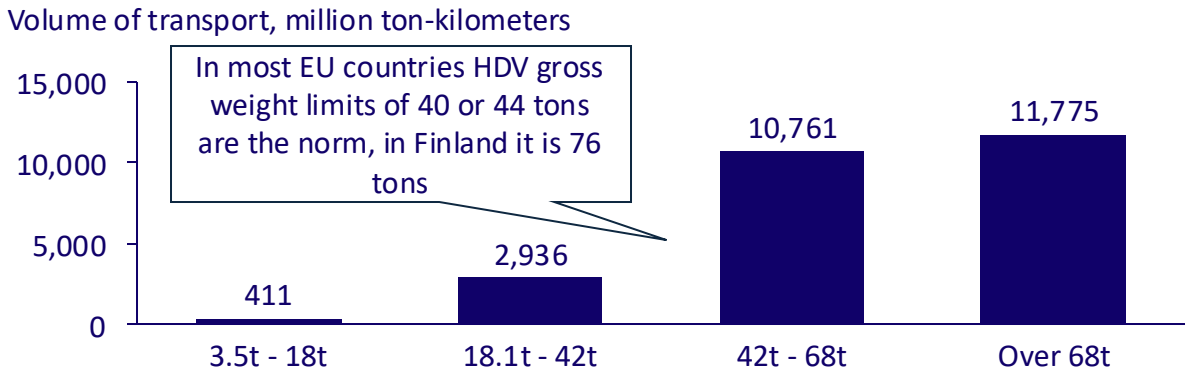
Gross vehicle weight	< 40 tons	42-50 tons	42-76 tons
Daily distance	max 300km	max 300km	>300km
			
Most suitable solution	Battery electric	Battery / Biofuels / Hydrogen	Biofuels / Hydrogen

Comments

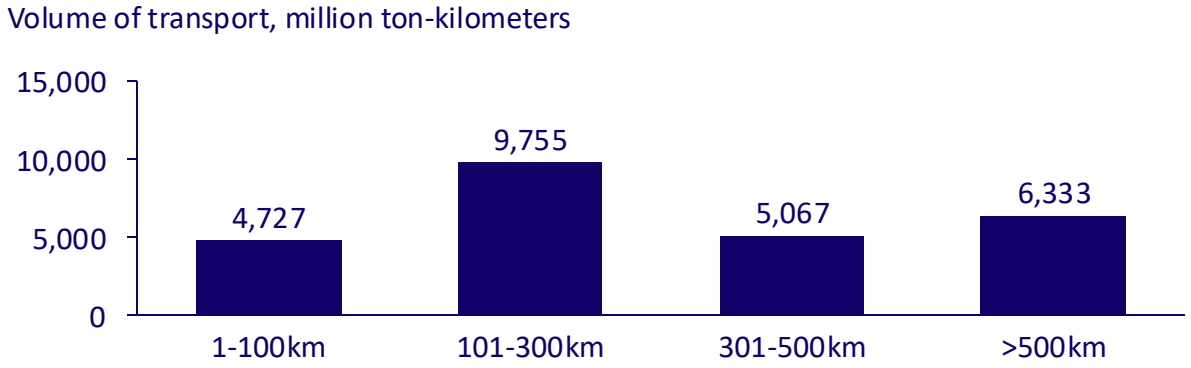
- Battery electric vehicles are the most energy-efficient and should be used whenever feasible.
- Electricity grid capacity will restrict the maximum power and limit fast charging capabilities or increase the cost of recharging significantly.
- Hydrogen production can be done more continuously, and it puts less stress on the congested electricity grids.
- Hydrogen fuel cell trucks are well-suited for heavy loads and long distances.
- Biofuels are easy drop-in solution for existing fleet.

Over 87% of Finnish road freight is transported by large heavy-duty vehicles (> 42 ton)

Distribution of HDV freight transport per weight class in Finland, 2024



Distribution of HDV freight transport per journey length in Finland, 2024



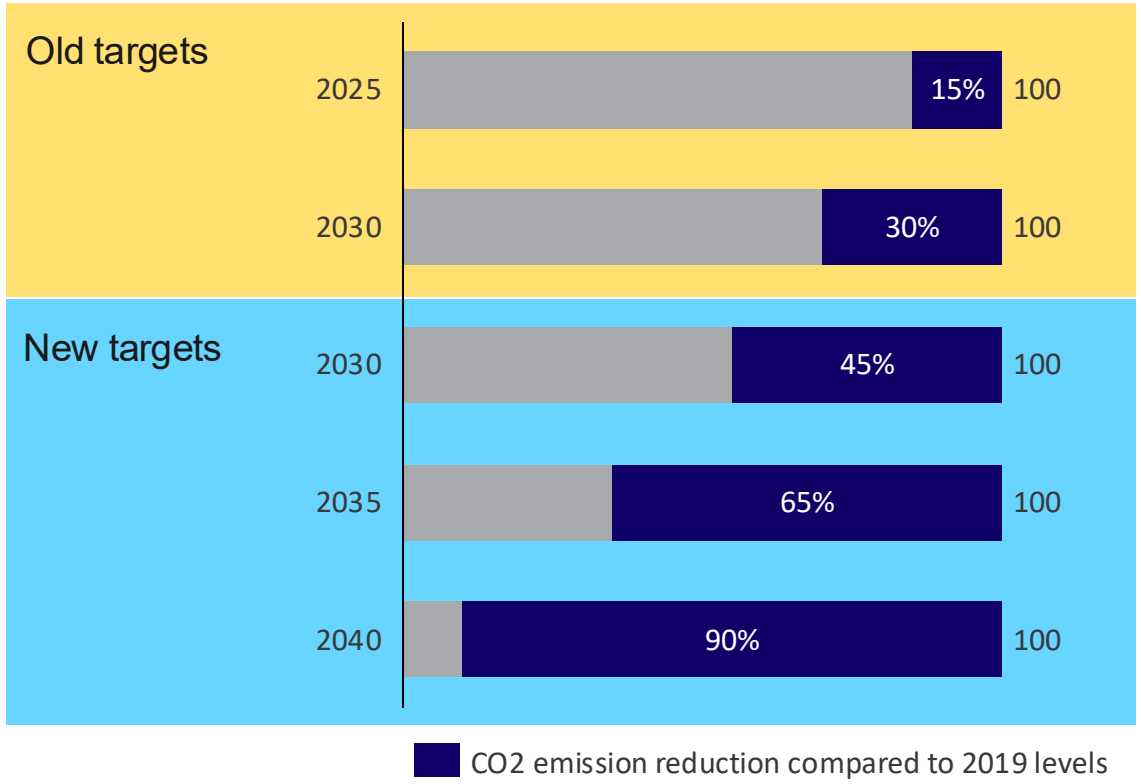
Comments

- The majority of emissions in the heavy-duty transport sector originate from very heavy vehicles, which are primarily used for long-haul transport
- Electrifying these trucks is challenging due to the battery weight reducing cargo capacity and the need for rapid charging, which strains electricity networks.
- In the short term, biofuels offer a carbon-free solution, while hydrogen presents a cost-efficient long-term option for large heavy-duty trucks.

Source: Tilastokeskus

Regulations regarding HDV emissions are tightening

New HDV tailpipe emission reduction targets in the EU compared to 2019 levels



Comments

- In 2023, the Commission proposed a revision of the Regulation on CO2 emission standards for heavy-duty vehicles. If adopted, the proposal would introduce new, stronger CO2 emission standards for heavy-duty vehicles from 2030 onwards and extend the scope of the Regulation to cover smaller trucks, city buses, long-distance buses and trailers
- There is an additional incentive mechanism to adopt zero emission vehicles (i.e. fuel cell hydrogen trucks or battery electric trucks)
- Under RED III, 1% of the fuels used in the transport sector in the EU must be Renewable Fuels of Non-Biological Origin (RFNBOs), i.e. hydrogen & e-fuels

Source: European Parliament

Refueling hubs in major cities would cover most of the country

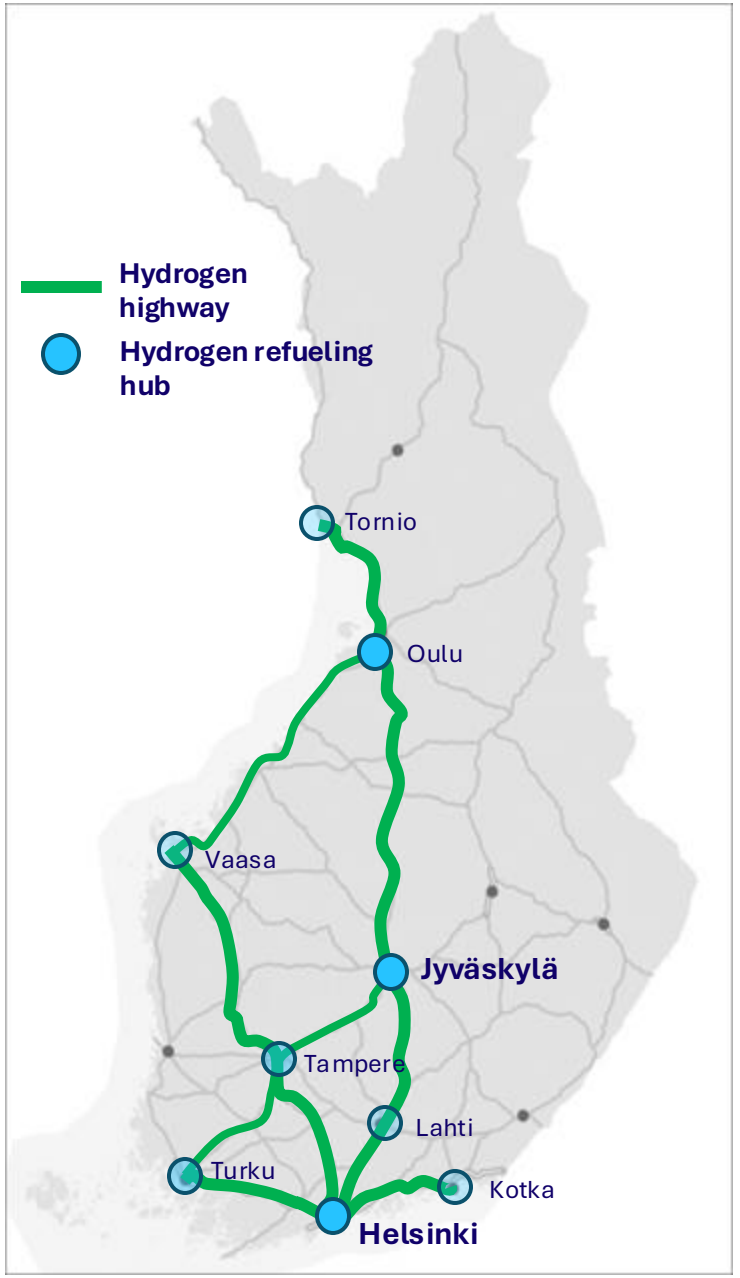
Trans-European Transport Network (TEN-T) core network is the basis for the hydrogen highway

Alternative Fuels Infrastructure Regulation (AFIR)

AFIR details requirements for the deployment of H2 refueling infrastructure for EU member states:

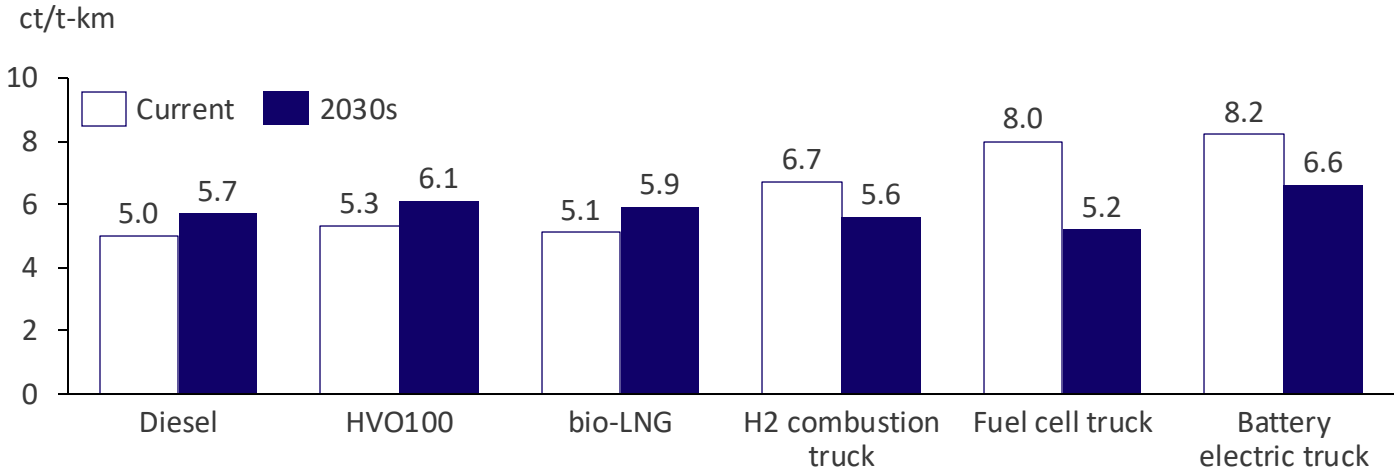
- By 2031, there needs to be a hydrogen refueling station (HRS) every 200km with a minimum capacity of 1 ton/day in the European core network
- Finland's core network = 1100 km, means 5 stations and at least 1 refueling station in each urban node (Helsinki, Turku, Tampere, Oulu, Jyväskylä, Lahti and Kuopio)
- All public refueling stations need to support a 700-bar refueling system

- Majority of Finnish road logistics travel via the TEN-T core network
- Helsinki and Jyväskylä hydrogen hubs are already under construction
- With gross vehicle weight limits up to 76 tonnes, Finland can leverage hydrogen's strengths for the heaviest and longest-haul freight, where battery electric solutions are less feasible.
- Hydrogen trucks are particularly well-suited for Finland's heaviest vehicles and longest routes, where battery electric solutions face limitations due to weight and charging constraints.



Hydrogen trucks will be cheaper than battery electric trucks per ton-km in the future

Distribution of HDV freight transport per weight class in Finland, 2024



Comments

- In order to incorporate information about payload capacity, it is necessary to calculate the Levelised Cost Of Transport (LCOT). This indicator represents the total cost per unit of mass transported and distance travelled, expressed as c€/tkm.
- In Finland, truck gross combined weights of up to 76t are possible, shifting the TCO advantage even more in favor of hydrogen in comparison to battery electric trucks as heavier batteries are required for these trucks

Assumptions:

Component improvements	Current	2030s
Battery costs €/kWh	230	200
Battery density kWh/kg	0.14	0.19
Fuel cell costs €/kW	430	150
Fuel cell efficiency kWh/km	2.93	2.64

Fuel costs (excl. VAT)	Current	2030s
Diesel €/l	1.4	1.8
HVO100 €/l	1.6	2.0
Biomethane €/kg	1.3	1.7
Hydrogen €/kg	8.0	6.0
Electricity €/kWh	0.36	0.28

Truck parameters	Value
GVW* t	42t
Powertrain kW	340 kW
Daily mileage km	320 km
Operating hours/day	6

*GVW = Gross vehicle weight

Source: Magnino et al., Roland Berger, ICCT

3H2 – Helsinki Hydrogen Hub

- Helen took investment decision on its first hydrogen plant (3 MW PEM) in March 2024; commissioning 2026
- Location: Eastern Helsinki (Vuosaari)
- Main goal of the pilot plant is to build capabilities in development, operation and optimization of hydrogen plants
- Designed for maximum efficiency (>90%) and flexibility
  - Only renewable electricity is used for hydrogen production with the help of hydrogen storages
  - All the waste heat is utilized in Helen's district heating network
- Hydrogen will be mainly used for heavy duty transport
  - Hydrogen refueling station will be built by partner next to 3H2
  - Container loading terminal enables hydrogen to be transported to various customers, e.g. industry, ferries, etc.

3H2 - Helsinki Hydrogen Hub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Other related projects

- **Jyväskylä**
  - Hydrogen bus pilot as part of the green hydrogen ecosystem
  - 5 Caetano busses busses will be operated and maintained by Koiviston auto
  - Toyota foundation (Cefmof) has financed the refueling station and will build an on-site electrolyser in 2025
- **Oulu**
  - Energiequelle will build a hydrogen production plant with a capacity of up to five megawatts (MW) and a hydrogen refueling station for buses and other heavy vehicles.
- **Tornio**
  - Vireon is planning a hydrogen refueling station in northern Finland, at the crossroads of Finland and Sweden.

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