
THE NORDIC'S Government incentives

What is needed to stimulate the uptake of H₂/electrofuels larger vehicles



Deliverable 6.4

Next Wave

- Next Wave focuses on providing infrastructure for a large-scale deployment of heavy-duty hydrogen vehicles.
- The goal is to further stimulate the global technological lead, which the Nordic countries have by **stimulating the very first hydrogen infrastructure rollout for larger vehicles** while at the same time map how the infrastructure build-up needs to be done.
- Time span: 01.10.2019 – 30.09.2023
- Financed by: Nordic Innovation and project partners



Sponsor:



Partners:



Incentives

- Governmental incentives have proven vital when introducing zero-emissions transport
- Iceland and Norway are potentially the best examples of this – as both have had nearly the same incentives for zero-emission vehicles for years
 - VAT was revoked
 - Taxes (road or annual) reduced or revoked
 - Infrastructure build up supported by Governmental funds
 - just to name a few
- Other incentives do also work
 - Like issuing new taxi licences in Copenhagen for zero-emission taxis
- Compared to the passenger car, larger vehicles / commercial business needs a different approach



Status larger vehicles

- Current availability is low – but most truck manufacturers are developing solutions for demonstrations 2023/24 and for real scale deployment 2025-2027
- Due to the low availability in the beginning, the first rollout will be where there is strong Governmental support both for deployment of vehicles and build-up of infrastructure
- Compared to conventional trucks, the investment cost of the zero-emission trucks are likely to stay higher for several years to come
 - **H₂ and BE trucks are 2-4* more expensive than a diesel version, depending on size, configuration, range, refuelling time, technology, etc. BE trucks are usually at the lower end, but with longer refuelling time and shorter range! H₂ ICE are also at the lower end**
- Completely new infrastructure has to be build simultaneously
- New incentive programs are needed to stimulate potential uptake
 - VAT incentives do not work for commercial activities
- Adoption speed will be controlled by incentives
 - And support for infrastructure



Next Wave study visit to IAA, September 2022

Current incentives larger vehicles - Denmark



- Direct financial support – vehicles (*includes ICE-H₂*)
 - With the energy agreement (Energiaftalen 2018) 500 mio. DKK were allocated to support the green transition of road transport 2020-2024. 50 mio. DKK was allocated to the purchase of green trucks – giving BEVs and FCEVs precedence
<https://www.trm.dk/media/0onne5gg/endelig-aftaletekst-250621-final-a.pdf>
- Direct financial support - infrastructure
 - 72 mio. DKK were allocated for co-financing refuelling and charging infrastructure in 2022
- Other support
 - A CO₂ MAUT for heavy duty vehicles will be introduced from 2025 differentiating the fee after CO₂ emissions thereby making e.g., FCEV trucks cheaper in relation to fossil vehicles
<https://www.trm.dk/media/vzoeqemf/aftaletekst-kilometerbaseret-vejafgift.pdf>
 - The newly formed Danish government states in its manifesto that further initiatives will be put in motion to reach the 2030 targets for the transport sector. This includes revisiting political agreements making them more effective considering the technological developments, and the possibility of increasing the target for the number of electrical vehicles. The advancement of zero-emission trucks is also a priority including transitioning fleets and establishing infrastructure
<https://www.stm.dk/media/11768/regeringsgrundlag-2022.pdf>

Current incentives larger vehicles - Finland



- Direct financial support – vehicles
 - For hydrogen trucks there are no direct financial support. There is a subsidy system for electric trucks (up to 50000 €) and gas trucks (up to 14 000€ for LNG, up to 14 000€ for CNG), but hydrogen trucks are probably not belonging to any of those groups
 - <https://www.traficom.fi/sv/vara-tjanster/ansok-om-anskaffningsstod-el-och-gasdrivna-lastbilar>
- Direct financial support - infrastructure
 - There has been tendering of investment subsidies (up to 40%) for purchasing HRS
 - <https://energiavirasto.fi/sv/stod-for-trafik-infra>
 - The deadline was 26.10.2022 and no any decisions have been published yet
 - In addition, energy aid can be probably received if HRS is located next to the production place of renewable hydrogen. Aid can be granted for one distribution station at most, provided that it is located in the immediate vicinity of the production plant. The subsidy level is also 40%
 - Most probably P2X solutions is building one HRS using this support in Harjavalta

Current incentives larger vehicles - Iceland



- Direct financial support – vehicles (*includes ICE-H₂*)
 - Until now none fixed - (however, first funding scheme has been made available (2023) and will probably follow the Norwegian model, final details to be determined)
- Direct financial support - infrastructure
 - None (done by individual applications to the National Energy fund)
- Other support
 - Lower annual tax
 - 100% depreciation in year 1
 - Affects income tax
 - National fund provides support for infrastructure and vehicles
 - Annual application round (competitive fund)



Current incentives larger vehicles - Norway



- Direct financial support – vehicles (*includes ICE-H₂*)
 - 40% of additional cost compared to conventional truck (50% for SMEs)
- Direct financial support - infrastructure
 - 40% of the investment cost of a new H₂ infrastructure for larger vehicles
- Other support
 - No road taxes
 - Tax on toll roads: ZE Trucks are exempted or pay reduced tax
 - May be decided regionally
 - Example: In Oslo, ZE Trucks are exempted tax on toll roads until 2027
 - Depreciation: 30% for ZE Trucks versus 24% for conventional trucks
 - Contract for Difference (CfD) – the Government appointed to launch a plan for implementation of CfD during 2023



ASKO operates 4 Scania FC Trucks in Trondheim

Current incentives larger vehicles - Sweden

- Direct financial support - vehicles
 - 20% of the investment cost
- Direct financial support - infrastructure
 - 100% of the investment for 13 refuelling stations within the Electrification pilots program
 - Up to 70% of the investment cost within the Climate leap program
- Other support
 - None



SUMMARY: Instruments and incentives

Incentives: hydrogen for transport	NO	SE	DK	FI	IS
Purchase of trucks	Enova: No specific program, but possible to get 40% (SME: 50%) of additional cost	Energimyndigheten: 20% funding of investment	No specific subsidies. Strategy for ZE trucks published in 2022	No specific subsidy for trucks. Can be a part of larger demo.	100% depreciation in year 1. No VAT. Reduced annual fee. No excise tax for ZE trucks. Direct subsidy from '23.
Purchase of buses	Same as for trucks	Energimyndigheten: 20% funding of investment from 2022	Same as trucks – but public tenders almost all ZE	Same as for trucks	Same as for trucks
Hydrogen stations	Enova: No specific program but possible to get 40% of cost. Must be related to purchase of trucks	Naturvårdsverket – Klimatklivet: up to 70% funding of investment	No specific subsidy but tender for ZE infrastructure 72 mill DKK and 225 mill DKK underway	Up to 40% subsidy possible in tenders. Subsidy possible as part of electrolyser investment	No incentives
Annual CO₂ tax	Annual tax is 0,- for ZEVs and only 378 NOK for HD diesel trucks. CO ₂ -tax is 159,- NOK/ton (2021)	107 SEK/g CO ₂ for range 90-130 g/km and 132 SEK/g for emissions above 130 g/km according to official test cycle	Part of fuel tax – no general CO ₂ -tax but underway as part of “green tax reform” to be negotiated in 2022	No annual car tax since 1.10.2021	Gasoil + diesel 11.75 ISK/L Gasoline 10.25 ISK/L Fuel oil 14.45 ISK/kg Fossil gas 12.85 ISK/kg
Toll roads	Exemption or reduced tax	No exemption based on emissions	CO ₂ -based MAUT for trucks planned in principle from 2025	No toll roads in Finland	No incentive
National ferries	Exemption or reduced tax	No exemption based on emissions	Program underway – tender completed but not yet public	Not relevant	No incentive
Zero emission zones	Being considered in some large cities	No zones yet	Legal framework on its way through parliament	No such zones in Finland	N.A.

Necessary incentives for hydrogen in heavy-duty transport

- Clear national ambitions for decarbonisation of transport
- Harmonized incentives across the Nordics
- Public funding needed in the early stage
 - Purchase trucks, establish stations, production of hydrogen
- Long-term benefits for use of hydrogen trucks, i.e.,
 - Exemption on toll roads and public ferries
 - Exemption of annual fee for trucks
 - Introduction of zero-emission zones in cities
 - Access to zero-emission lanes, reserved parking, and reserved and timely favoured delivery of goods
- Increased CO₂ tax – polluter should pay principle



TCO: Expecting diesel parity before 2030

- Several TCO analysis concludes that Hydrogen trucks will reach diesel parity within 2030
- Main expectations in TCO calculations:
 - Cost of vehicle is expected to remain higher than diesel
 - Cost of maintenance will be lower than diesel
 - Cost of hydrogen is crucial for the TCO
- TCO model for Nordic conditions should be developed
 - Several examples to build upon exists
 - An example of TCO work:
<https://theicct.org/publication/eu-hvs-fuels-eva-fuel-cell-hdvs-europe-sep22/>
- Incentives are needed on several levels
 - Hydrogen production
 - Hydrogen refuelling infrastructure
 - Hydrogen trucks / vehicles



How to stimulate uptake: Vehicles

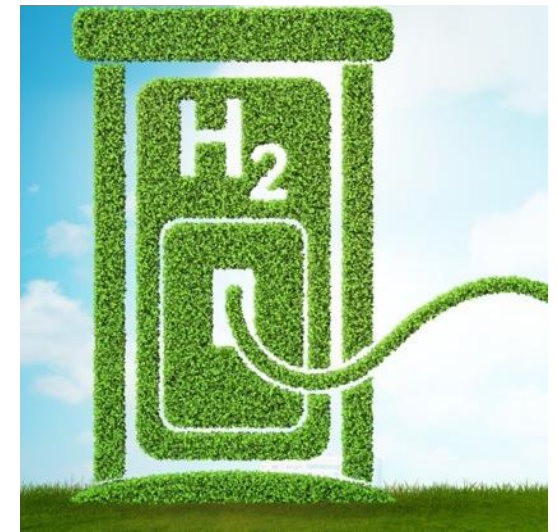
- Certain vehicle volume necessary – otherwise cost of infrastructure too high
 - Resulting in too high fuel cost
- Truck companies must be willing to deploy at a higher price
 - Willing to pay a premium in the beginning
- 2-4* times higher CAPEX is around €125-375.000 (40+ ton semi trailer truck)
 - Depending on, configuration, range and refuelling time
 - Cost comparison (both CAPEX and OPEX) between H₂ and BE should consider all aspects, fuelling time, range, carrying capacity, customer acceptance (usability, shifts, operation hours), etc.
 - Smaller truck, like <40 tons are less costly
- If market introduction is to happen incentives are needed
- For customers to act the project recommends a support of 80% of additional cost which could result in €100-300.000 grant per vehicle
 - This figure is for a semi trailer truck. Smaller trucks are cheaper and the grant per vehicle would therefore be lower
 - Smaller support, like 40-60% might stimulate the market if there is OPEX support
- Other long term incentives also necessary
 - Reduction of annual taxes (road taxes/weight taxes, different tax forms between countries)
 - Other incentives: make OPEX similar between zero-emission vehicles and fossil vehicles



Next Wave study visit to IAA, September 2022

How to stimulate uptake: Infrastructure

- Infrastructure funding necessary
 - At least CAPEX support for the initial stations (infrastructure needs to be build in a few locations at the onset, otherwise no truck operators will to use such trucks)
 - Learning has also shown that redundancy is needed from day one when we have commercial operation of such large vehicles
- Stations cost € 1.5 – 3.0 million (dependent on capacity and pressure)
- Green H₂ production has to be secured simultaneously
 - Can also be used for industry and maritime transport
 - Can also be used for electrofuel production (methanol, ammonia, sustainable aviation fuel (SAF))
- For the initial build up, incentives are necessary
 - Being OPEX or CAPEX is not the key – the key is that the fuel cost needs to be at parity with diesel
- Other infrastructure issues in need of municipal/governmental support
 - Land has to be available
 - Permitting process has to be shortened
 - Access to renewable energy must be secured



How to stimulate uptake: Others

- Governments should consult with key stakeholders (truck importers (sellers), truck operators, and infrastructure providers)
 - What sizes of vehicles should be supported?
 - Potentially different incentives for different sizes
 - Should OPEX be supported?
 - Contract for difference?
- Transnational cooperation needed to secure cross-border transport with hydrogen trucks
 - Infrastructure must be in place on both sides of the borders
 - Incentives for use of trucks should be harmonized between the Nordics
 - Regulations for distribution of hydrogen should be harmonized between the Nordics
- The Nordic ministerial cooperation and their ambitions need to be transformed to concrete action
 - Projects facilitating cooperation and stimulating rollout of trucks and infrastructure should be supported



Next Wave study visit to IAA, September 2022

Possible barriers for hydrogen heavy-duty transport

- Availability of trucks
 - Small numbers available until 2025
 - Global competition for the trucks – incentives are important
- Availability of infrastructure
 - The stations must be in place before the trucks arrive
 - Difficult to find areas for energy stations
 - Long permitting-times
- Lack of common models for TCO and LCA
- Costs-incentives not in place
- Uncertainty about new business models for truck operators; pay per km, lease or buy trucks?
- Legislation (“5 kW/ton”-rule) Commission regulation (EU) No 1230/2012 “The engine shall provide a power output of at least 5 kW per ton of the technically permissible maximum laden mass...”



World premiere of Quanton FC Truck at IAA, September 2022

Incentives will dictate deployment speed until 2028

- With low production capacity, deployment will seek high incentive locations
 - BEV passenger vehicle deployment in Norway and Iceland are good examples from the past
- If incentives make zero-emission competitive with fossil fuel solutions, uptake can be reasonably fast
- Introducing large-scale truck fleets will be costly – however with large CO₂ savings
 - Many of the large trucks drive 100,000 km a year and burn up to 50 litre per 100 km
- Government emission ambition need strong financial backing in the beginning



Thanks for your attention

