

Hydrogen Strategy Basis for the Oslo Region

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While the main focus of fuel cell technology has historically been the car market, many other applications of fuel cells are being developed or deployed, both automotive and stationary. The case of Akershus County (the region surrounding Oslo) in Norway is special in several regards:

- It has a large density of battery cars, by far the largest in the world;
- No natural gas network is present;
- Electric power prices are reliably low;
- Legislation grants privileges (no tax, free parking, use of bus lanes) to electric cars, both battery and hydrogen.

At the time of writing, the county of Akershus and Oslo are the site of all Norwegian hydrogen refuelling stations, and authorities have been consistently positive towards hydrogen for a long time.

The sales of battery vehicles in Norway took off with the arrival of mass-produced battery cars from major producers, such as Mitsubishi, Tesla, Nissan, BMW and more. Most owners charge their cars at home, and a country-wide network of fast chargers has been deployed and is being extended.

Therefore, this market for zero-emission vehicles is very competitive for hydrogen cars, and the presence of only a handful of hydrogen refuelling stations (all concentrated around Oslo) is a major handicap. Most consumers will not consider buying a hydrogen vehicle before a country-wide refuelling network is in place, which is difficult in Norway due to the large area to cover compared to e.g. Denmark, which has a similar population and a complete hydrogen network.

To bypass the well-known chicken-and-egg problem, we propose focusing the promotion of hydrogen mobility on *fleets*. Fleet owners can make an economic case for owning a dedicated refuelling station for their vehicles, providing therefore "chicken and egg" at the same time. With some form for financial support from the government, the fleet owners can make their station available to the public, thereby adding a station to the public network at a minimal cost for the public. The continued usage of the station by fleet owners would guarantee continued maintenance, and would assure consumers that the station will not be closed after a short time, as demonstration projects often are.

Some fleets can be deployed with current technology and available infrastructure: for Akershus county, we identified the possibility of hydrogen taxis in and around Oslo, forklifts in logistic companies, and material handling vehicles at Oslo Airport Gardermoen.

Deploying hydrogen buses in Oslo has already started years ago with the CHIC project, but experiences are mixed due to the low availability that was experienced.

In a longer perspective, the Akershus region can support the development of hydrogen-fuelled industrial vehicles (trucks, dumpers, etc.) and maritime applications, such as ferries and ships: each of these applications could result in one or more hydrogen stations made available to the public.

The market for private hydrogen vehicles will not start growing significantly until a large, country-wide network of refuelling stations will be established, and is likely going to be one of the last markets for hydrogen technology to achieve full market penetration.

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