

# The Finnish hydrogen roadmap: Hydrogen to join electricity in ending traffic pollution

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Global expectations for hydrogen are currently sky-high. Transport applications stand at the threshold of commercialisation, while ahead lies an investment boom in the hydrogen distribution network. The changeover to hydrogen based on natural gas would already mean a potential saving of billion in Finland's balance of payments. If hydrogen could then be produced from domestic renewable raw material, our car and bus traffic would eventually be practically self-sufficient and leave a significantly reduced carbon footprint. The above was revealed in the Finnish hydrogen roadmap published recently.

The Finnish [hydrogen](#) roadmap, compiled by VTT Technical Research Centre of Finland and partly funded by the Finnish Funding Agency for Technology and Innovation (Tekes), assesses the export opportunities that can be available to Finnish businesses through international development. The report envisages the kind of energy-, climate- and industrial-political opportunities offered to Finland through widespread adoption of [hydrogen energy](#), and presents realistic recommendations for gaining access to them.

## Hydrogen transport fuel also competitive on price

The global [car industry](#) is the driver of development in hydrogen [energy technology](#), having confirmed the arrival of [hydrogen fuel cell vehicles](#) on the consumer markets by 2015.

Finland's expertise in biofuel refinement and efficient biofuel industry are also significant globally. Hydrogen can be produced from forestry biomass highly effectively using processes based on fluidised bed gasification and reforming. By-product hydrogen generated by the chemical industry and [hydrogen production](#) integrated with other production are already a practical alternative.

"VTT's research indicates that [gasification](#) of [timber harvest](#) debris produces hydrogen with greater efficiency than it does diesel. For the time being, however, the cheapest hydrogen is obtained through reforming natural gas. This also reduces emissions, as greater mileage is obtained with hydrogen reformed from natural gas than with pure natural gas. Another advantage with hydrogen vehicles is that they don't produce oxides of nitrogen or any other particulate emissions, just water," says Project Manager and Principal Scientist Jussi Solin of VTT.

The changeover of car and bus transport to electric power has already begun, offering notable efficiency benefits compared to the internal combustion engine. Replacing the big battery in an electric car with a 5 kg hydrogen tank and fuel cell enables a range of more than 500 kilometres .of winter driving and refuelling in 5 minutes.

The roadmap recommends Finland's preparing for the market arrival of vehicles powered by fuel cells by procuring cars and buses of this type for trial purposes. Such trials should be linked to the development, testing and marketing of hydrogen refuelling stations, other export products, and services.

## **Hydrogen demands special technology and expertise in materials**

Finland is already prepared for the construction of hydrogen refuelling

stations through gas company Voikoski Oy, which this year has set the ball rolling by using its own innovative technology to bring an exportable hydrogen refuelling station to Vuosaari in Helsinki.

"We are now investing at record levels and are fully focused on hydrogen. Last winter we supplied hydrogen for Arctic trials in Lapland, and in Hanover at the beginning of the week published the refuelling station concept now undergoing trials at Voikoski," says Managing Director Kalevi Korjala. Mr Korjala hopes the Finnish pilot will support export drives and the efforts of technology growth enterprises to develop the demanding components and control systems..

Hydrogen use in energy and transport reveals considerable benefits in reducing carbon dioxide and other environmental emissions, replacing imported fuels with domestic renewable energy, and in maintenance support performance, regional employment and cleantech development.

Using hydrogen produced by electrolysis to store electricity enables growth of the share of renewable energy and its connection to the electricity network. An electrolysis plant managed according to electricity price fluctuations can be made profitable.

For Finland the question is not only one of energy, but of processes, materials, equipment and the manufacture of components. In other words, of building the export products that will be needed for the future hydrogen distribution network.

Provided by VTT Technical Research Centre of Finland

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