

Government resolution on hydrogen

PUBLICATIONS OF THE FINNISH GOVERNMENT 2023:19

vn.fi/en



FINNISH
GOVERNMENT

Publications of the Finnish Government 2023:19

Government resolution on hydrogen

Finnish Government Helsinki 2023

Publication distribution

**Institutional Repository
for the Government
of Finland Valto**

julkaisut.valtioneuvosto.fi

Publication sale

**Online bookstore
of the Finnish
Government**

vnjulkaisumyynti.fi

Finnish Government

Ministry of Economic Affairs and Employment

This publication is copyrighted. You may download, display and print it for Your own personal use. Commercial use is prohibited.

ISBN pdf: 978-952-383-986-1

ISSN pdf: 2490-0966

Layout: Government Administration Department, Publications

Helsinki 2023 Finland

Government resolution on hydrogen

Publications of the Finnish Government 2023:19

Publisher Finnish Government

Group author Ministry of Economic Affairs and Employment

Language English

Pages

18

Abstract

The Government resolution defines the national goals related to hydrogen and describes the measures that promote them. Finland seeks to achieve a leading position in the European hydrogen economy throughout the value chain. The objectives are to produce clean hydrogen and electric fuels for the needs of Finnish industry, transport and the energy system, modernize the industrial sector, increase value added exports, and secure investments in Finland.

The objective of the resolution is to build a new industrial sector in Finland based on hydrogen and products made from it that supports the renewal of the manufacturing industry and turns the industry's technology companies into leading global suppliers.

Keywords hydrogen, energy, industry, fuels

ISBN PDF 978-952-383-986-1

ISSN PDF

2490-0966

URN address <https://urn.fi/URN:ISBN:978-952-383-986-1>

Valtioneuvoston periaatepäätös vedystä

Valtioneuvoston julkaisu 2023:19

Julkaisija	Valtioneuvosto		
Yhteisötekijä	Työ- ja elinkeinoministeriö		
Kieli	englanti	Sivumäärä	18

Tiivistelmä

Periaatepäätöksessä määritellään kansalliset vetyyn liittyvät tavoitteet ja kuvataan niitä edistävät toimenpiteet. Suomi tavoittelee Euroopan johtava asemaa vetytaloudessa läpi koko arvoketjun. Tavoitteina ovat puhtaan vedyn ja sähköpolttoaineiden valmistus kotimaisen teollisuuden, liikenteen ja energiajärjestelmän tarpeisiin, teollisuuden uudistuminen ja korkean jalostusarvon vientiliiketoiminnan kasvu sekä investointien varmistaminen Suomeen.

Periaatepäätöksen tavoitteena on kasvattaa Suomeen uusi vetyyn ja siitä valmistettuihin tuotteisiin pohjautuva teollisuudenala, joka tukee valmistavan teollisuuden uudistumista ja kasvattaa alan teknologiayrityksistä kansainvälisesti johtavia toimittajia.

Asiasanat	vety, energia, teollisuus, polttoaineet		
ISBN PDF	978-952-383-986-1	ISSN PDF	2490-0966
Julkaisun osoite	https://urn.fi/URN:ISBN:978-952-383-986-1		

Statsrådets principbeslut om vätgas

Statsrådets publikationer 2023:19

Utgivare	Statsrådet		
Utarbetad av	Arbets- och näringsministeriet		
Språk	engelska	Sidantal	18

Referat

I principbeslutet anges de nationella målen för vätgas och åtgärder för att främja målen. Finlands ambition är att uppnå en ledande ställning inom vätgasekonomin i Europa genom hela värdekedjan. Målet är att framställa ren vätgas och elektrobränslen för den inhemska industrins, trafikens och energisystemets behov, att förnya industrin och att öka exportverksamheten med högt förädlingsvärde samt att säkerställa investeringar i Finland.

Syftet med principbeslutet är att utveckla en ny industrisektor i Finland som bygger på vätgas och produkter tillverkad av den, som stöder en förnyelse av tillverkningsindustrin och gör det möjligt för teknikföretagen inom sektorn att bli internationellt ledande leverantörer.

Nyckelord	vetgas, energi, industri, bränsle		
ISBN PDF	978-952-383-986-1	ISSN PDF	2490-0966
URN-adress	https://urn.fi/URN:ISBN:978-952-383-986-1		

Contents

1	Introduction	7
2	Basis	8
3	Objectives	11
4	Measures taken by ministries to promote hydrogen economy	13
5	Measures	14
	Appendices	18

1 Introduction

Finland has a significant potential to produce clean electricity. This enables the development of a competitive hydrogen economy in Finland on a European and even global scale.

In its autumn budget session in 2021, Sanna Marin's Government defined that a "national hydrogen strategy, including the P2X technology, hydrogen production and the advancement of CCSU solutions" will be prepared as part of the climate and energy strategy under preparation. According to the records of the budget session, a Government resolution will be prepared based on the strategy to promote the hydrogen economy.

For example, the consulting company AFRY's extensive *Hydrogen economy – opportunities and limitations* study for the Government's analysis, assessment and research activities have been used as background material for the resolution. The study aimed to offer a full overview of hydrogen technologies and development paths in the hydrogen economy. In spring 2022, a working group under the Ministry of Economic Affairs and Employment also assessed the need to establish a national hydrogen company in accordance with the assignment set during the budget session. According to the group's assessment, a national hydrogen production company does not seem to be necessary. The Government could better accelerate the development of the hydrogen economy by participating in the distribution of risks by supporting RDI activities and investments. According to the group's assessment, the Government could also help enable the construction of a hydrogen infrastructure.

In spring 2021, a *national hydrogen cluster* driven by companies was established in Finland. By autumn 2022, some 60 hydrogen industry companies and a group of industrial associations had joined the cluster. The goal of the hydrogen cluster is for Finland to lead the way internationally as a global developer and provider of hydrogen solutions. The cluster published a *white paper* on promoting Finland's hydrogen economy in September 2021. At the beginning of 2023, the hydrogen cluster initiated an investigation to prepare its proposal for Finland's hydrogen economy strategy.

2 Basis

The recent crises have underlined the significance of becoming more self-sufficient in energy as a key prerequisite at all levels of society. They have also shown that Finland's long-term energy policy has been and remains on a solid foundation. Finland's energy system is diverse and decentralised, and it is based on clean solutions and the use of renewable energy.

Energy self-sufficiency and clean energy will also be Finland's key competitive factors in the future. Clean solutions not only respond to the challenges presented by climate change, but also offer a competitive edge compared to countries in which the share of clean energy production out of total energy production is lower. The growing need for clean energy production has raised extensive interest in hydrogen as an enabler of a low carbon economy.

For example, the Intergovernmental Panel on Climate Change (IPCC) and the OECD's International Energy Agency (IEA) have investigated hydrogen in their climate and energy scenarios. Furthermore, research organisations have studied hydrogen in their numerous international energy scenarios. Recently, the EU, among others, has set high expectations for zero-emission hydrogen.

The attractiveness of hydrogen has also increased significantly in Finland, driven by the growing international interest. In autumn 2020, VTT Technical Research Centre of Finland prepared the national hydrogen roadmap as assigned by Business Finland. VTT has for long conducted hydrogen technology research, and it already prepared its first hydrogen roadmap in 2012. Other research organisations and universities of technology also study electric fuels processed from hydrogen.

Hydrogen has various uses as a raw material, fuel, energy carrier and storage device for energy. Hydrogen offers a low carbon option for fossil raw materials and energy sources in various applications, especially in sectors in which emissions reductions are difficult, provided that hydrogen is produced with zero emissions. Clean hydrogen helps reduce emissions in transport (electric fuels), agriculture (the ammonia required in fertiliser production), and the manufacture of steel, chemicals and materials. Zero-emission hydrogen requires hydrogen production through electrolysis using zero-emission electricity or in other processes using bio-based/sustainable raw materials.

Currently, hydrogen is mainly produced from natural gas, releasing carbon dioxide into the atmosphere (grey hydrogen). Carbon dioxide can also be recovered and stored in the process (blue hydrogen). Through pyrolysis, hydrogen can be produced from biomass or natural gas. The carbon generated in the process can be used and sequestered in its solid form.

In the future, electrolysis, in which water is split into hydrogen and oxygen using renewable electricity (green hydrogen) or clean electricity (low carbon hydrogen), will be the most significant hydrogen production method. Green hydrogen carries different shades according to what renewable energy sources are used, and how hydrogen production is linked to the generation of renewable electricity and a new renewable electricity generation capacity.

Some 140,000–150,000 tonnes of hydrogen are produced in Finland per year (4.7–5.0 TWh). Roughly 99 per cent of this volume is produced from natural gas. A small volume of hydrogen is also produced for the needs of industry using electricity. In Finland, 88 per cent of hydrogen is used in the processing of oil and biofuels. Major users of hydrogen include Neste's facilities in Porvoo and UPM's biofuel production plant in Lappeenranta. In Finland, hydrogen is also generated as a by-product at various production plants in the forest and chemical industries.

Both the production and use of hydrogen are expected to increase significantly in the future. Hydrogen has new uses in the chemical and metal industries and transport. The Energy Authority has granted the first subsidies for investments in hydrogen stations. The use of hydrogen in heavy transport will increase, requiring the hydrogen station network to be developed.

Solutions similar to electric fuel production processes also help produce other end products for the needs of the chemical, material and fertiliser industries, among others. Therefore, the use of zero emission hydrogen offers significant opportunities for decarbonising industrial and agricultural processes. Significant incentives are already available to reduce transport emissions, which have an impact on targeted markets.

Currently (at the beginning of 2023), more than 20 hydrogen projects are in progress in different planning phases in Finland. Most of these projects would produce electric fuels for industries and transport. The projects are spread across Finland, being mainly situated in conjunction with the largest industrial regions close to the southern and western coasts.

Gasgrid Finland is investigating the opportunities to develop Finland's hydrogen network and the hydrogen market in the Baltic Sea region. As a result, it has launched three large-scale infrastructure development projects in cooperation with infrastructure operators

and international industrial organisations in neighbouring countries. In addition, cooperation networks for hydrogen have been established in Finland, including the national hydrogen network in the Bothnian Bay region.

Finland's strengths include, above all, the sufficiency of low-cost renewable energy, the stable electrical grid and solid expertise in the industrial and energy sectors, including the design, manufacturing and deployment of solutions that improve large-scale industrial processes, digitalisation and energy efficiency. In addition, Finland's benefits include the abundant bio-based CO₂ sources in the forest industry and district heating production (electric fuels from hydrogen and CO₂), district heating networks in which the waste heat generated in the electrolysis process and other electric fuel production phases can be used, and the rich supply of clean water (seawater desalination consumes energy).

Finland has expertise in various hydrogen technology areas and in the management of complete energy systems. For example, Finland has been an active player in fuel cell technology for decades, frequency converters are used in the electrification of electrolyzers, and gas engines are converted to run on hydrogen and electric fuels. International growth markets have already opened up for Finnish research, service and technology expertise in the sector.

3 Objectives

In summer 2022, the Finnish Government prepared the climate and energy strategy, including a separate section on hydrogen. The resolution's objectives and measures are based on the outlines of the climate and energy strategy, the dialogue with industrial operators, and the Ministry of Economic Affairs and Employment's internal preparation.

According to the Government's definition, the objective is to make Finland a competitive and predictable investment environment for the hydrogen economy. Hydrogen offers an opportunity to accelerate the green transition in Finland, and the export of hydrogen-related technologies can generate significant global emissions reductions.

Based on our strengths, we have the capability to establish significant value chains in the hydrogen economy.

We seek to achieve a leading position in the European hydrogen economy throughout the value chain. If the market conditions develop favourably, Finland can produce at least ten per cent of the EU's zero emission hydrogen by 2030.

The objectives are to produce clean hydrogen and electric fuels for the needs of Finnish industry, transport and the energy system, modernise the industrial sector, increase value added exports, and secure investments in Finland.

In addition to increasing the value added, the goals most effectively support the withdrawal from fossil fuels and the achievement of national climate policy goals.

A sufficient production capacity for clean electricity and investments in transmission networks and international connections also enable Finland's ability to develop in the long term into an export country not only for added value products, like green steel, but also for hydrogen and electric fuels.

Large-scale hydrogen production requires a high availability of competitive clean electricity. The new wind power capacity under construction is many times higher than Finland's current need which, combined with the steady and predictable development

of the operating environment, makes Finland an attractive location for investment and option for the EU's planned high-volume import of green hydrogen and products processed from it from outside Europe.

The position of a leading country in the hydrogen economy calls for a national growth strategy and inter alia, the secured availability of zero emission electricity, the development of the infrastructure required, and above all, significant industrial investments to enable growth. Building a significant production capacity and increasing the value added translate not only to a massive increase in windpower capacity, but also investments of tens of billions of euros in hydrogen production and its processing into green methane, methanol and ammonia during the next 10 to 20 years. The objective is to build a new industrial sector in Finland based on hydrogen and P2X products that supports the renewal of the manufacturing industry and turns the industry's technology companies into leading global suppliers.

Achieving this objective also requires investments in electricity and hydrogen transmission networks that must be developed sustainably considering land use and regions, while aiming to use electricity, hydrogen and their by-products, including heat and oxygen, as effectively as possible.

Public measures help promote the establishment of a production capacity for renewable and low-carbon hydrogen and accelerate the use of hydrogen in industry and transport, and in balancing energy networks, especially electrical grids. Launching investments also calls for regulations that support them, as well as a positive operating environment and financial incentives. Furthermore, the progress of the hydrogen economy requires the growing need for skilled employees to be addressed.

Ensuring safety is an important and integral part of the development and use of new hydrogen technologies. Technical safety regulation needs to be amended to better predict and manage risks. Proactivity and updated regulations support the development and successful deployment of technologies, produce cost savings and limit accident risks.

Developing safety regulations quickly is a requirement for the rapid development of investment projects. For the fulfilment of investment projects in the hydrogen economy, predictability in the operating environment, the smooth flow of permit processes and the planning of land use may give Finland a competitive edge when companies are considering potential locations for their production plants. The smooth flow of permit processes must be developed without making any compromises on quality, while addressing the development of environmental processes towards the one-stop-shop legislation and permits implemented through a national model as required by the Parliament.

4 Measures taken by ministries to promote hydrogen economy

In December 2020, Finland signed the Green Hydrogen Manifesto with 22 other EU Member States and expressed its willingness to participate in the hydrogen IPCEI process. The Important Project of Common European Interest (IPCEI) is a procedure in which a derogation from standard state subsidy regulations is permitted based on the promotion of common European interests. The Sustainable Growth Programme for Finland has allocated significant funding to hydrogen projects and other projects for the recovery and use of carbon dioxide, part of which is intended for projects carried out by companies participating in the hydrogen IPCEI process. In addition, the Ministerial Working Group on Preparedness allocated separate funding to hydrogen projects in spring 2022 to strengthen self-sufficiency, withdraw from fossil energy and accelerate investments. In addition, national funding can be granted for hydrogen projects from the energy aid.

During its budget session in spring 2022, the Finnish Government decided to accelerate investments in the green transition (including hydrogen investments) by granting them a temporary precedence in permit processes. The precedence procedure entered into force at the beginning of 2023.

In addition, electric fuels were added to the transport fuel distribution obligation at the beginning of 2023.

Gasgrid Finland, Finland's national gas transmission company, established a subsidiary specialising in hydrogen in 2022. The Finnish Government gave Gasgrid Finland the task of promoting the development of a national hydrogen network, international infrastructure cooperation and hydrogen markets in the Baltic Sea region as quickly as possible.

Gasgrid Finland, together with the main grid company Fingrid, has investigated the opportunities offered by the electricity and hydrogen transmission infrastructure to the hydrogen economy and energy system, as well as the requirements set by hydrogen production and consumption for the transmission infrastructure.

5 Measures

Operating environment and regulation

- Participating actively in developing regulation on the hydrogen market in the EU, emphasising the role of a well-functioning market. If required, developing national regulation in the sector regarding the market, infrastructure and chemical safety.

Responsible ministries: Ministry of Economic Affairs and Employment, Ministry of the Environment

Other actors: Finnish Safety and Chemicals Agency (Tukes)
- Ensuring rapid permit processes for hydrogen projects in accordance with the precedence procedure by seeing to the authorities' competence, resources, interaction and cooperation. Continuing the development of procedures.

Responsible ministries: Ministry of the Environment, Ministry of Economic Affairs and Employment, Ministry of Finance, Ministry of Justice

Other actors: Regional State Administrative Agencies (AVI), Centres for Economic Development, Transport and the Environment (ELY), Tukes
- Promoting the development of the EU's CCS/CCU regulatory framework.

Responsible ministries: Ministry of Economic Affairs and Employment, Ministry of the Environment
- Developing national hydrogen networks and related infrastructure under coordination, while adopting a proactive approach to the gas market legislation under preparation in the EU.

Responsible ministries: Ministry of Finance, Ministry of Economic Affairs and Employment

Other actors: Gasgrid Finland
- Creating preconditions for investments in renewable electricity production, and electricity and hydrogen transmission networks. Developing transmission networks sustainably considering land use and regions, while addressing landowners' rights, by improving the redemption procedure and minimising the impact on the environment and nature.

Responsible ministries: Ministry of Economic Affairs and Employment, Ministry of the Environment

- Promoting the maximally effective use of electricity, hydrogen and its processed products, as well as their by-products, including heat and oxygen. Addressing the joint impact of projects and opportunities for an effective implementation to minimise environmental and nature impact, starting as early as the planning phase.

Responsible ministries: Ministry of Economic Affairs and Employment, Ministry of the Environment

- Identifying the applicability of various risk and cost distribution instruments, including the Carbon Contracts for Difference (CCfD), in promoting low-carbon industry. Identifying the opportunities to use the CCfD at a national level.

Responsible ministry: Ministry of Economic Affairs and Employment

- Setting a target of at least three per cent for the proportion of electric fuels out of all transport fuels by 2030, and investigating the opportunity to increase the target once the amendment to the renewable energy directive has been completed.

Responsible ministries: Ministry of Economic Affairs and Employment, Ministry of Transport and Communications

- Highlighting the importance of all zero-emission production forms of hydrogen with a technology-neutral approach in the EU and globally.

Responsible ministry: Ministry of Economic Affairs and Employment

Competence and cooperation

- Promoting the development of competence in the hydrogen industry to meet the needs of companies.

Responsible ministries: Ministry of Education and Culture, Ministry of Economic Affairs and Employment

Other actors: Service Centre for Continuous Learning and Employment (JOTPA), hydrogen cluster

- Engaging in closer cooperation with the national hydrogen cluster and other organisations that promote the development of the hydrogen industry.

Responsible ministry: Ministry of Economic Affairs and Employment

Other actors: Business Finland, hydrogen cluster

- Promoting the entry of hydrogen investment in Finland, EU-level cooperation of companies operating in Finland, international networks, and the joint development of projects.
Responsible ministry: Ministry of Economic Affairs and Employment
Other actors: Business Finland, hydrogen cluster, national hydrogen network
- Ensuring the safe implementation of hydrogen projects by developing technical safety regulations and through cooperation with the authorities and the development of competence.
Responsible ministry: Ministry of Economic Affairs and Employment
Other actors: Tukes
- Participating in international hydrogen cooperation between developed economies within the scope of the IEA, the Clean Energy Ministerial, and Mission Innovation. Aiming to position Finland as one of the leading hydrogen economies in Europe.
Responsible ministries: Ministry of Economic Affairs and Employment, Ministry of Finance
Other actors: Business Finland

Innovation and investments

- Investing in RDI activities in different areas of the hydrogen technology, including through Business Finland's RDI funding and programmes.
Responsible ministry: Ministry of Economic Affairs and Employment
Other actors: Business Finland
- Effectively using the funding opportunities offered by the EU and international cooperation by participating in the EU's RDI and investment programmes.
Responsible ministry: Ministry of Economic Affairs and Employment
Other actors: Business Finland
- Promoting the investments required for hydrogen production, transmission and distribution through EU funding and the opportunities offered by the EU.
Responsible ministry: Ministry of Economic Affairs and Employment
Other actors: Business Finland, Gasgrid Finland

- Accelerating the development and deployment of technologies and solutions for the recovery, storage and use of carbon dioxide (CCS/CCU) by funding piloting and demonstration projects.
Responsible ministries: Ministry of Economic Affairs and Employment, Ministry of the Environment
Other actors: Business Finland
- Supporting new solutions and demonstration projects that promote system integration.
Responsible ministry: Ministry of Economic Affairs and Employment
Other actors: Business Finland
- Piloting the use of hydrogen in transport, especially in heavy road transport, and water transport and non-road machines.
Responsible ministries: Ministry of Transport and Communications, Ministry of Economic Affairs and Employment, Ministry of the Environment
Other actors: Finnish Transport Infrastructure Agency / Finnish Transport and Communications Agency (Traficom)

Appendices

Appendix 1: Hydrogen economy – Opportunities and limitations

<https://julkaisut.valtioneuvosto.fi/handle/10024/163901>

Appendix 2: The Role of the State in Hydrogen Economy: final report

<https://julkaisut.valtioneuvosto.fi/handle/10024/164255>

Appendix 3: Government report on the national climate and energy strategy,
carbon-neutral Finland 2035 – national climate and energy strategy

<https://valtioneuvosto.fi/paatokset/paatokset?decisionId=0900908f807c35c1>

SNELLMANINKATU 1, HELSINKI
PO BOX 23, 00023 GOVERNMENT, FINLAND
valtioneuvosto.fi/en/
julkaisut.valtioneuvosto.fi

ISBN: 978-952-383-986-1 PDF

ISSN: 2490-0966 PDF