ESTONIA

Opportunities for **Hydrogen Energy Technologies** Considering the National Energy & Climate Plans

FCH
FUEL CELLS AND HYDROGEN JOINT UNDERTAKING

Contract details
Fuel Cells and Hydrogen 2 Joint Undertaking (FCH 2 JU)
Study on Opportunities arising from the inclusion of Hydrogen
Energy Technologies in the National Energy & Climate Plans
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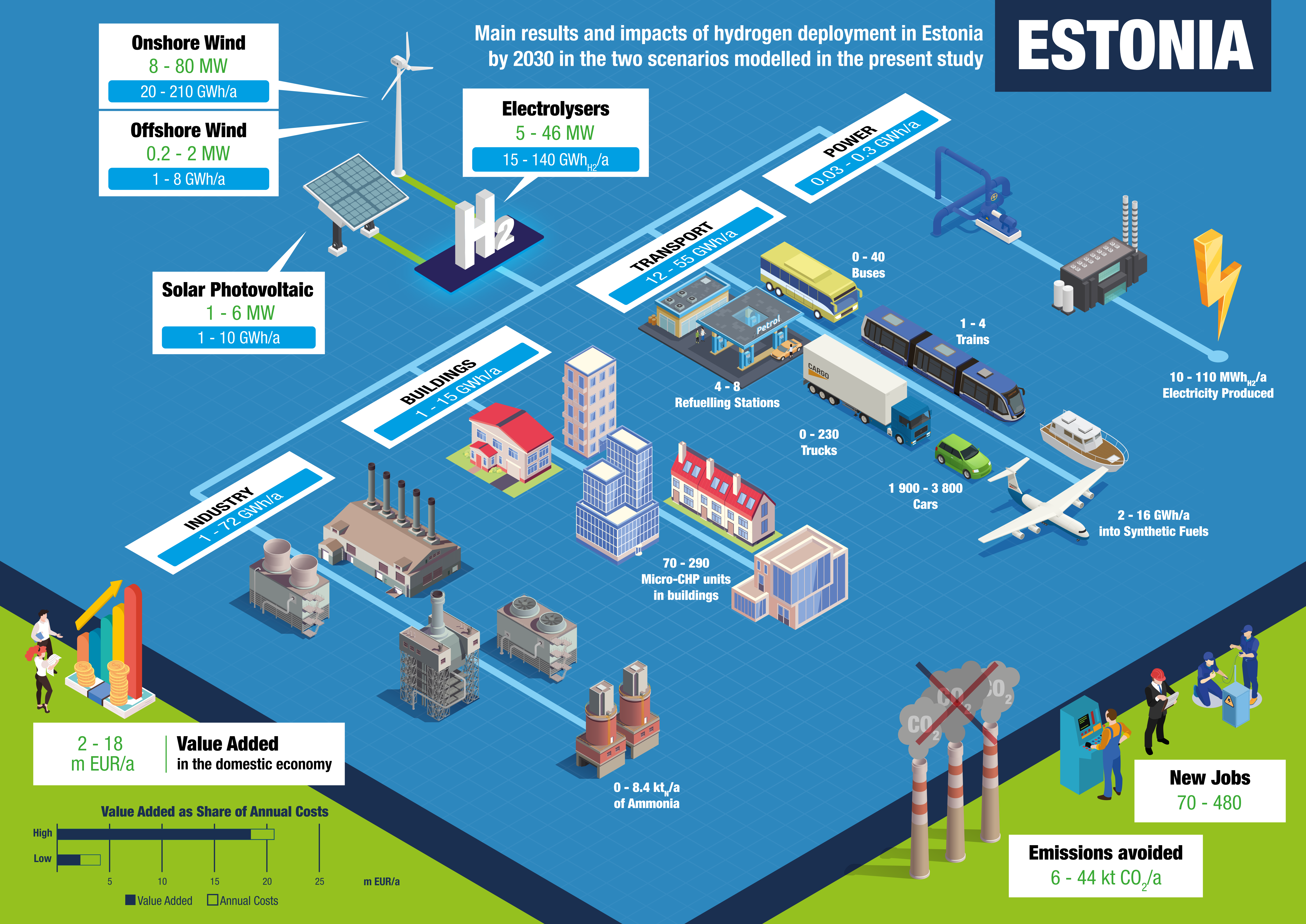
Introduction

The **Fuel Cells and Hydrogen Joint Undertaking** (FCH JU), in close cooperation with the **European Commission - DG Energy**, has commissioned a study on the "Role of Hydrogen in the National Energy and Climate Plans". This study is being conducted by the consultancies **Trinomics and LBST**.

This fiche represents one of the outputs of the study; it comprises two major parts:
- Analysis of **national opportunities for hydrogen deployment**, based on the national hydrogen production and demand potential, the gas infrastructure and the enabling environment. In this context, the role of hydrogen in the current National Energy and Climate Plan is in particular analysed.
- Assessment of **national economic, environmental and technical impacts of hydrogen deployment** under a high and a low scenario.

This information is expected to provide useful information to EU Member States that are considering to include renewable or low-carbon hydrogen deployment in their decarbonisation policies or roadmaps.



ESTONIA
Main results and impacts of hydrogen deployment in Estonia by 2030 in the two scenarios modelled in the present study
Onshore Wind
8 - 80 MW
20 - 210 GWh/a
Offshore Wind
0.2 - 2 MW
1 - 8 GWh/a
Electrolysers
5 - 46 MW
15 - 140 GWh_{H2}/a
Solar Photovoltaic
1 - 6 MW
1 - 10 GWh/a
H_2
POWER
0.03 - 0.3 GWh/a
TRANSPORT
12 - 55 GWh/a
BUILDINGS
1 - 15 GWh/a
INDUSTRY
1 - 72 GWh/a
0 - 40
Buses
1 - 4
Trains
4 - 8
Refuelling Stations
Petrol
CARGO
0 - 230
Trucks
1 900 - 3 800
Cars
10 - 110 MWh_{H2}/a
Electricity Produced
2 - 16 GWh/a
into Synthetic Fuels
70 - 290
Micro-CHP units
in buildings
0 - 8.4 kt_N/a
of Ammonia
CO_2
2 - 18
m EUR/a
Value Added
in the domestic economy
Value Added as Share of Annual Costs
High
Low
5
10
15
20
25
m EUR/a
Value Added
Annual Costs
New Jobs
70 - 480
Emissions avoided
6 - 44 kt CO_2/a

EXECUTIVE SUMMARY

Estonia's commitment for hydrogen deployment according to its NECP

According to its NECP, Estonia has joined the Hydrogen initiative[1] at the meeting of the EU energy ministers in Austria in September 2018, considering that "the use of hydrogen in different economic sectors allows to move towards a low-carbon economy in the most efficient way".

According to the NECP, the Ministry of Environment has set up a "Hydrogen Work Group[2]" with the aim to analyse the deployment of hydrogen and fuel cells applications in the Estonian energy system to contribute to its "climate and energy targets. Estonia plans to address the transport, building, electricity generation and gas networks sectors, addressing the entire value chain from generation, over storage, transport and distribution to end use. Estonia's NECP emphasizes that the lack of regulation is a major obstacle to the development of clean hydrogen.

Estonia has established a hydrogen working group which intends to issue a Hydrogen Roadmap. The Estonia Hydrogen Association welcomed the first hydrogen powered vessel in Estonia[3] in June 2019. Estonia intends to be involved in the extension of the H2GO[4] IPCEI project.

Estonia was not involved in the HyLaw project, and could possibly carry out a similar assessment to identify and address its national specific barriers to the deployment of hydrogen.

Estonia's NECP does not include specific objectives or targets for the production or use of hydrogen.

The scenario assessment shows substantial potential benefits of hydrogen deployment in Estonia by 2030

Hydrogen demand

Two (high and low) scenarios of hydrogen demand in 2020-2030 were developed, based on different levels of ambition linked to the national context. The resulting values are summarised in the scheme in the previous page. For Estonia, a limited development of hydrogen demand is assumed in the considered scenarios in **transport**, in particular for passenger cars, and trains, and also in aviation (through hydrogen-based liquid fuels or PtL) and navigation[5]. A partial development of hydrogen demand is also assumed in the scenarios in **industry** (although only in the High scenario), concretely in the ammonia and aromatics production. Switching high temperature heat processes fuels to renewable hydrogen could represent another important potential use in the considered scenarios.

In the **building** sector, hydrogen can replace part of the current use of natural gas and can be distributed via existing gas grids through admixture to natural gas. The building sector is expected to have in the Low scenario a limited demand by 2030 but would constitute a majority of demand for green hydrogen in the High scenario.

The scenarios assume only a marginal share of electricity generation from hydrogen by 2030, coming from combined heat and power installations.

Hydrogen production

To cover the estimated hydrogen demand from new uses and from substitution of fossil-based hydrogen, 10 to 90 MW of dedicated renewable electricity capacity would have to be installed to produce green hydrogen via electrolysis. While "surplus" electricity might be available in times of high renewable electricity production, the main share will have to be covered by dedicated sources. In the two scenarios, part of the 2030 hydrogen demand would still be covered by fossil-based hydrogen produced via steam-methane reforming of fossil fuels.

In its NECP, Estonia estimates the production of around 5.3 TWh of renewable electricity in 2030. The technical potential for renewable electricity production in Estonia seems however significantly higher[6]. Building additional renewable electricity capacity dedicated for hydrogen production thus could be a feasible scenario.

Estimated socio-economic and environmental impacts

The annual costs to produce green hydrogen (including the cost of dedicated renewable electricity sources), to develop the transport infrastructure (or adapt the existing one) and end-user applications would in the considered scenarios reach respectively 4 and 20 million EUR. These activities will generate value added in the domestic economy, amongst others by creating jobs in manufacturing, construction and operation of hydrogen technologies and will contribute to greenhouse gas emission reductions. This is in particular important in hard-to-decarbonize industries. According to the European EUCO3232.5 scenario[7], the Estonian GHG emissions should be reduced by 5 Mt CO_2 in 2030, compared to 2015. In the scenarios considered, the deployment of hydrogen could contribute 6 – 44 kt CO_2 to this goal, which is equivalent to 0.1% - 1% of the required emission reduction.

[1] The Hydrogen Initiative http://h2est.ee/wp-content/uploads/2018/09/The-Hydrogen-Initiative.pdf
[2] http://h2est.ee/eng/estonias-task-force-for-the-adoption-of-hydrogen-technologies/
[3] http://h2est.ee/eng/the-first-hydrogen-vessel-in-estonia/
[4] https://www.hydrogen4climateaction.eu/projects
[5] Detailed assumptions are available in the methodology annex of the report, that can be consulted via the following link : http://trinomics.eu/project/opportunities-for-hydrogen-in-necps.
[6] The technical potential for renewable electricity production is based on the study commissioned by DG ENER Impact of the use of the biomethane and hydrogen potential on trans-European infrastructure (Trinomics, LBST, E3M; 2019).
[7] EC, 2019. Technical Note on Results of the EUCO3232.5 scenario on Member States. Available at https://ec.europa.eu/energy/sites/ener/files/technical_note_on_the_euco3232_final_14062019.pdf

HYDROGEN IN THE NECP OF ESTONIA

According to its NECP, Estonia has joined the Hydrogen initiative[8] at the meeting of the EU energy ministers in Austria, in September 2018, considering "the use of hydrogen in different economic sectors allows to move towards a low-carbon economy in the most efficient way".

In order to analyse the possibilities to introduce low-carbon technologies, the Ministry of Environment has set up a "Hydrogen Work Group[9]" with the aim to assess the deployment of hydrogen and fuel cells applications in the Estonian energy system, especially in the transport sector.

To diversify its energy sources, Estonia considers increasing the use of artificial/synthetic energy carriers and fuels, especially liquid hydrogen produced with renewable electricity rather than with fossil fuel.

In addition to other energy storage technologies, hydrogen production and storage is expected to provide flexibility to the energy system by shaving peak loads in a 2040 perspective.

Estonia recognizes that today hydrogen is globally mainly produced from natural gas and coal and used for refining petroleum and producing fertilisers. A global shif to clean hydrogen necessitates capturing and storing fossil carbon originated from steam reforming methane production and the uptake of renewable hydrogen. Based on international studies (IEA), the price of hydrogen could decrease by 30% by the year 2030. Hydrogen might become one of the main options for storing renewable energy, in particular over long periods. Hydrogen can be transported from regions with favourable conditions for renewable electricity generation to energy-intensive cities and industrial areas over long distances. The shift to clean energy also necessitates the use of hydrogen in transport, buildings and power sectors. A major obstacle for the development of a renewable hydrogen industry is the lack of regulation. The industrial ports could be priority development centres for the supply of renewable hydrogen to ships, vessels and other vehicles.

Cooperation opportunities with the Nordic countries and the other Baltic States[10] are also considered and would focus on the development of emerging technologies and applications like energy storage, CCUS or hydrogen.

[8] *The Hydrogen Initiative http://h2est.ee/wp-content/uploads/2018/09/The-Hydrogen-Initiative.pdf*
[9] *http://h2est.ee/eng/estonias-task-force-for-the-adoption-of-hydrogen-technologies/*
[10] *Baltpool https://www.baltpool.eu/lv/*

OPPORTUNITY ASSESSMENT

Hydrogen production potential & its role in energy system flexibility

The technical potential of variable renewable energy sources in Estonia is very high compared to its forecasted electricity demand in 2030, there is hence a strong opportunity to use this abundant resource to produce renewable electricity-based hydrogen via electrolysers. According to the NECP, Estonia would by 2030 only use 3% of its technical potential in variable renewable electricity generation, so there is a great margin for building up additional capacities.

The indicators also show a moderate opportunity to use renewable hydrogen production and storage as a flexibility provider to the electricity system. Estonia has however a large cross-border electricity interconnection capacity, which is expected to be more than twice as high as the average load in the country. The opportunity for using renewable hydrogen production and storage as a flexibility provider is therefore dependent on a higher rate of variable renewable electricity development, than is currently expected.

	Technical variable renewable electricity potential (TWh/yr)	Technical renewable electricity generation potential compared to forecasted gross electricity consumption in 2030 (NECP)	NECP estimate of variable renewable electricity production in 2030 (TWh/yr)	NECP estimate of variable renewable electricity production in 2030 compared to its technical potential	Ratio between variable power generation capacity in 2030 and average load (based on EUCO)	Readiness for CO_2 storage
Estonia	192	1326%	5.31	3%	75%	Very Low

Estonia has limited readiness for wide-scale deployment of CCS, in particular due to lack of suitable geological CO_2 storage sites.

Energy infrastructure

Estonia has not yet considered to assess the possibility to inject (limited) hydrogen volumes into its existing methane transport and distribution network and/or to convert (part of) its grid infrastructure from methane to hydrogen in the longer term. However, considering the limited coverage and limited intensity of use of the gas grid, it should not be addressed as a priority.

	Technical and economic feasibility of converting gas distribution networks to hydrogen (share of polyethylene pipelines in distribution grid)	Natural gas demand in residential and services sectors / length of gas distribution network (GWh/km)	Existing salt cavern natural gas storage sites (TWh)	Suitable geological formations (potential for future hydrogen storage)
Estonia	Not available	0.7	0	NO
EU	MS range 16%-99%			

To date, there are no salt cavern natural gas storage sites in Estonia that could be used for hydrogen, nor underground salt layers that could provide suitable storage opportunities for hydrogen.

Current and potential gas & hydrogen demand

In Estonia there seems to be a large opportunity for the use of hydrogen and derived fuels in the effort to decarbonise the transport sector, which is still heavily dependent on fossil fuels. Especially in rail and road transport, there seems to be substantial room for including hydrogen in decarbonisation strategies. Next to the transport sector, hydrogen can also be deployed in industry to replace natural gas use and also as a low-carbon energy carrier for the provision of high-temperature process heat. Lastly, hydrogen can be employed in the country's built environment to decarbonise the remaining fossil fuel based share in the energy mix, especially for heating applications.

Opportunities for hydrogen demand in industry

The opportunities for replacing existing fossil-based hydrogen use in industry with decarbonised hydrogen seem to be limited, as there are no major industries that already use hydrogen in Estonia. However, hydrogen could still play a role in the decarbonisation of Estonia's industry. Natural gas accounts for around one fifth of the industrial energy demand in Estonia, and hydrogen is one of the logical low-carbon alternatives as it can rely on the existing methane infrastructure. Furthermore, a quarter of the energy consumed in Estonian industry is used to generate high-temperature process heat. Together with biomass, hydrogen is one of the solutions that can be used to reduce GHG emissions from this part of the industrial energy consumption.

	Presence of ammonia industry / share of ammonia production capacity in EU28 total	Presence of refineries / Share of Estonian refineries in total captive hydrogen production by refineries in the EU28	Share of Estonia in total primary steel production in the EU28	Share of natural gas in industrial energy demand (2017)	Share of high-temperature (>200°C) process heat in industrial energy demand (2015)
Estonia	0%	0%	0%	22%	25%
EU	MS range 0%-16%	MS range 0%-26%	MS range 0%-30%	Average 32% MS range 0%-43%	Average 38% MS range 9%-60%

Opportunities for hydrogen demand for heating and cooling in the built environment

The heating demand in Estonia's built environment is mostly satisfied through the use of biomass, district heating and electricity. Less than 10% of the energy use in Estonia's households and services comes from the direct use of fossil fuels, where natural gas accounts for the lion's share. Hydrogen is one of the options that can be used to replace this remaining natural gas use in the Estonian built environment, thereby contributing to the full decarbonisation of this sector.

	Share of natural gas in the household and service sector energy demand (2017)	Share of heating in the household and service sector energy demand (2015)	Share of cooling in the household and service sector energy demand (2015)
Estonia	9%	73%	1%
EU	Average: 34% MS range: 0% - 60%	Average: 74% MS range: 41% - 82%	Average: 3% MS range: 0% - 46%

Opportunities for hydrogen demand in transport

Transport seems to be the sector with the largest opportunities for the deployment of hydrogen in Estonia, certainly on the short term. The two subsectors that stand out are rail and road transport. Estonia's rail sector is strongly reliant on fossil fuels, accounting for 95% of the sector's energy use, which is far above the EU average of 30%. Together with electrification, the deployment of hydrogen trains is one of the ways in which this sector can be decarbonised. Besides the rail sector, the road transport sector in Estonia is almost completely dependent on fossil fuels. Deployment of a combination of electric vehicles and fuel cell vehicles could help Estonia to reduce the GHG emissions from this carbon-intensive sector. Lastly, the energy use relating to bunkering activities for international shipping is quite significant in Estonia. Although international shipping is currently not yet covered by international climate policies, decarbonisation of this sector is important for reaching international climate objectives. Deployment of hydrogen and derived fuels represents one of the promising ways to reduce GHG emissions in this sector and the same holds for the aviation sector.

	Share of heavy transport (trucks, buses & vans) in total energy demand in road transport in 2020	Share of fossil fuels in energy use of rail transport (and absolute consumption) in 2017	Share of inland shipping in overall energy demand for transport in 2017	Energy use by international shipping relative to total (domestic) final energy use in transport in 2017	Share of domestic and international aviation in overall energy demand for transport (incl. energy use int. aviation) in 2017	Share of fossil fuels in energy use of road transport in 2017
Estonia	31% (2 500 GWh)	93% (183 GWh)	0.8% (77 GWh)	38.2% (3 570 GWh)	5% (771 GWh)	100% (9 005 GWh)
EU	Average 32% MS range 18%-48%	Average 30% MS range 0%-95%	Average 2% MS range 0%-9.8%	Average 14% MS range 0%-1011%	Average 14% MS range 1%-25%	Average 95% MS range 79%-100%

Enabling environment: national hydrogen policies and plans, projects and industry

The assessed indicators show that Estonia is starting to prepare an institutional framework for the deployment and use of hydrogen with the setting up of the "Hydrogen Work Group", which intends to establish a Hydrogen Roadmap. Estonia could address the deployment of hydrogen in view of valuing its large potential of variable renewable electricity. Estonia should continue its coordination's efforts with the neighbouring countries to properly integrate hydrogen into the electricity and gas systems, and to share experience and practices with the other Baltic countries. Estonia could participate in dedicated hydrogen related research and facilitate the implementation of pilot and demonstration projects in the area of sector coupling based on hydrogen technologies.

Existence of (or concrete plans for) national hydrogen roadmaps or strategies — Positive environment: ✖

The Ministry of Environment has set up a "Hydrogen Working Group"[11] with the aim to analyse the deployment of hydrogen and fuel cells applications in the Estonian energy system, especially in the transport sector.
The first task of the Group is to issue a Hydrogen Roadmap for Estonia. The next steps will address more specifically policy and technical measures.

[11] http://h2est.ee/eng/estonias-task-force-for-the-adoption-of-hydrogen-technologies/

GHG mitigation gap in non-ETS sectors (need for additional GHG reduction measures) — Positive environment

Estonia's 2030 target for greenhouse gas emissions in sectors not covered by the EU Emissions Trading System (non-ETS) is -13 % compared to 2005 as set in the Effort Sharing Regulation (ESR). The NECP seems to indicate that the planned additional measures may be sufficient to reach this target. Replacement of fossil fuels by renewable hydrogen in the building and transport sectors could contribute to ensure that the target is effectively reached.

Existence of (active) hydrogen national association — Positive environment: ✖

Current and planned hydrogen refuelling infrastructure for the transport sector

Alternative fuels infrastructure directive (2014/94/EU)

The Estonian National Policy Framework (or NPF set in the context of the alternative fuel infrastructure directive (2014/94/EU)) does not contain specific targets for alternative fuel vehicles. Estonia is focusing on increasing the share of alternative fuels use in road transport and aims to increase the use of renewable energy sources in road transport to 10% of the energy consumed by 2025 via liquid biofuels, bio-methane and electricity. While a first pilot project for hydrogen is mentioned, hydrogen could be considered in the next plans for alternative fuels as an additional measure to contribute to full decarbonisation of road transport.

	Inclusion of hydrogen in national plans for the deployment of alternative fuels infrastructure (2014/94/EU)	Existence of hydrogen refuelling stations (2019)	which is equivalent to 1 refuelling station per … cars
Estonia	YES	0	Not applicable
EU		Total 156	Average 1 677 543

Existence of (investment on) hydrogen-related projects

Estonia has R&D expenditures for hydrogen (e.g. 900 k EUR in 2015), though only one pilot project in the transport sector and one power-to-gas project (under construction) have been identified.

	Existing R&D and pilot projects directly related to hydrogen	RD&D annual expenditure on hydrogen & fuel cells (m EUR) (average 2013-2017)	Activities and projects in industry to use hydrogen as feedstock	Number of power-to-gas projects (existing and planned)
Estonia	YES	0.8	NO	1

Existence of national tax incentives (CO_2 pricing mechanisms & car taxation)	Positive environment
Estonia has set up a CO_2 pricing mechanism, which is key to allow progressively the use of low carbon vehicles (including hydrogen)	✓

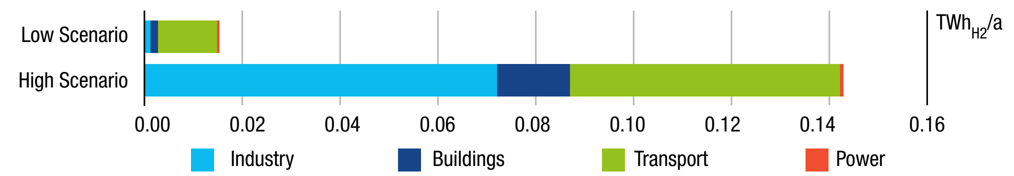
Fossil energy import bill

Like many EU Member States, Estonia is strongly dependent on imports for its natural gas as well as its oil consumption. Switching from imported fossil fuels to nationally produced hydrogen for industrial processes and heating applications and promoting the use of hydrogen in the transport sector could contribute to reducing the energy import dependence and bill.

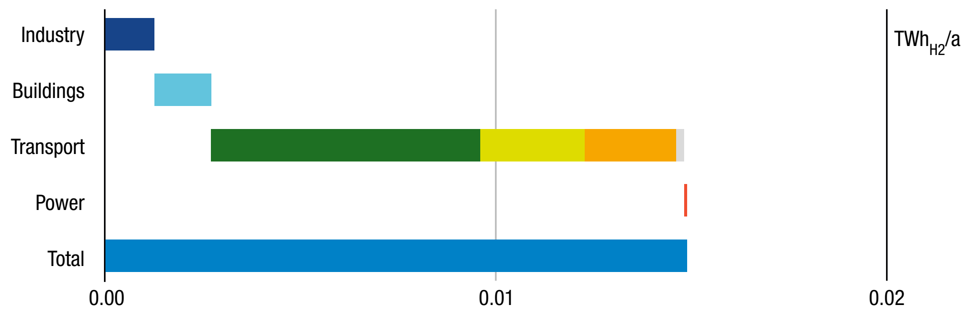
	Import bill for natural gas as share of national Gross Value Added	Import bill for all fossil fuels
Estonia	0.5%	1.1%
EU	Average: 0.6% MS range: 0% - 1.5%	Average: 2% MS range: 0% - 7%

SCENARIO ASSESSMENT
Estimated renewable/low carbon hydrogen demand for Estonia by 2030

Hydrogen demand in the year 2030 has been estimated in a low and a high scenario covering the range of uncertainty. Today, conventional hydrogen mainly used in industry is produced from fossil fuels (e.g. through steam methane reforming) or is a by-product from other chemical processes. Both scenarios assume that in 2030 renewable hydrogen will be provided to partially substitute current conventional production and to cover additional demand (e.g. from transport sector).

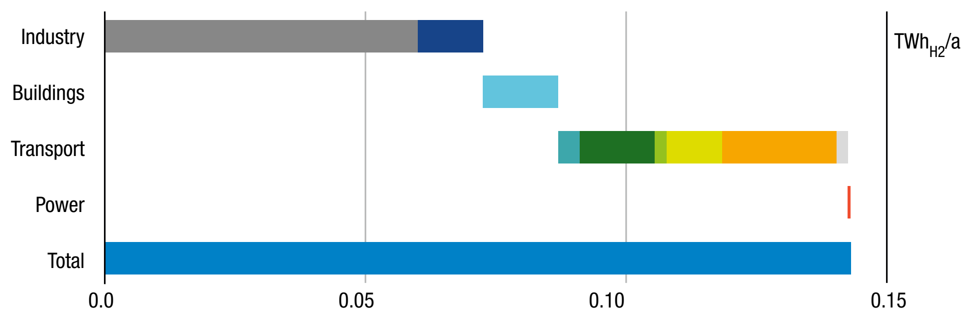


Low scenario

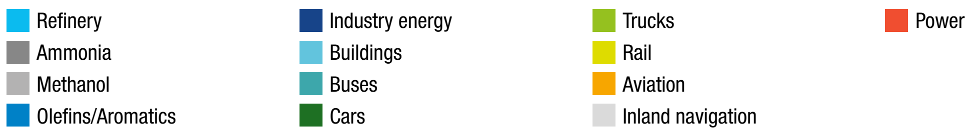


In the low scenario, renewable hydrogen accounts for 0.05% of final total energy demand (i.e. 0.02 out of 31 TWh/a) or 0.6% of final gas demand (2 TWh/a) according to EUCO3232.5.

High scenario



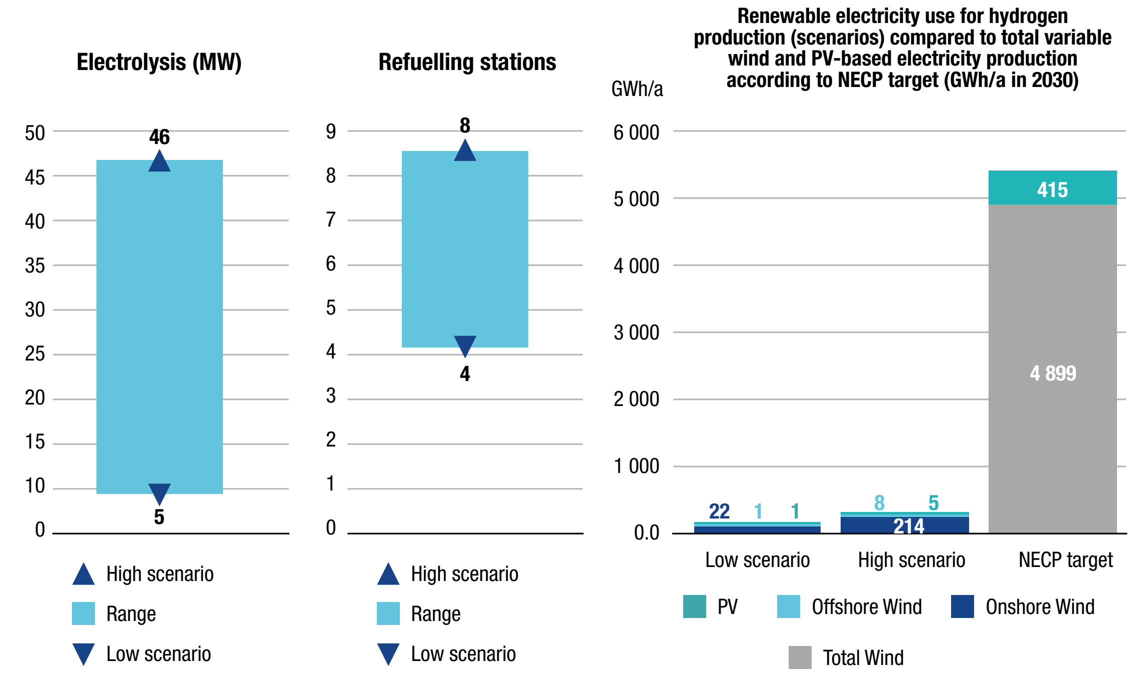
In the high scenario, renewable hydrogen accounts for 0.5% of final total energy demand (i.e. 0.1 out of 31 TWh/a) or 6.2% of final gas demand (2 TWh/a) according to EUCO3232.5.



Hydrogen generation, infrastructure and end users in Estonia by 2030

The analysis of renewable hydrogen generation, infrastructure and end use is based on the demand estimates presented above. Renewable hydrogen is generated from variable renewable power using electrolysis. The analysis covers only national hydrogen production to satisfy domestic demand and does not take into account any cross-border trade of hydrogen (i.e. hydrogen imports and exports are not included in this analysis).

Renewable hydrogen generation and infrastructure



The required renewable power production accounts for 0.03% of the overall technical renewable power potential in the low scenario and for 0.3% in the high scenario.

End users

End user	Unit	Low scenario	High scenario
Passenger cars	Nº	1 900	3 800
Buses	Nº	0	40
Lorries	Nº	0	200
Heavy duty vehicles	Nº	0	30
Trains	Nº	1	4
Substituted fuel in aviation	GWh/a	2	14
Substituted fuel in navigation	GWh/a	0.2	1.5
Micro CHP	Nº	70	290
Large CHP	Nº	0	0
Iron&Steel	% of prod.	0%	0%
Methanol	% of prod.	0%	0%
Ammonia	% of prod.	0%	5%

According to the estimations, the hydrogen refuelling station network will by 2030 encompass between 4-8 stations for 2 000-4 000 fuel cell vehicles on the road.[12]

Further use of renewable hydrogen is foreseen in ammonia production (up to 5%).

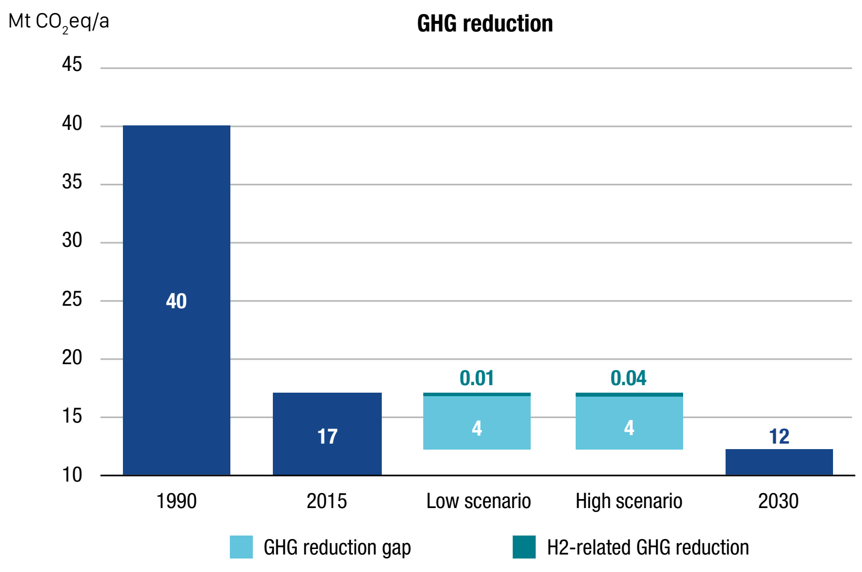
Finally, the introduction of 70-290 stationary fuel cells for combined power and heat production is estimated.

[12] *In order to ensure a minimum coverage of the country with hydrogen refuelling stations, more stations may be necessary for supplying hydrogen to the vehicle fleet.*

Environmental and financial impact in Estonia by 2030

Greenhouse gas (GHG) emission reductions were calculated by estimating the fuels replaced by hydrogen, and their respective greenhouse gas footprint. Comparing these to the 2030 GHG reduction targets results in the contribution of hydrogen to achieving these targets.

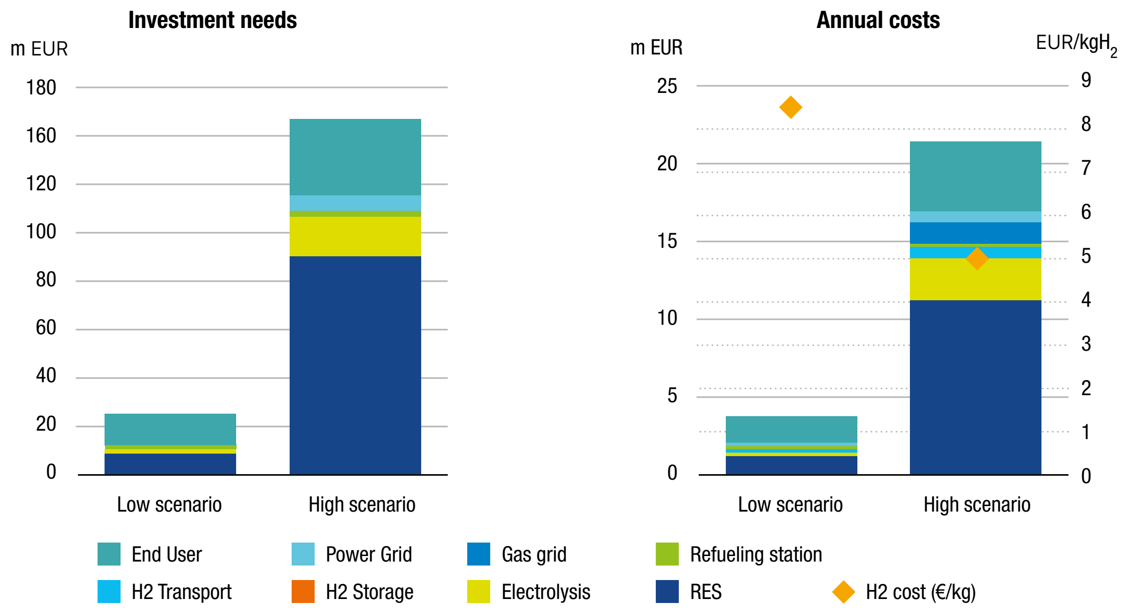
Environmental impact



An additional GHG emission reduction of 0.01-0.04 Mt CO_2 is estimated in 2030 corresponding to 0.1%-1.0% of the overall GHG emission reduction gap towards 2030 target (based on EUCO3232.5).

Financial impact

The financial scenario assessment includes investments (CAPEX) until 2030 and operating expenses (OPEX) per year in 2030. Cumulative investments in hydrogen technologies are estimated at 29-166 million EUR until 2030, while annual expenditure would amount to 4-21 million EUR (including end user appliances as well as power and gas grids).

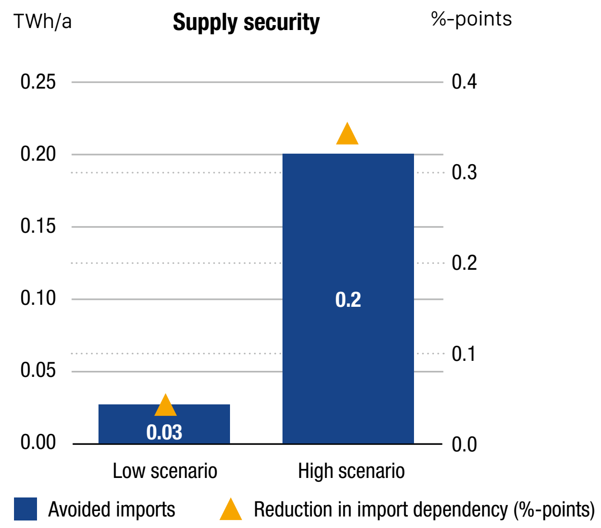


Impact on security of supply, jobs and economy in Estonia by 2030

Hydrogen contributes to the security of energy supply objective by reducing fossil energy import dependence and enhances energy supply diversification by facilitating deployment of renewable energy sources. This is assessed by estimating imported fossil fuels that will be replaced by hydrogen based on domestic renewable sources.

Security of energy supply

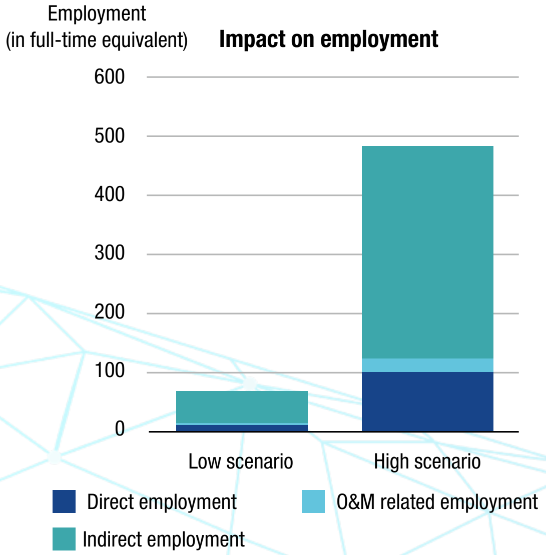
Deployment of renewable hydrogen would lead to 0.03-0.2 TWh/a of avoided imports, and thus reduce import dependency by 0.04-0.3% (in volume terms) in 2030, depending on the scenario.

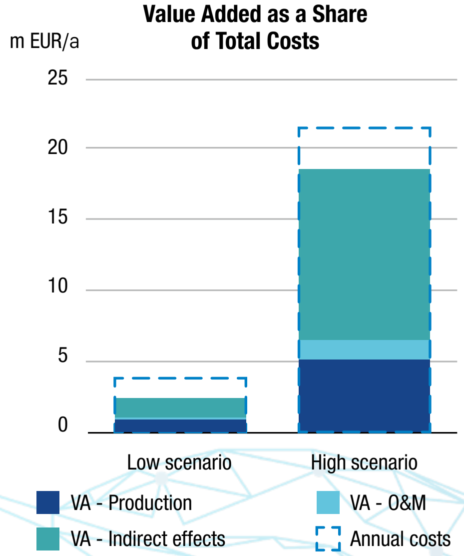


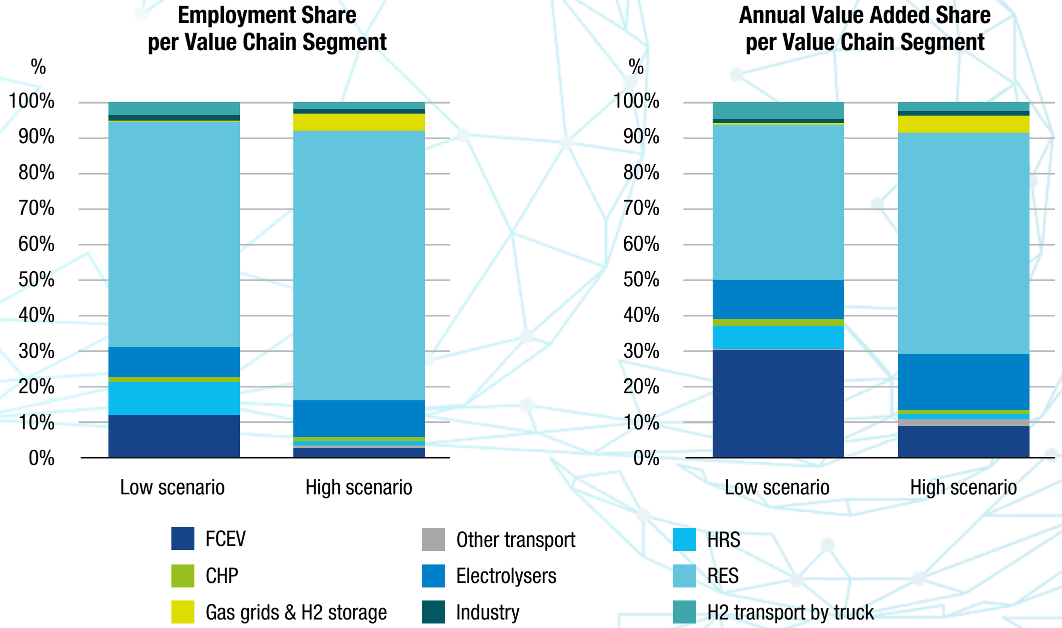
Impact on employment and value added

This analysis shows that in the years 2020-2030 around 1 million EUR can be retained annually in the domestic economy as value added in the low scenario, and almost 7 million EUR in the high scenario (value added is defined here as sum of wages for employees, margins for companies and taxes). If the indirect effects induced by the investment in and operation of hydrogen technologies are also taken into account, around 2 million EUR (low scenario) and almost 20 million EUR (high scenario) of value added can be created in the Estonian economy annually, which is almost equivalent to the amount of annual investment needed. Most of this value added is expected to be created by building dedicated renewable electricity sources and electrolysers for hydrogen production. In the low scenario, a more significant share of value added is expected to be created by investment in passenger fuel cell vehicles and refuelling stations.

The hydrogen-related expenditures in 2020-2030 are estimated to generate employment of 20 - 130 direct jobs (in production and operations & maintenance), and contribute to a further 50 – 360 indirectly related jobs, depending on the scenario. Most of these jobs are expected to be created by building and operating dedicated renewable electricity sources and electrolysers for hydrogen production and by investment in hydrogen refuelling stations.







ESTONIA

Opportunities arising from the inclusion of **Hydrogen Energy Technologies** in the National Energy & Climate Plans

FUEL CELLS AND HYDROGEN
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