Ministry of Climate and Environment

POLISH HYDROGEN STRATEGY UNTIL 2030 WITH AN OUTLOOK UNTIL 2040

SUMMARY

1. INTRODUCTION

Polish Hydrogen Strategy until 2030 with an outlook until 2040 (PHS) is a strategic document of the Polish Government that sets out the main objectives for the hydrogen economy development in Poland and the actions needed to achieve them.

Hydrogen offers solutions for the sectors of economy where emissions reduction through direct electrification are difficult to achieve.

HYDROGEN ECONOMY is collectively understood as: technologies of production, storage, distribution, and utilization of hydrogen and its derivatives in various sectors of economy.

Poland is currently in 3rd position among European hydrogen producers, just behind Germany and the Netherlands with an annual production of approx. 1.3 million tons, but only a marginal share of hydrogen comes from renewable sources.

The development of hydrogen economy requires the creation of the entire value chain, in particular the construction of new RES power generation capacity, installations for the production of hydrogen and its derivatives from low-carbon sources, processes and technologies for the needs of the energy sector, heating, transport and other sectors of the economy.

The vision and overarching goal of the PHS is creation of the Polish hydrogen industry and its development to achieve climate neutrality and maintain the competitiveness of the Polish economy.

In order to achieve this, it is necessary to prepare well-coordinated strategies at the national and European levels, taking into account the social dialogue, which will contribute to designing appropriate policies and relevant legal frameworks that will respond to market needs and Poland's international climate commitments.

Creating incentives to build supply and demand is crucial, including bridging the cost gap between conventional solutions and renewable and low-carbon hydrogen solutions, and by establishing appropriate state aid rules and providing funding for hydrogen technologies.

The origin of primary energy used for the manufacturing of hydrogen determines its competitiveness and life cycle emissions. The terminology applied in the strategy relates to the level of CO_2 emissions related to this process rather than to a specific production technology. PHS therefore distinguishes:

- *Conventional hydrogen –* produced by various processes that use fossil fuels without CO_2 emissions mitigation. These processes are primarily steam reforming of natural gas, coal gasification or separation from coke oven gas. It accounts for as much as 76% of the hydrogen produced in the world.
- *Low-carbon hydrogen –* produced from renewable or non-renewable energy sources with a carbon footprint of less than 5.8 kg CO_2 eq/kg H_2 according to the criteria set out in the Commission Delegated Regulation supplementing Regulation (EU) 2020/852 of the European Parliament and of the Council. Whenever this definition is being used, it entails also the renewable hydrogen.
- *Renewable hydrogen –* renewable hydrogen is produced by electrolysis of water in an electrolyser powered by electricity from renewable sources, by reforming of biogas or bio-

methane or by biochemical conversion of biomass, provided that the requirements of sustainable development are met. In its production, CO2 emissions are kept at less than 1 kg CO_2 eq/kg H_2. An additional advantage of this technology is the possibility to obtain very high purity of the manufactured gas (at a level of 99.999 %).

PHS is a part of the global, European and national efforts to achieve a low-carbon economy such as: 1992 UNFCCC Convention, 1997 Kyoto Protocol, Paris Agreement and European Green Deal.

The strategic long-term goal set for the European Union (EU) is to achieve climate neutrality by 2050 in line with the Paris Agreement. A hydrogen strategy for a climate-neutral Europe („EU Hydrogen Strategy"), published on July 8, 2020, is an important part of this efforts.

On the national policy landscape, PHS is in line with the objectives of the Strategy for Responsible Development until 2020 (with an outlook until 2030) (SRD), Polish Energy Policy until 2040 (PEP 2040) and the National Energy and Climate Plan (NECP) for 2021-2030. PHS builds on the Polish government's efforts to support hydrogen technologies initiated in National Policy Framework for the Development of Alternative Fuels Infrastructure.

2. OBJECTIVES OF THE STRATEGY

The objectives of the strategy refer to three priority areas of hydrogen use: energy, transport and industry, as well as its production, distribution and storage, and the need to create a stable regulatory environment.

The adopted priority areas relate to the concept of sector coupling, which implies an increase in the use of electricity from RES an its use by specific sectors in order minimize dependence on fossil fuels to greenhouse gas emissions and seize the full potential of the RES-based energy system.

OBJECTIVE 1: IMPLEMENTATION OF HYDROGEN TECHNOLOGIES IN THE POWER AND HEATING SECTOR

In the next 5 years the main objective for implementation of hydrogen in the Polish energy and heating sector is to support research and development in the field of co- and poly-generation systems for residential blocks, office buildings, small estates and public buildings using fuel cells and in the field of P2G and G2P systems. Further activities are planned in a span of 10 years, until 2030. In this perspective, the research work carried out earlier and the first implementations of the technology should enable the development of larger investments. It is estimated that implementation of hydrogen technologies in Poland in such a way will support effective cooperation of the gas system and electric power system operation in accordance with the concept of sector coupling and enable energy storage.

OBJECTIVE 2: USE OF HYDROGEN AS AN ALTERNATIVE FUEL FOR TRANSPORT

Hydrogen is seen as a mean to reduce emissions in transport, especially in urban transport (buses), road transport (heavy and long-haul transport), light fleet vehicles (forklifts, vans, cabs), non-electrified rail (where electrification is not an economic option), maritime and river transport, and in the longer perspective also in aviation, including unmanned vehicles (drones). Hydrogen will become an alternative for those branches of transport where electrification is unprofitable or impossible.

By 2025, 100 to 250 zero-emission buses powered by hydrogen are expected to be in operation, at least 32 hydrogen filling stations will be built, and hydrogen purification plants complying with the EU

purity standard will be constructed. At the same time, work will begin on the first vessels and the construction of hydrogen trains and locomotives with hydrogen propulsion systems. In the perspective of 2030 about 800-1000 hydrogen buses should be in operation, gradually replacing combustion vehicles. A network of refuelling stations will continue to develop and production of hydrogen-based fuels will set off (such as ammonia or methanol).

OBJECTIVE 3: SUPPORTING THE DECARBONIZATION OF INDUSTRY

The use of low-carbon hydrogen will significantly reduce greenhouse gas emissions from energy-intensive industries. Currently, hydrogen is used in Poland primarily as a feedstock in the chemical, petrochemical and refining industries, and it is from these sectors that the majority of demand for low-carbon hydrogen will come.

The industrial sector has the potential to become the largest user of low-carbon hydrogen due to the lack of alternative decarbonization options. Sub-sectors requiring very high temperatures (>200 °C), such as steel or chemicals, due to the specifics of their processes, present a significant challenge in the decarbonisation of industry due to the lack or limited potential for large-scale electrification of their processes with renewable energy. Hydrogen represents an opportunity to reduce emissions from chemical feedstocks and reactants i.e. ammonia, methanol, iron reduction and petrochemical products.

To develop industrial applications of hydrogen, public support will be provided to pilot technology projects for sectors where climate neutrality is difficult to achieve - in particular steel, refining and chemicals. By 2030, at least 5 hydrogen valleys, understood as centers of excellence for the implementation of the hydrogen economy, sector integration, industry climate transformation, and infrastructure construction, are planned.

OBJECTIVE 4: HYDROGEN PRODUCTION IN NEW INSTALLATIONS

Poland's strategic goal for hydrogen production by 2030 is to provide the conditions for launching hydrogen production facilities from low- and zero-emission sources. The Polish government intends to support only low-carbon hydrogen, i.e. from renewable sources and produced using zero-emission technologies. Obtaining support for the production of hydrogen from fossil fuels will be possible provided that technologies efficiently limiting CO_2 emissions are used (e.g. CCS/CCU).

The PHS, by making support conditional to the level of emissions associated with the production of hydrogen rather than specific technologies, adopts a technology-neutral approach.

In the next 5 years, the government will support research and development of low-emission processes and technologies for obtaining hydrogen, as well as launching such installations with a total power of min. 50 MW. In 2030 the aim is to achieve an installed production capacity of 2 GW from low- and zero-emission sources and processes.

OBJECTIVE 5: EFFICIENT AND SAFE HYDROGEN TRANSMISSION, DISTRIBUTION AND STORAGE

For the harmonious development of a hydrogen-based economy, it is necessary to deliver hydrogen efficiently from the production site to the end user and to store it safely.

In terms of transmission and distribution, it will be possible to transport hydrogen in existing natural gas networks if they are or will be adapted to transport hydrogen admixture.

In the initial years of market development, hydrogen will be primarily transported by road and rail (tankers, tank trucks). Over time, as customer demand for hydrogen increases, existing gas infrastructure or dedicated hydrogen pipelines will be used for transportation.

Amongst the potential big scale hydrogen storage facilities, salt caverns were considered to be the most optimal solution. Hydrogen storage in large aboveground tanks may become necessary if hydrogen technologies start to be implemented on a mass scale.

OBJECTIVE 6: CREATING A STABLE REGULATORY ENVIRONMENT

Creation of a stable regulatory environment is a priority for the Polish Government and administration. It is necessary to create regulations that will remove barriers to the development of the hydrogen market and encourage a gradual increase in the use of RES for electrolysis.

HORIZONTAL AND NON-LEGISLATIVE ACTIONS

In addition to the core 41. activities identified and supported by the PHS, activities of a horizontal nature can be added:

- Use of Polish R&D potential in the field of hydrogen technologies.
- Development of factories for electrolysers, fuel cells, hydrogen storage tanks, hydrogen-powered vehicles, and other components.

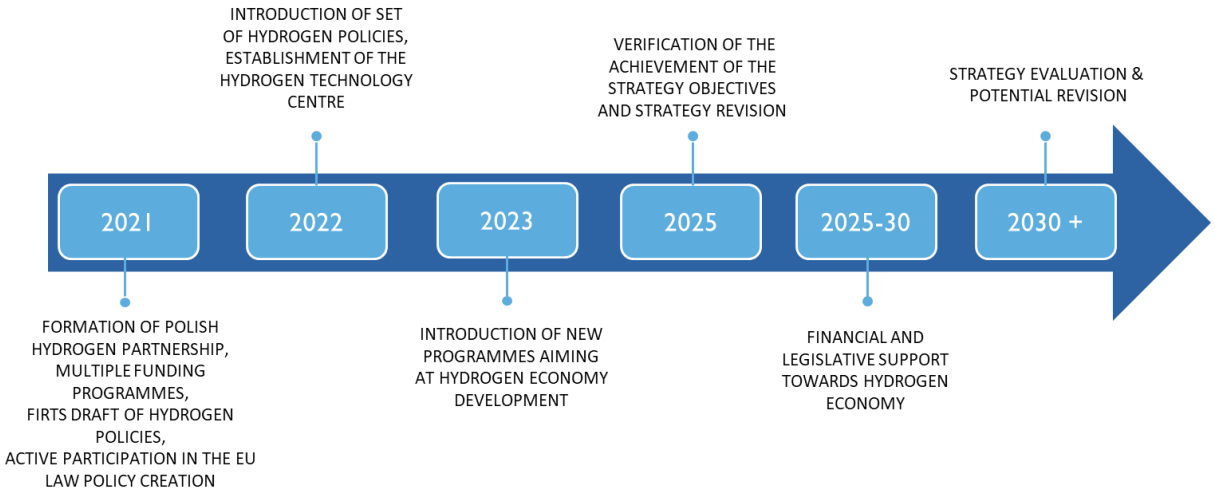
In pursuit of the goals set forth in the PHS, the Government of Poland plans to undertake a number of activities, such as:

- Concluding a Hydrogen Economy Sector Deal,
- Creating a Hydrogen Valley Ecosystem,
- Establishing of a Hydrogen Technology Centre,
- Building competencies for the hydrogen economy,
- Educational activities and public campaigns,
- European and international cooperation.

3. IMPLEMENTATION OF THE STRATEGY

The ten-year perspective of the PHS creates the need to develop a plan for its implementation, a system of monitoring and evaluation and to determine the guidelines for potential updates of the document.

Among the planned activities aimed at implementation of the PHS, one can distinguish those of legislative and non-legislative nature. Their proposed implementation in time looks as follows:



STRATEGY INDICATORS

Indicator name	Unit of Measurement	Base value (2020)	Target value (2030)
Installed capacity of the low-carbon hydrogen production facilities	MW	0	2000
Number of hydrogen valleys	pcs	0	5
Number of hydrogen buses in service	pcs	0	1000
Number of hydrogen stations	pcs	0	>32
Conclusion of the Hydrogen Economy Sector Deal	pcs	0	1
Creation of the Hydrogen Valley Ecosystem	pcs	0	1
Establishment of the Hydrogen Technology Centre	pcs	0	1