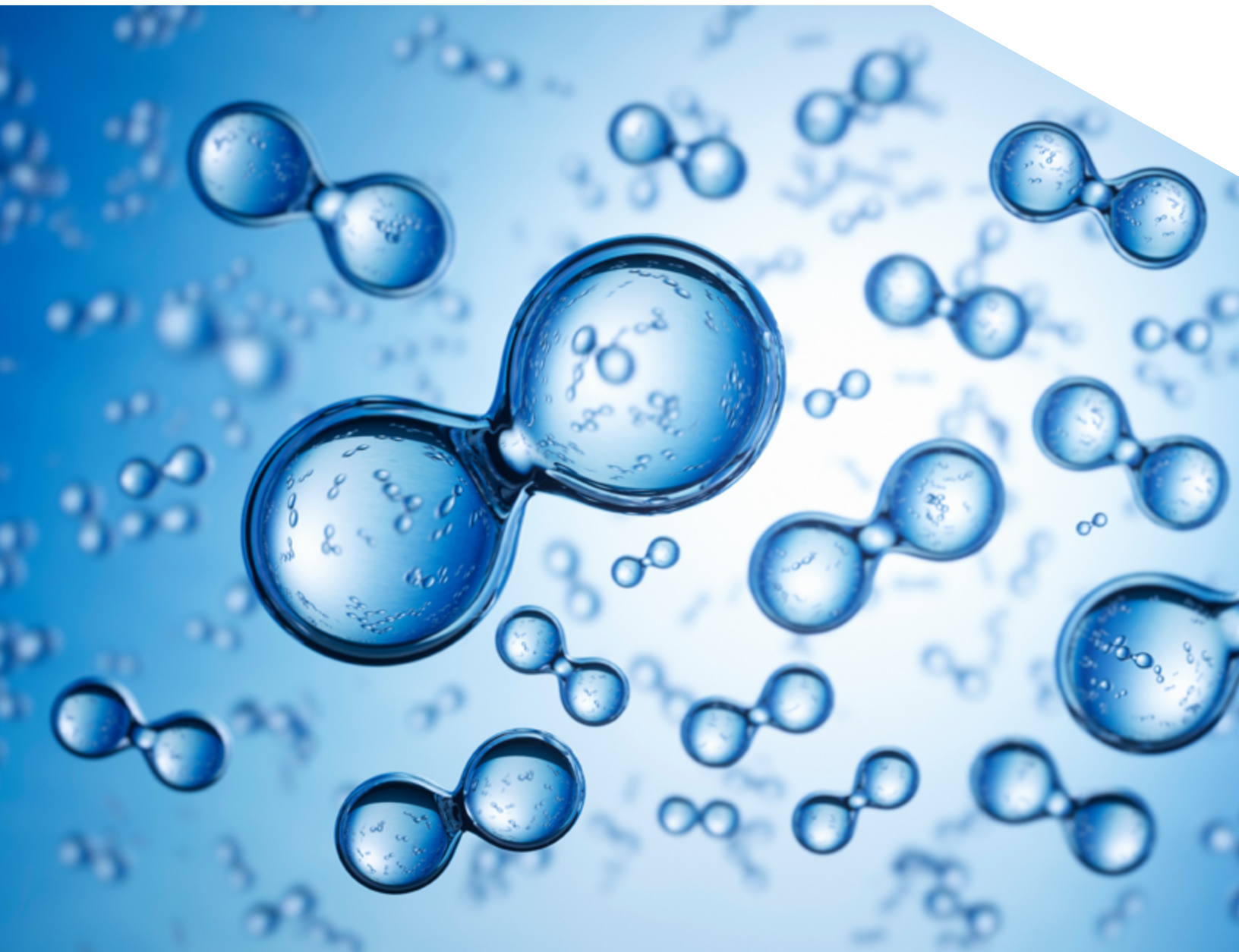


# Position on hydrogen



# Key messages

- Hydrogen is an important raw material and source of energy for the chemical industry, that, when used as a fuel, produces no direct carbon dioxide (CO<sub>2</sub>) emissions.
- LyondellBasell (LYB) is evaluating several sources through which we can secure low-carbon hydrogen in sufficient volumes that will allow us to substitute hydrogen for fossil fuels in our manufacturing facilities as a key lever towards achieving net zero greenhouse gas (GHG) emissions.
- Low-carbon hydrogen production will require large amounts of reliable renewable and low-carbon energy at competitive prices and the rapid creation of an efficient common carrier infrastructure to enable transfer.
- Government policies should support and promote accelerated development of this common carrier infrastructure through the creation of a stable investment framework and increased clarity around the permitting and approval process as well as stimulate the development of all types of low-carbon hydrogen.

## Introduction

LYB is committed to reducing greenhouse gas (GHG) emissions from our global operations and value chain and to delivering solutions that advance our customers' climate ambitions and support society's transition to a low carbon world. Our goals are to 1) achieve net zero scope 1 and 2 GHG emissions from our global operations by 2050; 2) reduce absolute scope 1 and 2 GHG emissions 42% by 2030 (relative to a 2020 baseline); 3) reduce absolute scope 3 GHG emissions 30% by 2030 (relative to a 2020 baseline); and 4) procure a minimum of 50% of electricity from renewable sources by 2030 (based on 2020 procured levels).

Globally, our combined scope 1 and 2 annual emission footprint is approximately 23 million metric tons, with approximately 75% of these emissions from North American operations and 25% from Europe. Scope 1 and 2 emissions from other regions of the world represent less than 1% of our total. Our pathway to reach net zero scope 1 and 2 GHG emissions in our global operations includes four critical levers:

- **Energy efficiency:** optimizing our use of energy in all our manufacturing processes to lower our energy footprint, reduce GHG emissions, and reduce operational costs.
- **Renewable electricity and electrification:** sourcing electricity from renewable electricity projects primarily through power purchase agreements and electrifying processes to reduce our reliance on fossil fuels.
- **Hydrogen:** increasing the use of hydrogen in our fuel mix used onsite for energy to replace other more carbon intensive fuels.
- **Carbon Capture and Storage / Utilization (CCS/CCU):** reducing direct emissions by enabling the capture and storage or reuse of CO<sub>2</sub> from our operations.

**This position document addresses key aspects of one of these levers, hydrogen.**

## Why does hydrogen matter to LYB?

1. Hydrogen is a critical raw material and energy carrier for the chemical industry and for LYB. When used as fuel, hydrogen produces no direct CO<sub>2</sub> emissions. However, most hydrogen is produced today using processes with high greenhouse gas emissions. We refer to hydrogen made from processes with low GHG emissions as “low-carbon hydrogen.” The chemical industry is developing projects that allow switching to low-carbon hydrogen and investing in new low-carbon hydrogen production technologies.
2. LYB is currently working to develop several sources through which we can secure hydrogen volumes to use as a substitute for fossil fuels or feedstocks in our manufacturing facilities. Different types of hydrogen we are considering include
  - Hydrogen as a natural by-product from the thermal cracking process.
  - Methane, another natural by-product from thermal cracking operations, can be reformed into hydrogen while capturing any carbon emissions from the reformation process for storage (CCS).
  - Methane from other sources, such as natural gas or biogas, can be reformed into hydrogen while capturing carbon emissions from the reformation process for storage (CCS).
  - Finally, hydrogen can be produced through the electrolysis of water with either renewable or low-carbon electricity.

## What do we need? LYB's position.

Producing enough low-carbon hydrogen to support a net zero chemical industry will require large amounts of renewable and low-carbon energy at competitive prices. The success of hydrogen is also linked to timely and adequate infrastructure for carbon capture and transportation. Government policies should support and promote the development of this infrastructure through the creation of a stable investment framework and increased clarity around the permitting and approval process.

Further, the infrastructure needs to be developed based on common hydrogen quality standards with purity levels that are based on the quality needs of end-users, including chemical companies that use hydrogen as raw material in chemical processes.

As LYB continues to evaluate investment into hydrogen, a competitive value proposition and assurance of the investment environment must be present. Existing industrial installations such as furnaces will need to be retrofitted or replaced with new ones, requiring large capital investment and increased operating costs.

To enable continued technological development and investment in hydrogen at scale, the following must be present:

- A stable and empowering policy environment in support of hydrogen production and consumption, including economic support for capital investments and operational expenditures. Such a policy framework should also incentivize demand for low-carbon products.
- Certainty around permitting procedures, including timely environmental permit reviews and approval processes.
- Public education around the benefits of low-carbon hydrogen, supported by campaigns initiated by governments and market participants.
- A technology-agnostic approach that enables the use of different hydrogen sources.
- Certification and classification based on environmental impact and CO<sub>2</sub> footprint with different hydrogen technologies having equal access to funding programs and incentive systems.
- A consistent global approach to certification and classification of hydrogen types to enable imports of hydrogen between different regions in the world, optimizing benefits of local circumstances for production.
- Sufficient infrastructure to transport hydrogen, electricity, and CO<sub>2</sub>. A separate hydrogen infrastructure must be developed in a timely manner by adaption of existing assets and/or expansion of pipelines, with a goal of achieving the lowest system costs to accelerate the development of hydrogen projects.

# About us

We are LyondellBasell (LYB) – a leader in the global chemical industry creating solutions for everyday sustainable living. Through advanced technology and focused investments, we are enabling a circular and low carbon economy. Across all we do, we aim to unlock value for our customers, investors and society. As one of the world's largest producers of polymers and a leader in polyolefin technologies, we develop, manufacture and market high-quality and innovative products for applications ranging from sustainable transportation and food safety to clean water and quality healthcare. For more information, please visit [www.lyb.com](http://www.lyb.com) or follow [@LyondellBasell](https://www.linkedin.com/company/lyondellbasell) on LinkedIn.