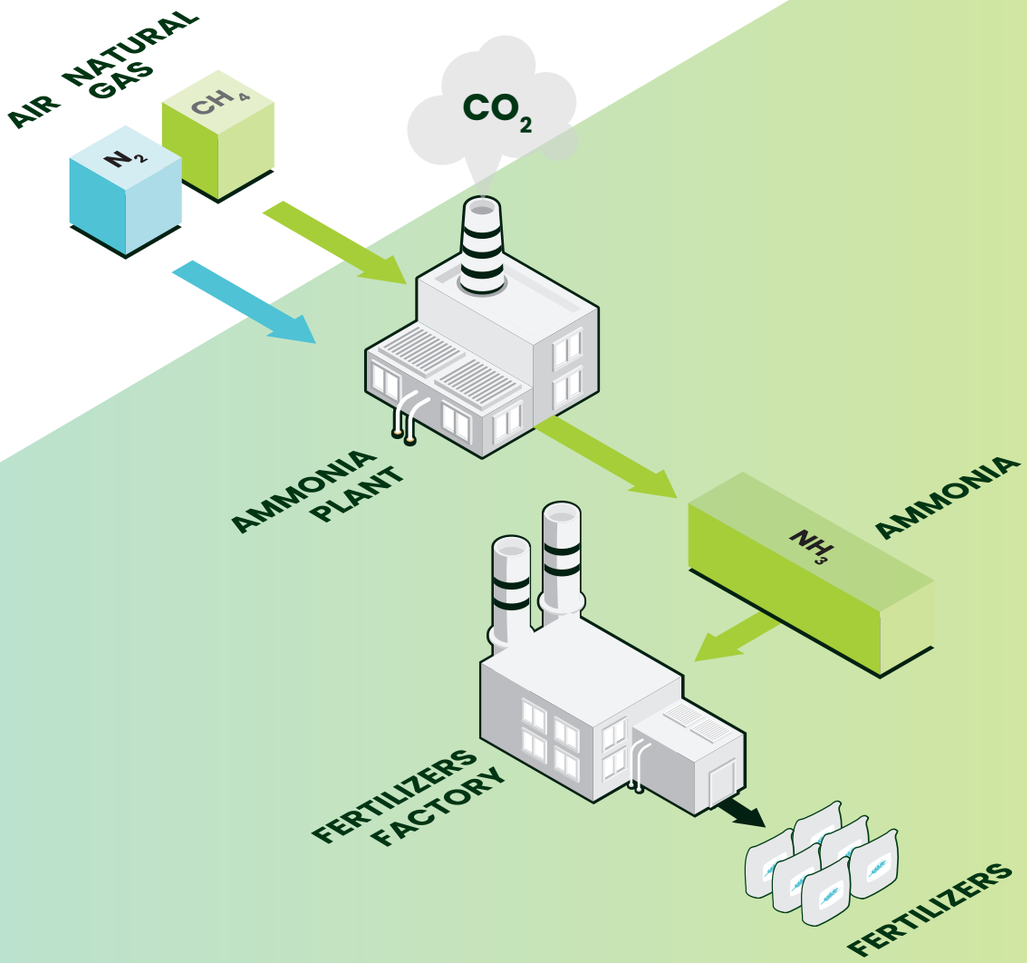
Paving the way **to green ammonia and low-carbon fertilizers**

Fertilizers Europe

Current Ammonia **and Fertilizer Production**

Today's production of nitrogen fertilizers is energy intensive. In Europe, ammonia production is mainly based on natural gas as a raw material and steam methane reforming (SMR) as the main technology. The first step involves splitting the natural gas molecules with the help of steam and high temperatures, to obtain hydrogen and CO_2. In a second step, this hydrogen is then combined with nitrogen from air to produce ammonia. Although it is the least carbon-intensive of the technologies available today, SMR nevertheless generates large quantities of CO_2.



Priorities to advance the transition

By 2050 - under the right conditions - **ammonia production could be based on decarbonised sources of energy**

A combination of policy solutions is needed to enable the transition to a climate-neutral economy by 2050 while keeping fertilizer industry competitive.

1. Low-carbon and competitively priced energy and feedstock
2. Infrastructure to transport low-carbon resources
3. Infrastructure for CO_2 management and avoidance
4. Funds to finance the transition

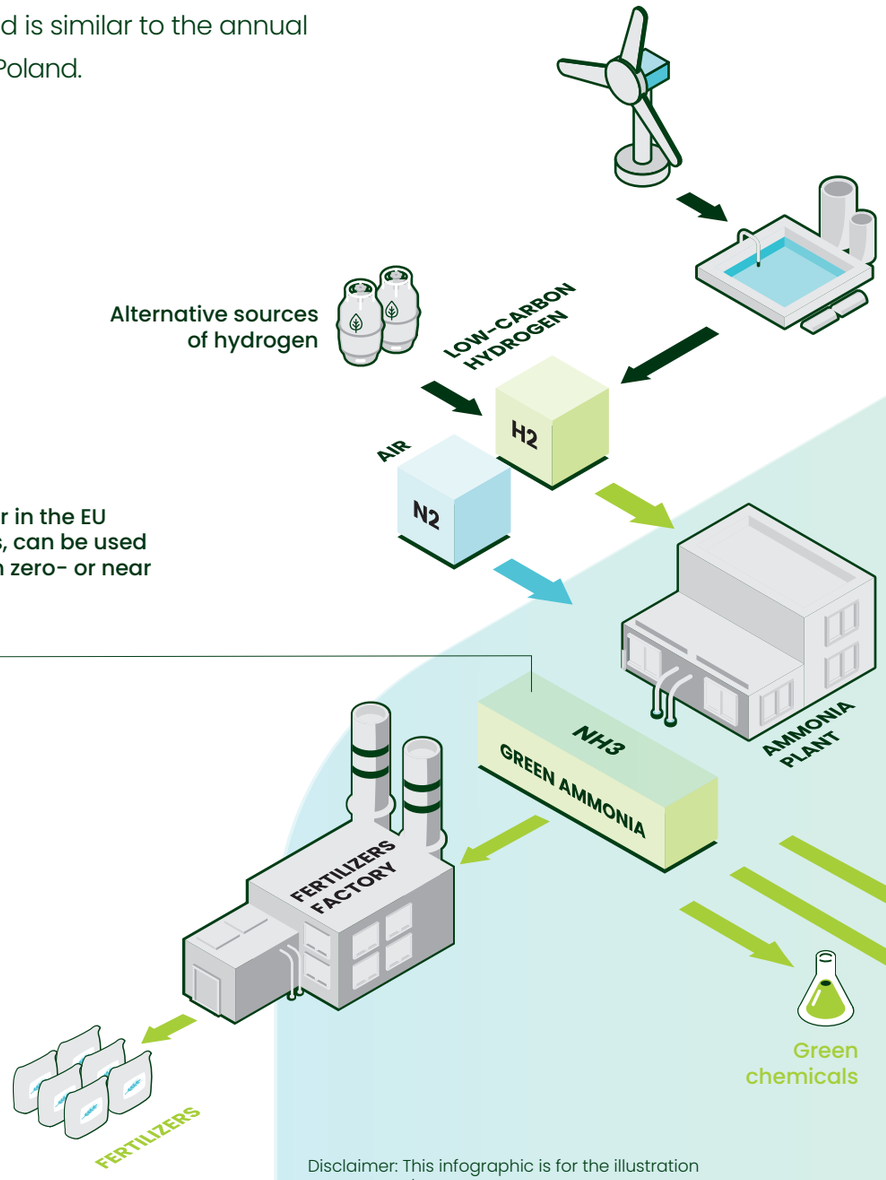
Beyond fertilizers - **creation of the market for green ammonia**

Potential markets

- **Agriculture** – low-carbon fertilizers
- Energy **storage**
- **Transport** /Shipping
- **Green** chemicals

2050 green ammonia and low-carbon fertilizer production

Low-carbon, abundant and competitively priced hydrogen is a pre-condition for green ammonia to become competitive versus current technology. If covered by renewable electricity, the demand is similar to the annual electricity demand of Poland.



Ammonia - a key factor in the EU decarbonisation efforts, can be used as a energy carrier with zero- or near zero carbon footprint

Electrolysis - technology allowing to replace natural gas with low-carbon hydrogen

Flexibility - green ammonia applicable for energy storage, transportation & clean chemicals

Disclaimer: This infographic is for the illustration purposes only

Advantages of ammonia compared to hydrogen

	Ammonia	Hydrogen
Detonation in air	None	High
Detection of leaks	Easy	Difficult
Ease of transportation	High	Low
Hydrogen's density	Higher	Lower

Ensuring level playing field

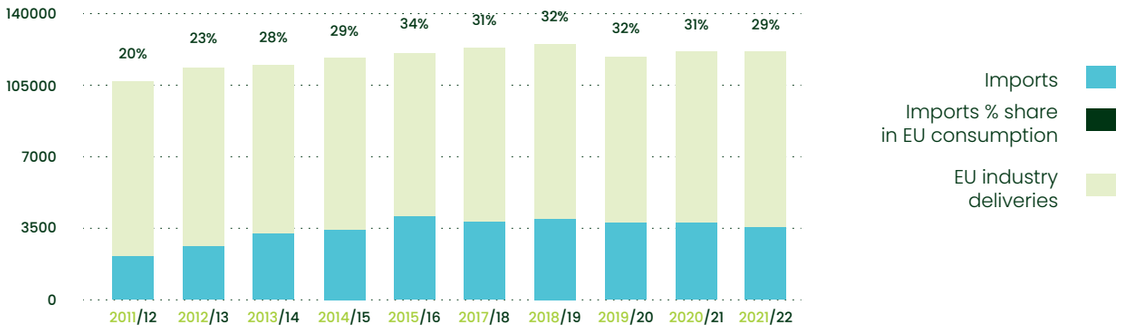
Carbon border adjustment mechanism

Fertilizers Europe calls for a level playing field between EU producers who are subject to EU ETS carbon costs and importers who are not.

The proposed model is based on continuation of the present principle of EU ETS including free allowances:

- The adjustment should be based on the difference between the product benchmark set in EU ETS and the carbon intensity of imported products, thus giving foreign exporters an incentive to improve their production.
- Planned carbon border adjustment mechanism needs to include equivalent measures to ensure competitiveness of EU-based exporters.

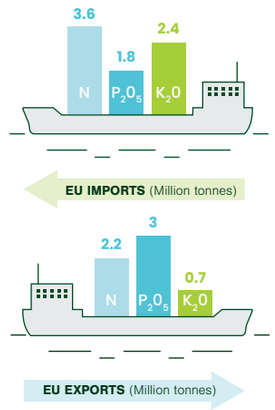
Imports % share in EU consumption of nitrogen fertilizers



Carbon leakage indicator

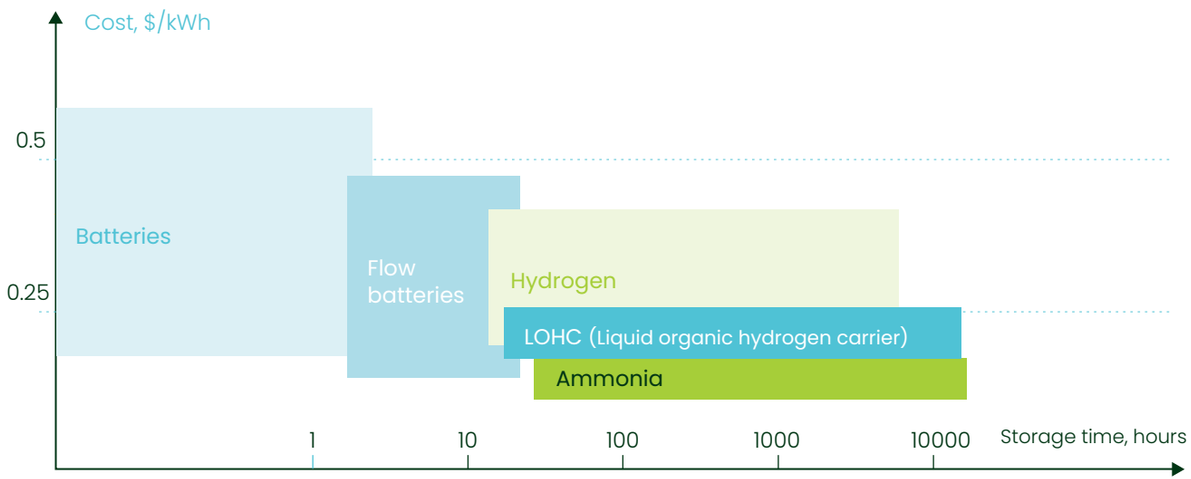
	Trade intensity	Emission intensity (kg CO_2/EUR)
Non-ferrous metals	4%	0.2
Organic basic chemicals	49%	2.2
Inorganic basic chemicals	54%	3.0
Paper	28%	3.0
Fertilizers	**32%**	**7.6**
Steel	26%	8.3
Refineries	26%	12.5
Cement	10%	24.2

European trade by nutrient 2020*



*Includes products for agricultural and industrial use

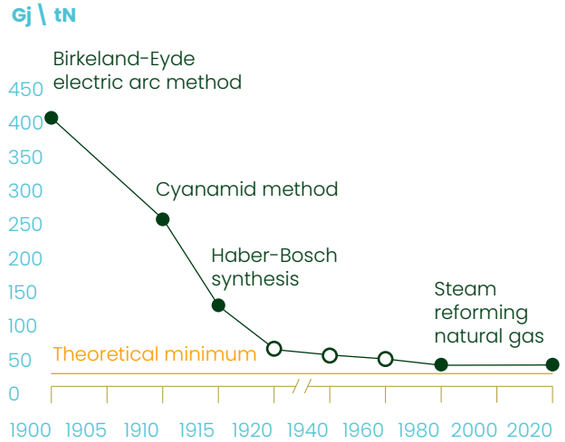
Ammonia as the most cost-effective energy carrier



Fertilizer industry's excellent record **in decreasing GHG emissions**

The European fertilizer industry has overall made tremendous improvements in the energy efficiency of ammonia production.

Fertilizer industry reaching technical limit in decreasing emissions



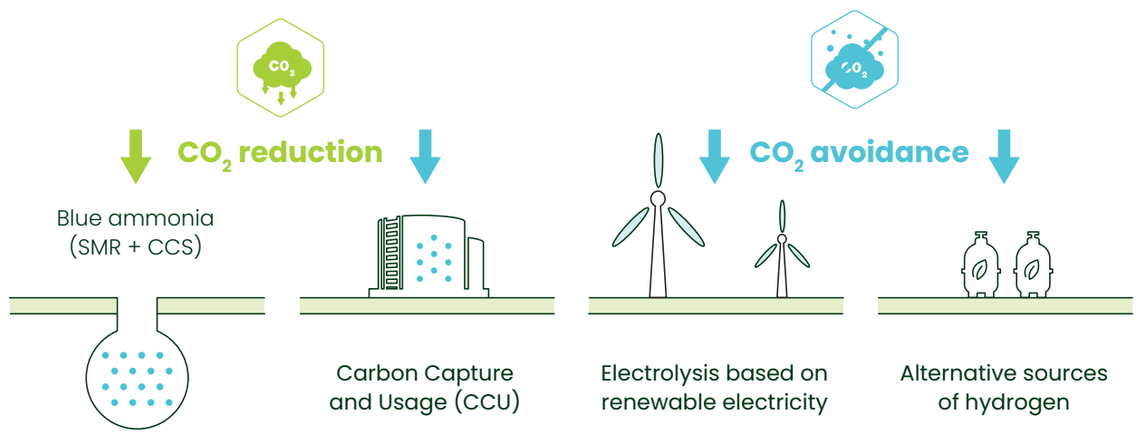
Source: Fertilizers Europe

The physico-chemical limitation of the present technology means that future investments are likely to improve efficiency only marginally. Newly build plants are generally very efficient, but on average, Europe's ammonia plants despite their average age are still the most energy efficient in the world and have the lowest CO_2 emissions.

As the only region in the world, European fertilizers producers have drastically reduced the emission of N_2O from its production.

Going beyond current production technology requires major developments in energy infrastructure, price competitiveness of green energy, scientific breakthroughs and markets for low carbon products.

Emerging low-carbon **technologies**



About **Fertilizers Europe**

16 Corporate members

8 National Associations

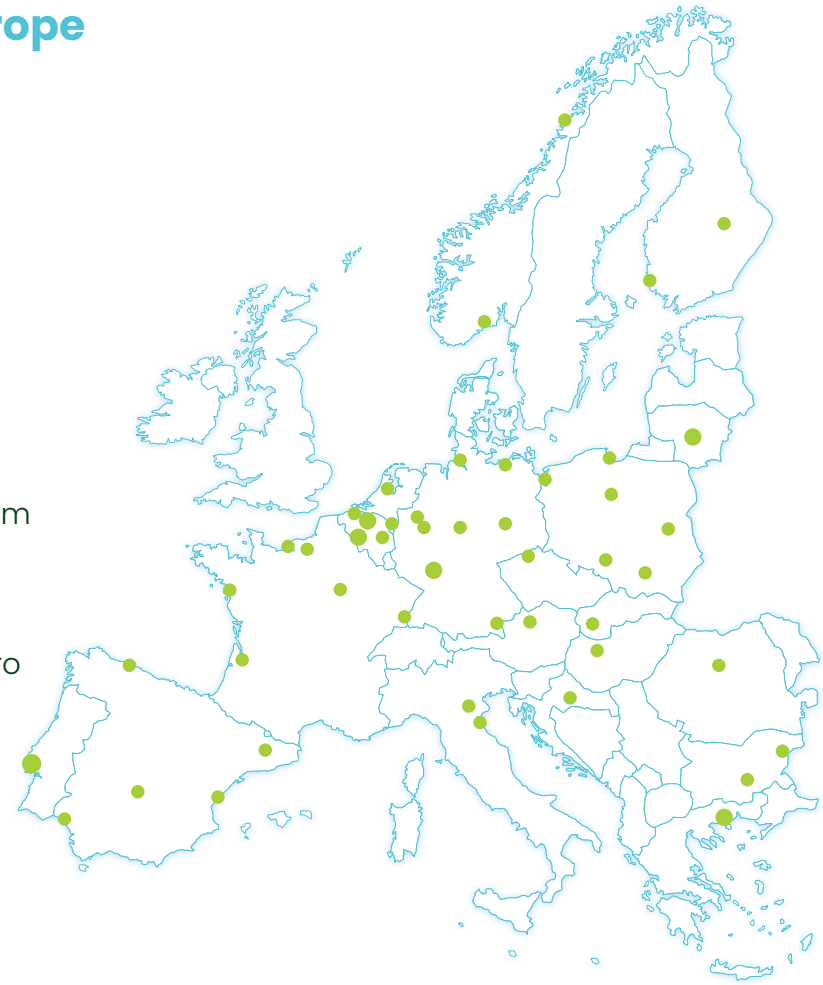
Fertilizers Europe
Avenue des Nerviens 9-31
1040 Brussels
+32 2 675 35 50

www.fertilizerseurope.com

Group Fertilizers Europe

twitter.com/FertilizersEuro

*Map illustrates major production sites in the EU+Norway



EU fertilizer industry **at a glance**

FEEDING **PEOPLE**

TODAY,
FERTILIZERS* ENABLE
50% OF GLOBAL FOOD PRODUCTION

FEEDING **ECONOMY**

120 +
PRODUCTION SITES

€1.2 BN
INVESTMENT

€9.5 BN
TURNOVER

74.000
EMPLOYEES

FEEDING **FARMING**

QUALITY PRODUCTS

SUPPLY SECURITY

FOOD SECURITY

ENVIRONMENTAL BENEFITS

* mineral fertilizers

Note: Average for last 5 years. Source: Fertilizers Europe