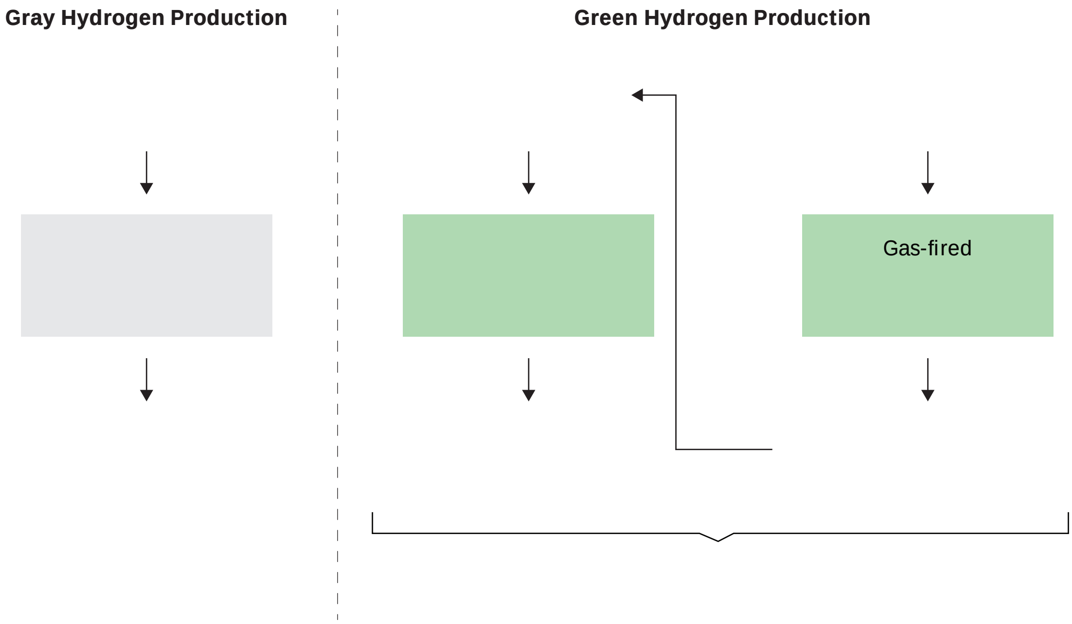
OliverWyman

GREEN VS. BLUE HYDROGEN

GREEN HYDROGEN

THE FULL-SYSTEM CARBON FOOTPRINT AND ECONOMICS

Exhibit 1: Schematic — why green hydrogen can be more carbon intensive than gray



Source: Oliver Wyman Analysis

Green hydrogen appears to be economically ine f cient, since its production requires

example, markets currently indicate prices of around $170 per MWh for electricity and $70 per MWh for natural gas in Europe in 2025. Once the cost of the electrolyzer conversion

around $245 per MWh (Exhibit 2), compared to gray hydrogen at around $120 per MWh. Using green hydrogen at $245 per MWh to replace natural gas (at $70 per MWh) is even less e f cient. This is also the case when looking at prices that prevailed before the current

A standalone green hydrogen plant taking electricity from an o f shore wind farm can produce green hydrogen for a total cost of around $130 per MWh, considerably cheaper than green hydrogen from the grid. However, this e f ectively relies on the windfarm selling the electricity to the electrolyzer at around $60 per MWh, which is not a logical choice when the

MWh.

Exhibit 2:

More battery storage. The growth in lithium-ion batteries o f ers a far more economical

of oversupply, with only about a 15% e f ciency loss and a lower capital cost per megawatt

Battery research and development. Alternative battery technology is receiving signi f cant

batteries, such as f ow batteries, and creating competition with green hydrogen for excess

seriously at blue hydrogen to f ll the gap in the

BLUE HYDROGEN
THE FULL-SYSTEM CARBON FOOTPRINT AND ECONOMICS

gas, creating a secondary, more dilute CO_2 stream. A capture e f ciency for both streams of di f ering fugitive emission level assumptions. The 3.4% appears a rather high estimate as to

Americas
+1 212 541 8100

EMEA
+44 20 7333 8333

Asia Paci f c
+65 6510