



# Air Liquide H2 Value Chain

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# Hydrogen as a cornerstone of energy transition... to reach carbon neutrality

Access  
to REN



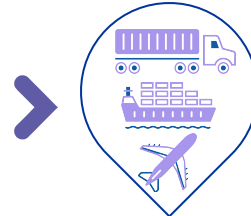
Technologies



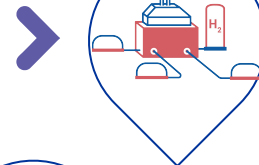
**H<sub>2</sub>**

**Production**  
Compression  
Liquefaction  
**Distribution**

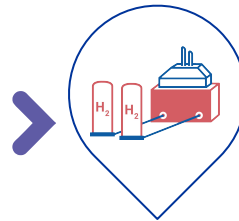
End Markets



Mobility



Industry



Energy

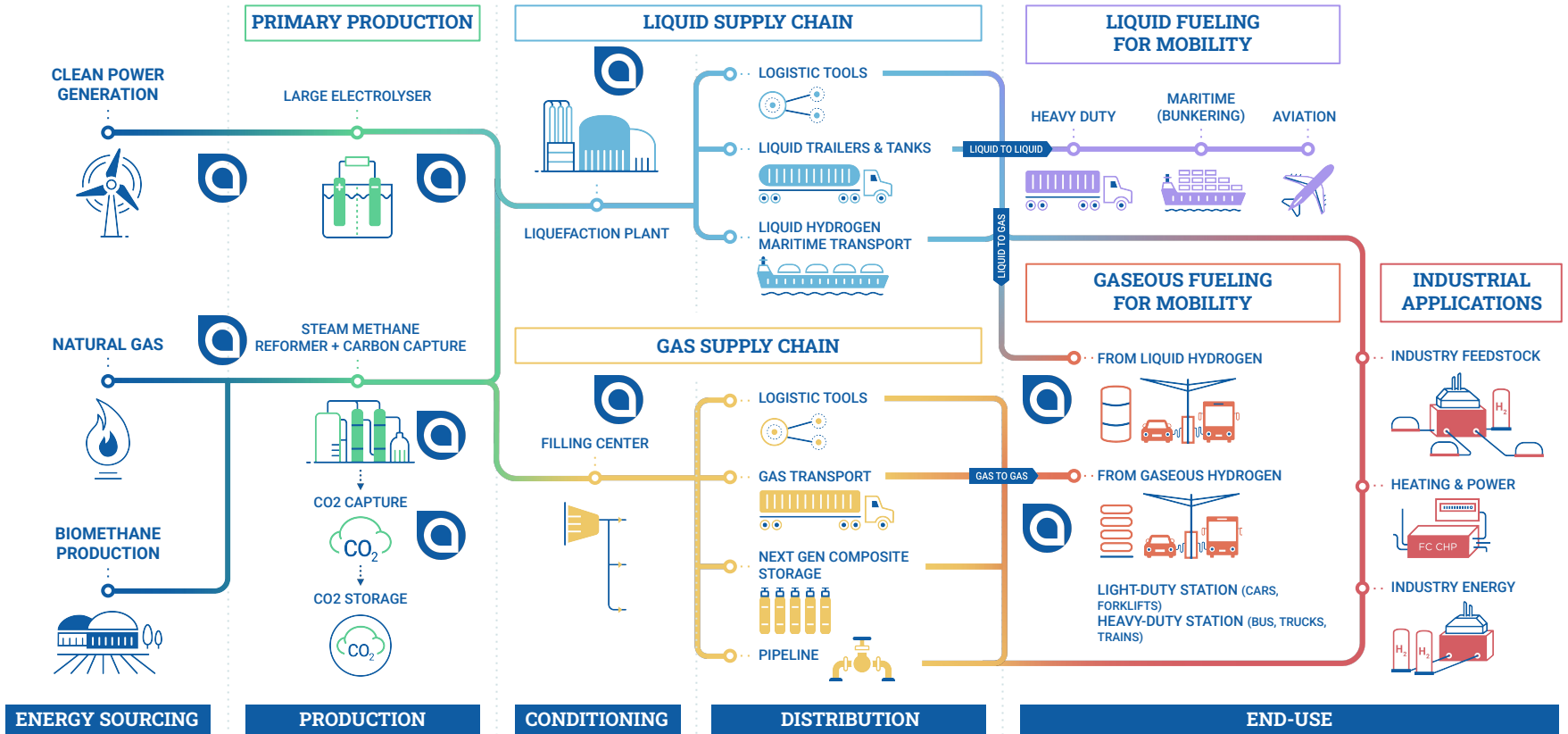
2050

**18%**  
of final  
energy demand

**6 Gt**  
annual  
carbon dioxide  
abatement

Source: Hydrogen Council 2017

# Hydrogen value chain : Air Liquide is mastering the whole value chain with 40+ years of experience



# Air Liquide already started to invest



**Power to Gas**  
Denmark  
1 Electrolyzer



**Mobility for Consumers**  
Paris, Brussels and Rotterdam  
7 HRS



**Power-to-Hydrogen**  
Normandy  
200 MW Electrolyzer



**Mobility for Heavy-Duty**  
Fos-sur-Mer  
1 HRS  
8 trucks + 3 bus



**Mobility for Heavy-Duty**  
Rotterdam  
25 HRS  
1,000 trucks



**Mobility for Consumers**  
Germany  
36 HRS



**Mobility for Professionals**  
US+EUROPE  
9 HRS



**Mobility for Consumers**  
US North-East  
12 HRS  
+ Supply chain



**Mobility for Consumers**  
California  
4 HRS



**Power to Gas**  
Bécancour  
20 MW Electrolyzer  
PEM Technology



**Liquid Hydrogen**  
Nevada  
30 tonnes/day



**Mobility for Consumers**  
Dubai  
1 HRS



**Mobility for Consumers**  
China  
30+ HRS



**Mobility for Consumers**  
South Korea  
9 HRS



**Mobility**  
> 185 Hydrogen Refueling Stations (HRS) assembled and delivered by AL in the world

More than 80 HRS supplied with AL hydrogen

**Low Carbon H2 production**  
Carbon Capture by Cryocap™ Electrolyzer

**H2 Supply chain**  
Liquid H2 production and distribution

14 bn m3 per year  
2.2 bn € sales  
1,850 km H2 pipelines  
47 large H2/CO plants  
40+ electrolyzers in operation

and time to scale up



# Scaling Up: Electrolyzer

**Towards 100+MW scale**

**Netherlands - ELYgator  
PEM/Alkaline 200 MW  
Under conception**

2025-

**France - NORMAND'HY  
PEM 200 MW  
Under conception**

Air Liquide accelerates its large scale renewable hydrogen production flagship project in France

Paris, France, October 20, 2021



2023-

**Germany  
Phase 1 20 MW  
Phase 2 10 MW  
Siemens PEM  
Under execution**

2020

**Taiwan  
25 MW  
In operation  
and ramping up**

2019

**Canada  
PEM 20 MW  
In operation**



**Denmark  
HYBALANCE PEM 1.25 MW  
In operation  
2018**

< 2017

> 35 electrolyzers in operation  
worldwide

Mainly Alkaline technology (<0.5  
MW)

**ONSITE**



# Air Liquide Ambitions

Lead **activation of H<sub>2</sub> Energy Markets with strategic partners**, in particular H<sub>2</sub> Mobility and Industry

Maintain leadership across the full value chain from H<sub>2</sub> production to delivery at the point of use



**CUSTOMER  
EXPERIENCE**

**TECHNOLOGY**



**INVESTMENT**



# Thank you

Hydrogen Energy