

Hydrogen Energy Nevada

Building a sustainable,
low-carbon society



- Time to ACT
- With Hydrogen
- Sustainably
- Together

Hydrogen

A very unique chemical element

- **Smallest and lightest atom.** One proton & one electron.
- **Oldest atom.** Hydrogen and Helium appeared more than 13 billion years ago.
- **Most abundant element.** 75% of the Universe mass and over 90% of its atoms
- **The hydrogen molecule is rarely found naturally.** It is often combined with another element

Hydrogen:

a unique expertise and experience

60

YEARS OF EXPERTISE

>1,000

EMPLOYEES IN HYDROGEN

€2.2bn

ANNUAL SALES

1.2 Mt

ANNUAL PRODUCTION

~200

STATIONS DELIVERED

~2,000

KM OF PIPELINES



We think **BIG** for hydrogen

Before 2035

~€8bn

INVESTMENT DECISION

>3x

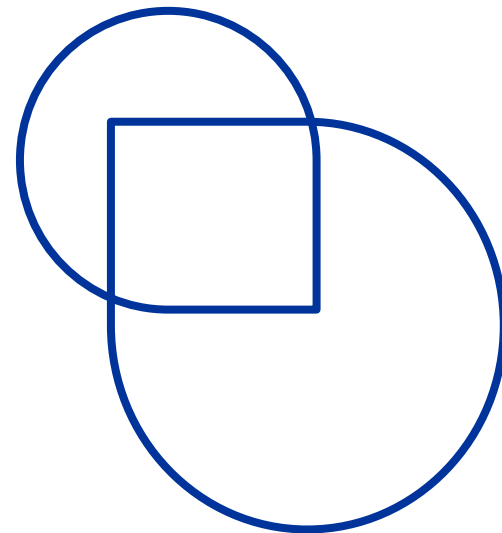
SALES

By 2030^(a)

3 GW

ELECTROLYSIS

(a) Including a confirmed capacity of 1 GW still under construction



Technology leadership

LOW-CARBON & RENEWABLE PRODUCTION

Electrolysis
PEM | ALKALINE

Reforming
SMR | ATR

Partial Oxidation (POX)



Other technologies
E-METHANOL

Carbon Capture
The most comprehensive offering

CONDITIONING

LIQUID HYDROGEN

Liquefaction
Scaled up capacities
& Optimized payload

GASEOUS HYDROGEN

Conditioning
High-Pressure filling centers

SUPPLY CHAIN

Liquid & gaseous storages

GH2 & LH2 distribution

GH2 & LH2 hydrogen stations

Focus: A worldwide leader in liquid hydrogen

60 years experience in hydrogen cryogenics

- Proven design in liquid hydrogen plant operations
- Efficient liquid supply chain
- Space program: over 700 liquid hydrogen tanks for Ariane, with a zero failure rate

Mastery of the entire liquid value chain

- Tailored solutions at each step (liquefier, storage, trailers, station)
- Proprietary cryogenics equipment, with inhouse manufacturing

Success stories

- Major development of a tandem trailer for the US market
- Building on our revolutionary solutions for onboard LNG ship to deploy liquid hydrogen
- Leader on large scale liquefaction technology

Leveraging our state-of-the-art experience in extreme cryogenics

LH2 in numbers

5

liquefaction centers

Over

800,000

hours of liquefaction

50+

trailers on the road

Over

60 tonnes per day

installed capacity

As of end of 2021

AIR LIQUIDE

Focus: **Leading the way in electrolysis and carbon capture**

Long lasting experience in electrolysis

- Over 50 years of experience in electrolysis
- Over 35 electrolyzers installed on clients' and our own sites
- A total capacity of more than 26 MW (10 tonnes per day), with 330 MW in progress

Carbon capture solutions

- A capacity of over 100,000 tonnes of CO₂ capture every year
- Over 15 years of in-house solution development for Carbon Capture
- Developing and operating proprietary solutions with a capture rate up to 99% (Cryocap™)
- Joint-venture with Sogestran for large scale carbon management with shipping and storage in Europe

Bespoke solutions

- Dimensioning a production project according to the client's situation
- Leveraging our production sites to serve complementary types of customers in industry and mobility

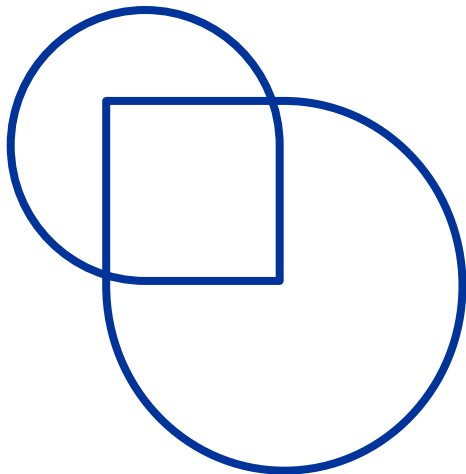
Providing a full portfolio of low-carbon hydrogen production



Air Liquide's Leadership in the U.S. and Nevada

Our Presence:

United States of America



Nevada liquid hydrogen plant

- The world's largest liquid hydrogen production site
- Supplying the growing demand in California
- Capacity: 30 tonnes per day of liquid hydrogen

California Mobility Market

- Design and installation of 4 refueling stations
- Providing hydrogen for FirstElement Fuel stations

North East Mobility Market

- A dedicated supply chain in partnership with Toyota

Hydrogen for Forklifts

- 25,000 hydrogen-powered forklifts in North America
- Design and installation of 3 refueling stations
- Providing hydrogen for Walmart and Coca-Cola

At a glance - **Air Liquide in Nevada**

~200

Employees

>10

Locations & Plants

>\$250M

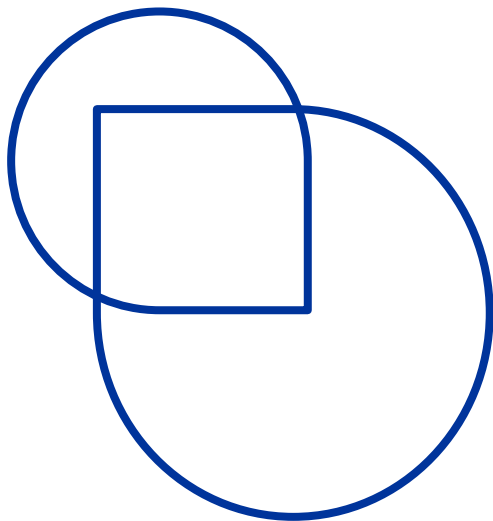
Invested

Construction and start-up phases of Air Liquide projects in Nevada, have provided jobs for more than 700 employees.



Project Spotlight:

Nevada



Production and liquefaction

Nevada, USA

The largest liquid hydrogen production and logistics infrastructure facility

Technology

- Steam methane reformer & liquefier
- Air Liquide proprietary technologies

Hydrogen

- Conventional, low-carbon and renewable hydrogen
- Facility can be powered by renewable energy

Capacity

- 30 tonnes per day
- Air Liquide's largest liquid hydrogen production site

Markets

- Clean mobility market in California (for more than 40,000 FCEVs)
- Industrial use

Commissioning

- Commissioned in May 2022



Hydrogen:

Today and Beyond

A Global Acceleration: **Ready to Scale Up**

TODAY

50,000

VEHICLES

25,000

FORKLIFTS

700+

HYDROGEN REFUELING
STATIONS

150+

MOBILITY APPLICATION
PROJECTS WORLDWIDE



TOMORROW

by 2030,

3 M

hydrogen
vehicles

in 2050,

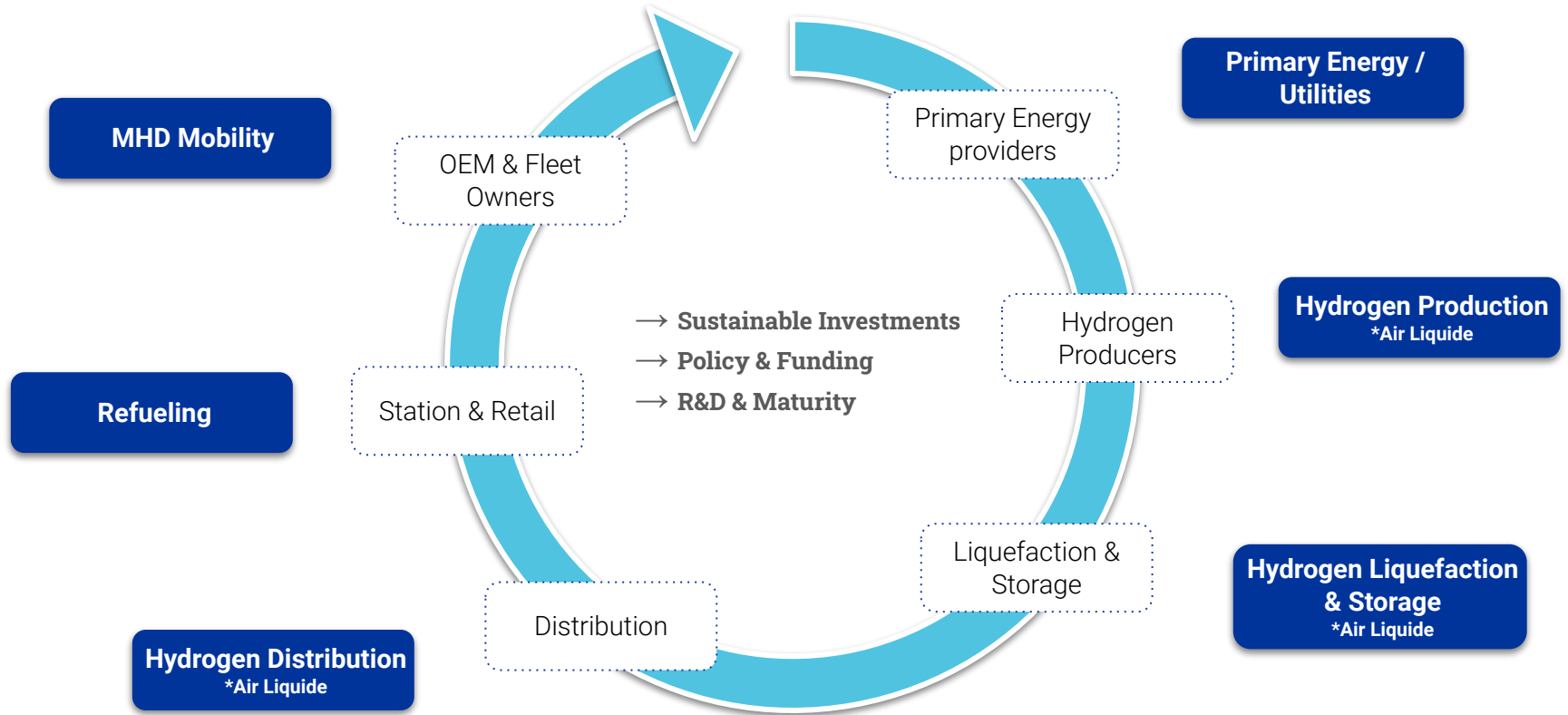
50%

of the demand
in hydrogen will
be linked to mobility

#1 in hydrogen
for mobility

- **Pioneer, with experts** mastering hydrogen for 60 years
- **With the broadest technology leadership**, and a full portfolio of low-carbon hydrogen technologies
- **The most international player** with a global footprint
- **One of the most active investing companies**, with assets already in operation
- **The largest amount of hydrogen assets in operation**
- **Leader in the hydrogen ecosystem** strategic partnerships, advocacy & financing

Hydrogen Ecosystem Model for MHDC



Key Challenges for the hydrogen mobility market

**Secured
supply of
low-carbon H₂**

**Continuity of
service and
operation**

**Economics
sustainability**

**Technology
maturity**

Availability of refueling network and HRS at point of operation

Access to subsidies & economic models for transitioning at parity


Vehicle availability, performance and reliability of operations over time

Additional Resources

National Petroleum Council

At the request of the Secretary of Energy, the NPC conducted a comprehensive study on the deployment of LCI hydrogen at-scale in the U.S. to support decarbonization of various energy and industrial market sectors across the entire value chain, including production, storage, transportation, and end uses.

- Air Liquide served on the SteerCo for the study and as Chair for Chapter 2: LCI Hydrogen Production at Scale.



To read the NPC study, *Harnessing Hydrogen: A Key Element of the U.S. Energy Future*, [click here](#).

Air Liquide Resources

- [2023 Annual Report](#)
- [Sustainability Report](#)
- [Air Liquide in brief 2023](#)

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AIR LIQUIDE