

H2 Economy: the supply chain issue...



Pierre Etienne FRANC
Air Liquide Technologies of the Future

AGENDA



- Air Liquide overview
- Hydrogen in Air Liquide: facts & figures
- H2 Supply chain and FCH Economy: metrics & challenges

AGENDA



- Air Liquide overview
- Hydrogen in Air Liquide: facts & figures
- H2 supply chain and FCH Economy: metrics & challenges

Air Liquide in brief



- **Total revenue 2009 : €12 billion**
 - ✓ 57% from Europe, 20% Asia
 - ✓ €1,2 bn Net Profit, 12% ROCE
- **Over 1 million customers in 75 countries**
- **42 300 employees**
- **36% of Air Liquide's revenue comes from gas applications which preserve life and the environment**
- **60% of Air Liquide's R&D budget devoted to developing technologies designed to preserve the environment and life**
- **5 strategic pillars for growth**



Energy



Environment



Health



High-Tech



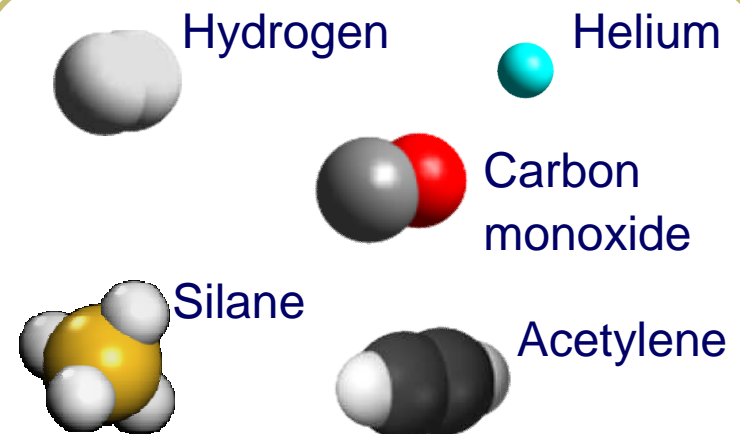
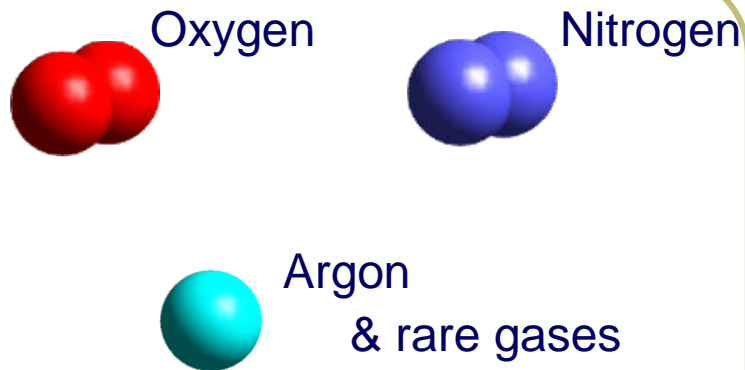
Emerging economies

Unique expertise and skills

Separating the
components of the
air
to take advantage of
their properties

Producing molecules
from
***natural
resources***
of the Planet

***Air Liquide
Technologies***



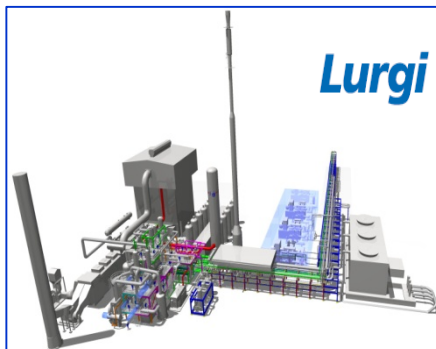
AGENDA



- Air Liquide overview
- Hydrogen in Air Liquide: facts & figures
- H2 Supply chain and FCH Economy: metrics & challenges

More than 40 years of experience in hydrogen

Production



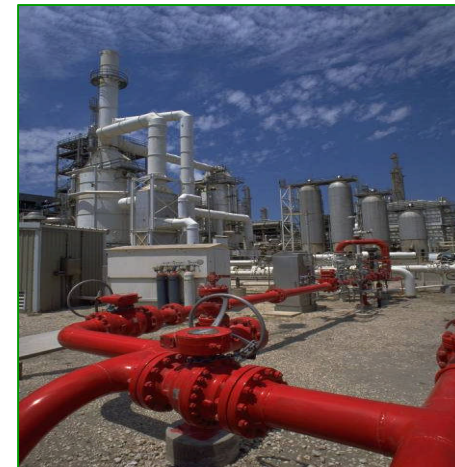
Technology E&C

Distribution



Technology E&C

Application



Technology E&C

Air Liquide Worldwide Hydrogen Operations



H₂: 545 km

Key Figures:

- 200 H₂ plants.
- 55 Hydrogen / CO Units
- 23 H₂ Purification Units
- Global H₂ Capacity > 1.3 million Nm³/h
- More than 1,850 km H₂ pipeline



H₂: 40 km

AL's assets for H₂ supply:

- H₂ Production Unit for OTF supply of H₂
- H₂ Purification Unit – OTF Supply of H₂
- H₂/CO Production Unit (SMR / POX)

OTF: Over the Fence supply, Air Liquide owns and operates plants



H₂: 950 km

AGENDA



- Air Liquide overview
- Hydrogen in Air Liquide: facts & figures
- H2 Supply chain & FCH Economy: metrics & challenges

H2 : many existing applications...



Heat Treatment

10 m³/h (batch) –
1000 m³/h (continuous)



Glass

80 to 500 m³/hour



H₂ Ultra pur <1ppb
50 to 500 m³/hour



Chemicals

Ex: 0,067 t/ton Anilin

Petroleum refining
(desulfuration & hydrocracking)

10-100 Km³/h



Ariane 5

28 tons/launch

2015 ?



Fuel cell vehicle

1 kg for 100 kms

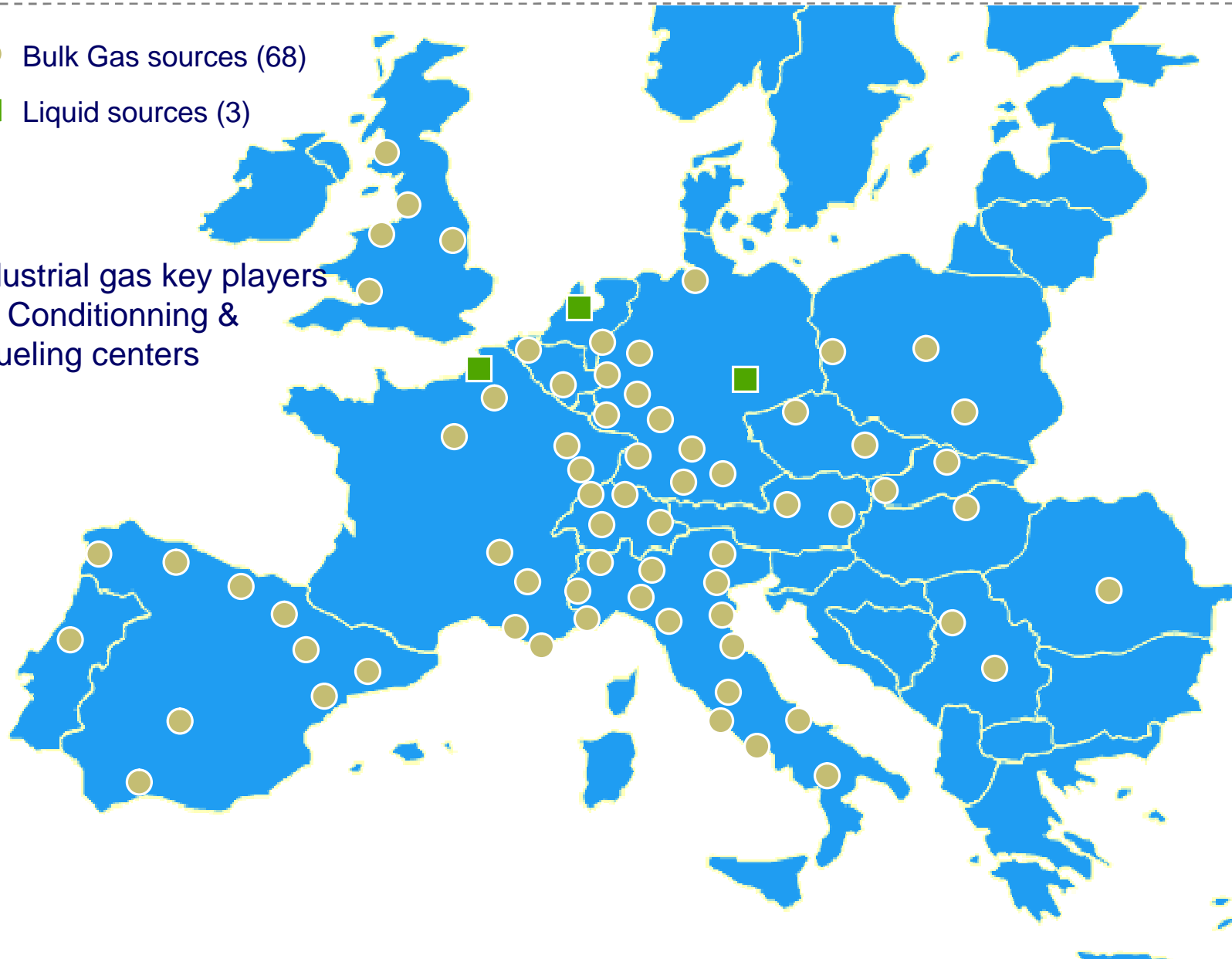
H2 supply chain : a dense distribution network

AIR LIQUIDE

● Bulk Gas sources (68)

■ Liquid sources (3)

Industrial gas key players
H2 Conditionning &
refueling centers



Air Liquide's ambition: be ready for 2015

