CLIMATE OBJECTIVES

Taking Actions in our company with our customers for the planet
Agenda

Our climate commitment and objectives

Deployment of initiatives for
  Our Assets
  Our Customers
  New Ecosystems

Contribution to financial performance

Q&A
Air Liquide commitment and objectives
Need for a sharp reduction in greenhouse gas emissions

Based on: UN-The Emissions Gap Report 2017
Air Liquide, a committed industrial player

ACTING ...

Long and strong involvement in limiting GHG emissions to reduce Carbon footprint:

- In its operations
- Through its Solutions to customers

... RESPONSIBLY

- Ahead of laws and regulations
- Responsible behavior recognized by extra-financial

Ratings

- MSCI: A
- CDP: A-
- SUSTAINALYTICS: 69/100 Gold

Indexes

- FTSE4Good
- Euronext Vigeo Eiris: Eurozone 120

NEW STEP

CLIMATE OBJECTIVES
Small essential molecules are core to our business model to drive customers solutions.
Our solutions addressing carbon emissions and air quality

- **1970**
  - Pipelines
  - Emissions related to transport
  - Oxy-combustion

- **1990**
  - On-sites
  - H₂ for sulfur removal in fossil fuels

- **2010**
  - Lighter cylinders
  - Continuous supply chain improvement

- **2030**
  - Clean mobility
  - Smart Innovative Operations
  - N₂

**Air quality**

**Emissions related to energy consumption**
Industry response to sharp CO₂ reduction requirement

Global CO₂ emissions

- Buildings, Agriculture and others: 3,300 Mt
- Transport: 26.2 Mt CO₂, 0.08%
- Power: 13,600 Mt
- Industry: 8,400 Mt
- Total: 32,700 Mt

Industry response
- Reduction of its own emissions
- Innovation and development of cleaner solutions to other emitting sectors

Source: Energy Technology Perspective 2017, IEA, Direct CO₂ emissions in 2014
Greenhouse gas emissions within Air Liquide

Air Liquide GHG emissions in 2017

Direct
14.5 MT

- 8.6 MT from steam methane reformer
- 5.1 MT from cogenerations
- 0.7 MT from transportation activities

Indirect
11.7 MT

- 94% for the supply of air separation units

Direct GHG: Scope 1 from Assets owned or controlled

Indirect GHG: Scope 2 from Energy generated upstream (purchased electricity, steam...)

Avoided GHG Emissions

- CO₂ 16.1 MT avoided in total
  - by customers using oxygen 11.5 MT
  - by Air Liquide through industrial efficiency 4.6 MT
CLIMATE OBJECTIVES

A global approach

ASSETS
Reduce our carbon intensity in 2025 vs. 2015 by -30%

CUSTOMERS
Act for clean industry by developing low-carbon solutions

ECOSYSTEMS
Contribute to a new low-carbon society
Embed Climate in our decision process

Carbon impact in the review of new investments

- to perform customer site assessment
- to evaluate risk of obsolescence of our assets
- to measure the impact on CO₂ intensity

Climate initiatives part of 2019 budget commitment

- climate objectives in managers’ compensation
Act & advocate: Engage with all stakeholders
Climate-driven initiatives for our Assets
Reduce Air Liquide carbon intensity in 2025 vs. 2015

Carbon intensity (kg $CO_2/€$ EBITDA) and Group Emissions

<table>
<thead>
<tr>
<th>Year</th>
<th>CO$_2$/EBITDA in kg/€</th>
<th>Direct Emissions (Scope 1), in Mt</th>
<th>Indirect Emissions (Scope 2), in Mt</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>6.3</td>
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<td>2016</td>
<td>4.4</td>
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<td>2025</td>
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</table>
**Assets: 3 main levers**

1. **INCREASE**
   - renewable electricity purchase

2. **REDUCE**
   - energy consumption per volume of production

3. **REDUCE**
   - carbon footprint of bulk & packaged gases
Lever 1: Increase renewable electricity purchase by +67% (from 6 to 10 TWh)

- Voluntary action to **buy renewable** energy - Power Purchase Agreement
- **Supplier arbitration** taking into account their energy mix
- **Improvement of energy mix** in countries where Air Liquide operates
Lever 2: Further reduce energy consumption per volume of production by -5%

→ New plants with higher energy efficiency
  ● Enabled by Innovation
  ● Continuous technology improvement between 2007 and 2015
    ○ -3.0% for ASU
    ○ -1.0% for SMR ➢ to be accelerated

→ Step change performance on existing plants
  ● Leveraging data - Smart Innovative Operations for:
    ○ Best Economical Point
    ○ Production & Supply Chain integrated Optimization
    ○ Predictive maintenance

→ Modernization/renewal of our assets base
  ● Retire obsolete assets and replace by best available technology
  ● Adapt equipment to evolving industrial basins
Lever 3: Reduce carbon footprint of bulk and packaged gases by -10%

Optimize plant operations
- Better energy efficiency

Optimize distribution routes
- Past improvement: bulk transportation -7.8% between 2008 and 2015
- New Integrated Bulk Operations program: thanks to Big data

Convert 20% of truck fleet to alternative fuels
- Industrial Merchant European project of fleet conversion from diesel to alternative fuels*
- Duplication of the European program to other Hubs

(* including 3rd-party trucks)
Climate-driven initiatives for our Customers
Act for clean industry

1. Low-carbon solutions & offers
2. Breakthrough manufacturing routes
Lever 1: Low-carbon solutions & offers

- Promote outsourcing
  - 15 to 20% energy by mutualization of assets

- Develop offers limiting transport related emissions
  - >700 Industrial Merchant on-sites currently in operation
  - 40% lighter cylinders versus steel cylinders

- Deploy Oxy-combustion
  - >11 mT CO₂ avoided by customers (2017)
  - New HeatOx solution
**Lever 2: Breakthrough manufacturing routes**

To limit our customers’ emissions

- $\text{CO}_2$

To capture $\text{CO}_2$

- $\text{CO}_2$

$\text{CO}_2$ capture

**CO$_2$ Economy**

**Merchant business:**
- Food
- Beverage
- Greenhouses
- ...

**Large Industry Customers:**
- Chemical industry
- ...

**Carbone Capture and Storage (CCS)**

- $\text{H}_2$ injection in steel process
- New materials for Electronics
- ...

MANUFACTURING SITE

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22 | November 30th, 2018 | CLIMATE OBJECTIVES | AIR LIQUIDE, A WORLD LEADER IN GASES, TECHNOLOGIES AND SERVICES FOR INDUSTRY AND HEALTH
Climate-driven initiatives for New Ecosystems
Contribute to a new low-carbon society

1. Circular economy
2. Clean cold logistics
3. Hydrogen clean mobility
4. Hydrogen global economy
Lever 1: Develop circular economy

OBJECTIVE: Reduce the use of Natural Resources

- Upstream/downstream integration leveraging technologies and new business models

... to Ecosystems...

NATURAL RESOURCES

Suppliers

Customers

Markets

New customers

Renewable

... thanks to R&D Start-ups Open innovation
Lever 1: Develop circular economy through biomethane production and usages

→ **Build** new biomethane plants
  - Air Liquide value in the **biogas purification** with proprietary membrane technology
  - 2 main regions:
    - Europe
    - USA
  - Capacity: 0.8 TWh/year today to 5 TWh/year in 2025

→ **Extended** usages
  - **End-users:** Industry and Transport
  - **Injection into existing natural gas network**

> > 60 Retail stations

> > 10 Production units
Lever 2: Clean cold logistics

Promote use of cryogenic molecules for cold transportation
**Lever 3: Hydrogen clean mobility**

→ Invest in low carbon \( \text{H}_2 \) production assets

1\textsuperscript{st} world scale liquid \( \text{H}_2 \) production plant dedicated to the \( \text{H}_2 \) energy market

→ Build and operate new \( \text{H}_2 \) stations (120 stations worldwide)
Lever 4: Hydrogen global economy

H₂ is a clean, safe and versatile energy carrier

Enable the renewable energy system

Large-scale renewables integration and power generation

Distribution

Buffer

Decarbonize end uses

4 Transportation
5 Industry energy
6 Building heating and power
7 Feedstock
8 Digital

2050 vision

18% of final energy demand
6Gt Annual CO₂ abatement
$2.5tn Annual sales (hydrogen and equipment)
30m Jobs created

(1) Source: Hydrogen Council
Contribution to financial performance
**Investments** to reduce carbon footprint...

<table>
<thead>
<tr>
<th>Yearly innovation Opex</th>
<th>Cumulated Capex since 2014</th>
<th>2018 investment decisions (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>~€100m to reduce carbon footprint</td>
<td>~€170m in biomethane</td>
<td>~€130m in hydrogen mobility</td>
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<tr>
<td>~€130m in hydrogen mobility</td>
<td>~40% embedding environment and climate objectives</td>
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(1) Investment decisions >€5m
... contribute to boost NEOS efficiencies...

Yearly efficiencies

>€300m

linked to reduced energy consumption in our production units

linked to optimization of delivery routes

~20%

~10%
... and to expand our core business...

2018 est. sales

- **Air quality**
  - H₂ for removing sulfur from crude oil

- **GHG Emissions**
  - O₂ for blast furnaces
  - O₂ for glass float
  - enScribe™, significantly lower GHG emissions

Sales CAGR 2008-2018

- €1.0bn
- €280m
- €80m
- €20m

> +6% (*)

(*) Based on H₂ for removing sulfur from crude oil and O₂ for blast furnaces
... while opening new markets

**Biomethane**

Market *

$6 to $7 bn

2025

AL Sales

\(~+40\%\)

CAGR 2016-2018

*Air Liquide estimates

~+40%

CAGR 2016-2018

**H₂ energy**

Market **

$0.5tn

2030

$2.5tn

2050

AL Sales

\(~+105\%\)

CAGR 2016-2018

*Hydrogen Council

2030
Air Liquide confirms its ambition

Lead our industry

Deliver long-term performance

Contribute to sustainability
CLIMATE OBJECTIVES

Taking Actions in our company with our customers for the planet