

# Low carbon hydrogen supply chain

***Maritime Conference, Floro,  
September 18th, 2019***

*Charline Dubois,  
Business Development Manager*

**Floro, Norway**

**H2 ENERGY WBL  
EUROPE**

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# 60 years of development in Hydrogen for our customers

14 bn  
m<sup>3</sup> / yr

## Production & Supply chain

### Production

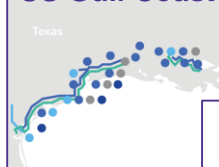


### Supply-chain (GH2 / LH2)



## Distribution Networks

### US Gulf Coast



### Singapore



- Hydrogen
- Oxygen
- Nitrogen
- Synthetic gas
- Hydrogen and/or carbon monoxide facility and hydrogen source
- Oxygen and nitrogen facility
- Cogeneration facility
- Synthetic gas facility

## Markets Segments

### Process industries

#### Oil & Gas



#### Steel, Glass



#### Electronics



#### Space Transport



# AL - Electrolyser scaling up

100  
MW+

*Scale up  
Preparing the  
next step*



Hydrogenics announces \$20.5m private placement and technology partnership with Air Liquide

By Anne Simpson | 2 January 2019

**HYBALANCE** One of largest  
**PEM**  
*In operation*

1,25  
MW



2019

20  
MW

Air Liquide signs long-term power purchase agreement for renewable electricity

Press release | Friday, November 30, 2018



MEDIA RELATIONS

2018

**BECANCOUR**  
Largest PEM project  
*Under execution*

Air Liquide invests in the world's largest membrane-based electrolyzer to develop its carbon-free hydrogen production



< 2017

more than 30 electrolyzers in operation worldwide  
usual range: 50 - 100 Nm<sup>3</sup>/h H<sub>2</sub>  
Mainly Alkaline technology  
**ONSITE**

# A complete & integrated low carbon solutions portfolio



CertifHy aims to develop the 1<sup>st</sup> European-wide Green and Low Carbon hydrogen GO scheme

## Air Liquide fait un investissement stratégique dans la production d'hydrogène décarboné par électrolyse

Communiqué de presse | Jeudi 24 janvier 2019



## Air Liquide joins innovative large scale Carbon Capture and Storage project in Norway

News | Monday, September 9, 2019



CHIN

LATE

Air Li  
Impr  
Paris



- Design and build Group's industrial gas production units

- Solution oriented towards our gas customers
- Plant life-cycle optimization
- Supporting operations

# H2 for mobility : already a reality worldwide - AL Examples

## Americas



Mobility for **Professionals**

US+EU  
2013-2017  
9 sites



Mobility for **Consumers**  
US North-East  
2015  
12 HRS + Supply chain



Mobility for **Consumers**  
California  
2014-2018  
5 HRS  
30 tpd LH2 plant

## Europe



Mobility for **Consumers**  
Paris  
2015-2018  
4 HRS



Mobility for **Consumers**  
Germany  
2014  
27% of 100 HRS

## ME - Asia



Mobility for **Consumers**  
Japan  
2014-2017  
6 HRS  
25% of 80 HRS  
by 2021



Mobility for **Consumers**  
Dubai HRS  
2016

## Key Elements

> 100 HRS built worldwide  
> 40 HRS\* for **FCEV**  
(controlled by AL)

> Member of **2 consortia**  
developing HRS networks,  
each time with 25% of  
**80-100 HRS**

**H2 Supply chain** in  
the US and Denmark

**ALIAD**  
Venture Capital

**5 Startups**

\* HRS: Hydrogen Refuelling Station



# *Let's scale up !*

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# Developing our skills in the operations of PEM electrolyser

1,25  
MW

*In operation*



**Hybalance plant, Hobro, Denmark**

20  
MW

*In execution*



**Becancour, Canada : the world's largest  
membrane-based electrolyzer**

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# Key drivers for investments in low carbon H2 production

- Serving growth markets ⇒ **develop new H2 markets**
- **Clear long term** framework for environmental attributes
- **Level playing field** between alternative pathways taking into account the different objectives
- **Phased** approach: aligning environmental and economics

Air Liquide to build first world scale liquid hydrogen production plant dedicated to the supply of Hydrogen energy markets

News | Wednesday, November 28, 2018

