

Advanced Business & Technologies

# Hydrogen mobility: Status of worldwide deployment initiatives

| Erwin PENFORNIS - VP H2 Energy Market | Tokyo – FC Expo



This document is **PUBLIC**

2015 → 2017

The confirmation of a growing momentum



© Toyota

This document is **PUBLIC**

2

2017

aB&T Hydrogen Energy

World leader in gases, technologies and services for Industry and Health



# 2015 → 2017: Building up scale all over the world!



This document is **PUBLIC**

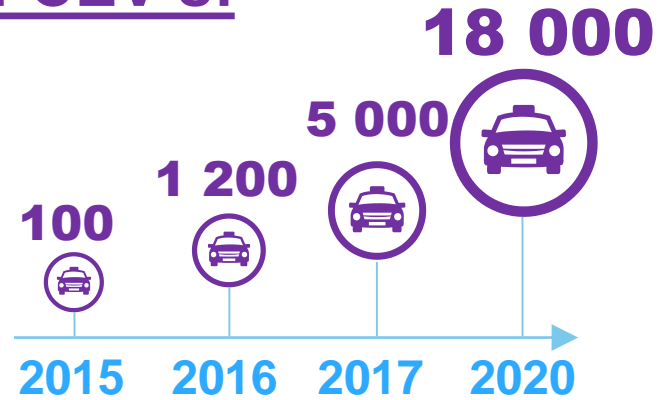


# US / California – the ZEV effect



Anaheim H2 station

## FCEV's:



## Southern CA Hydrogen Stations

### ● Retail: Open

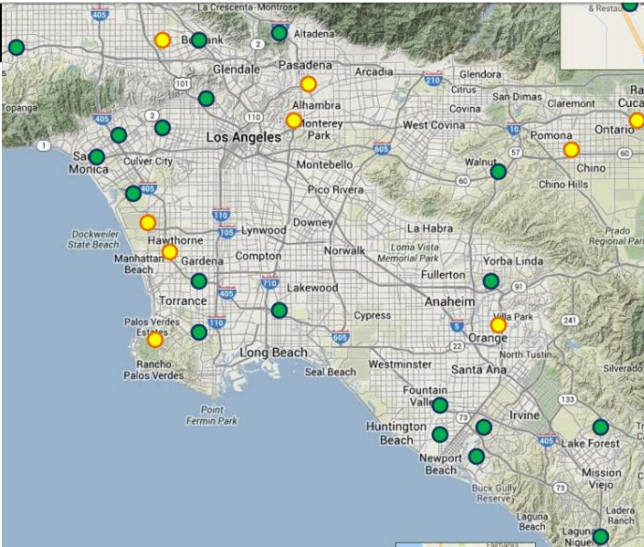
- Anaheim
- Costa Mesa
- Del Mar
- Diamond Bar
- Fairfax-LA
- Harris Ranch
- Hollywood
- La Cañada Flintridge
- Lake Forest
- Long Beach
- Playa Del Rey
- San Juan Capistrano
- \*Santa Barbara
- Santa Monica
- UC Irvine
- West LA
- Woodland Hills

### ● Other: Open

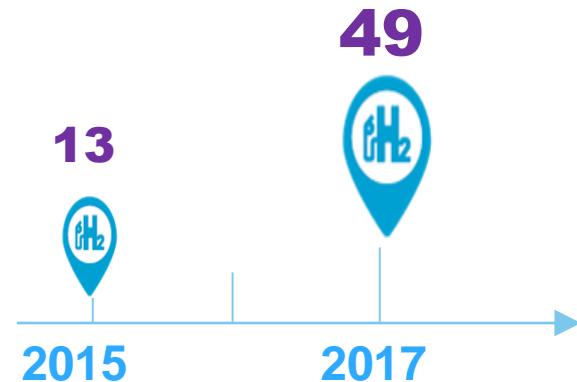
- Burbank
- Fountain Valley
- Harbor City
- Newport Beach
- \*Thousand Palms - SunLine Transit
- Torrance

### ● Retail: In Development

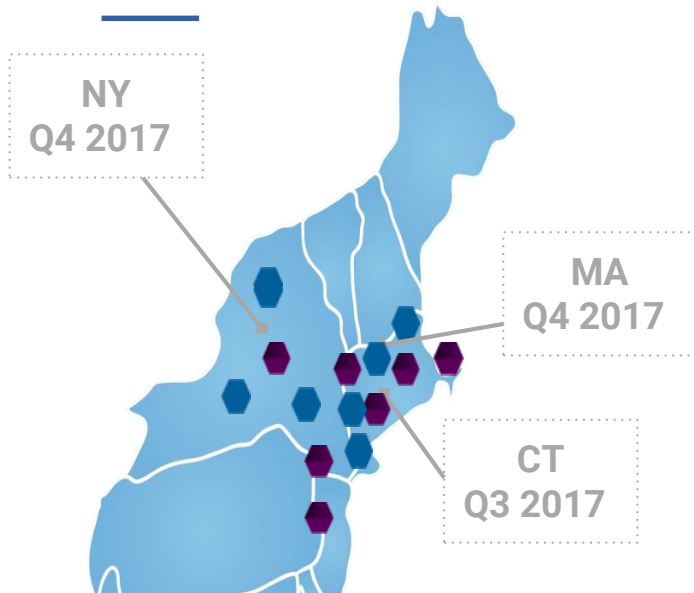
- Cal State LA
- Chino (upgrade)
- Lawndale
- LAK (upgrade)
- North Hollywood
- Ontario
- Orange
- Rancho Palos Verdes
- \*Woodside



## H2 stations:



# US - Conquering the Northeast



## New York

Bronx, NY  
Hempstead, NY  
Brooklyn, NY



## Connecticut

Hartford, CT



## Massachusetts

Braintree, MA  
Mansfield, MA



## New Jersey

Site location TBA



## Rhode Island

Site location TBA

Network of 12 Stations

Start-up over Q3-Q4 2017

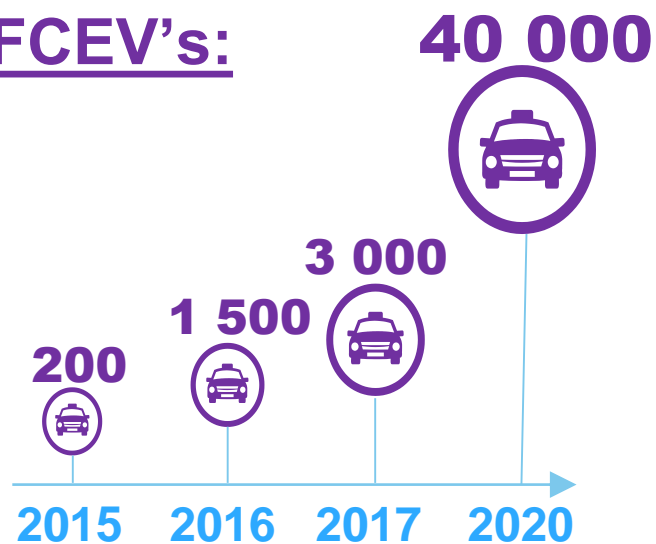
Dedicated H<sub>2</sub> supply chain by

Project in collaboration with

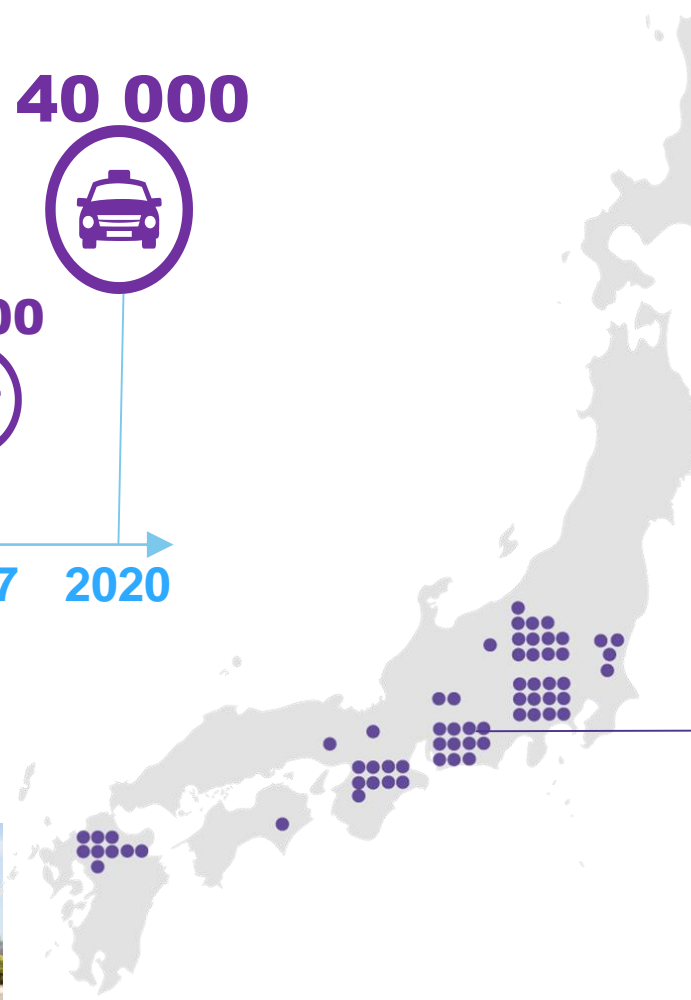
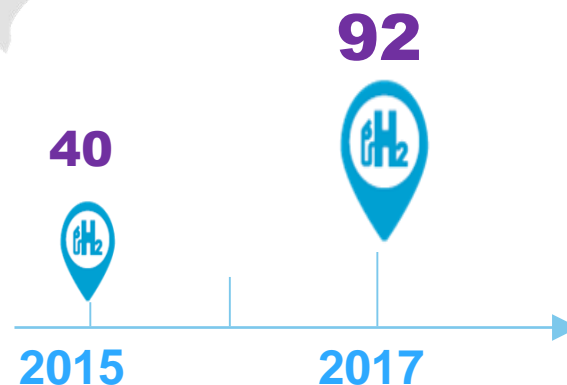


# Japan: Largest H2 station infrastructure in the world

## FCEV's:



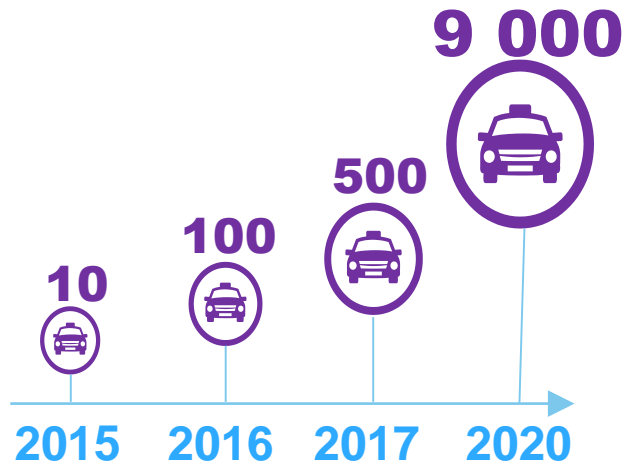
## H2 stations:



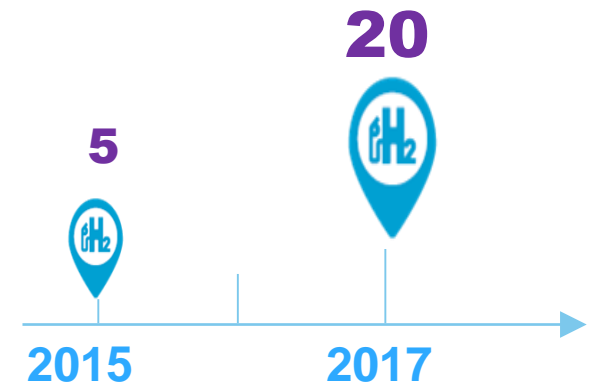
*Nagoya Atsuta*

# Korea – Rolling out an ambitious roadmap!

## FCEV's:



## H2 stations:



- Green Car roadmap being actively implemented
- Innovative fleet business models
- Creation of H2 Korea to accelerate infrastructure investments





# Middle East – 1st H2 station in Dubai!

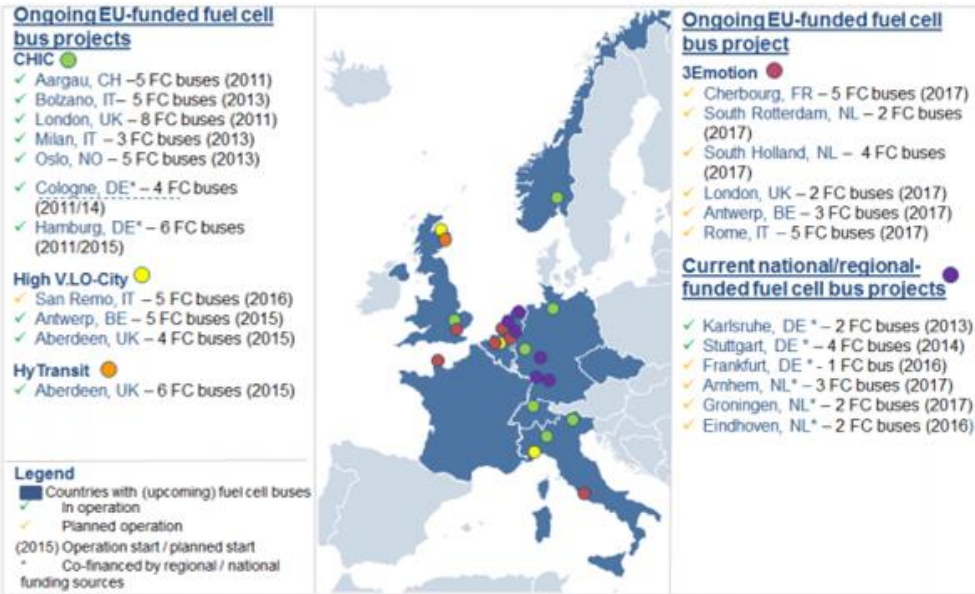


- 1st H2 station started in September 2016, with first Mirais deployed
- Scale-up of FCEV deployment in Dubai until 2020 World EXPO
- Collaboration between Air Liquide, ADNOC, Al Futtain Motors / Toyota & Masdar (green power provider) to develop a H2 mobility roadmap in the USA



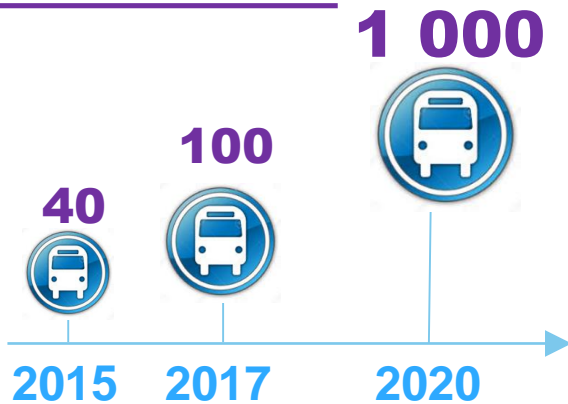


# FC Buses: EU and China showing the way



Next steps:

## FC Buses in EU:

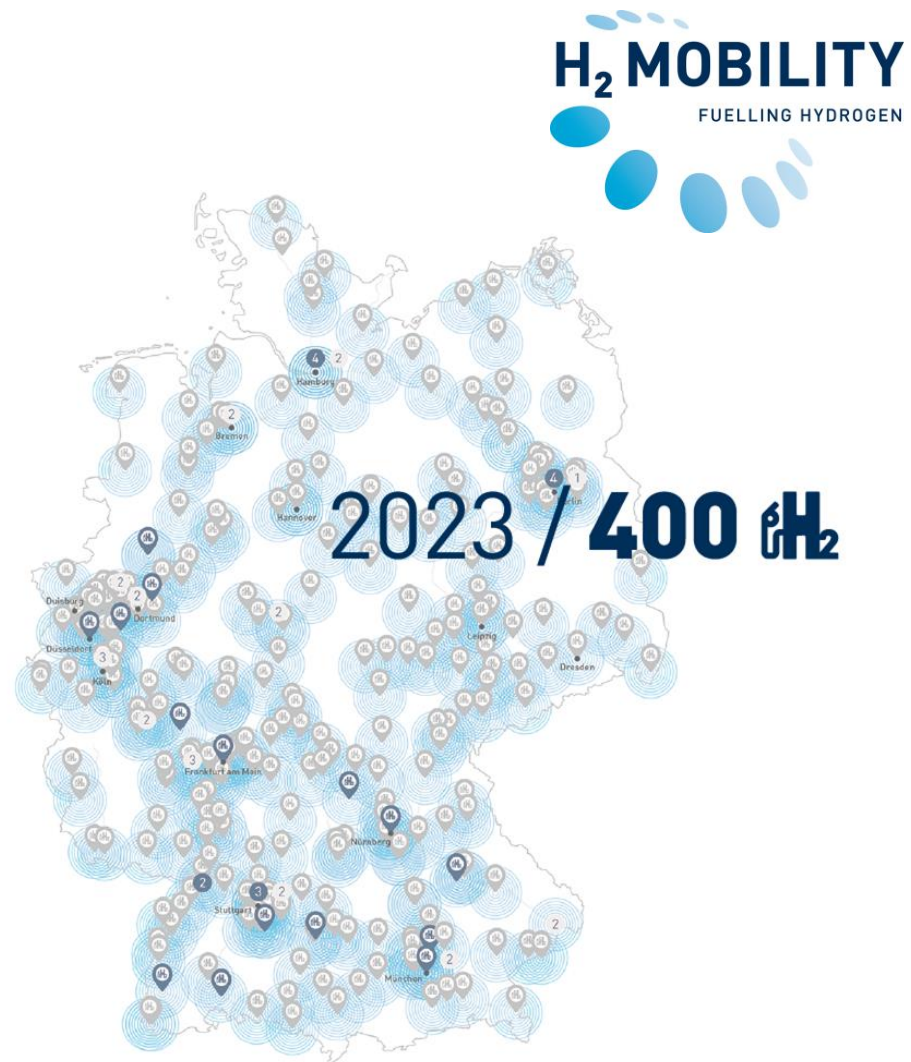


# Germany – H2 Mobility: Deploying at full speed!



**Air Liquide, Daimler, Linde, OMV, Shell and Total** have agreed an action plan for the construction of a Hydrogen station network in Germany

- **400 Hydrogen Stations by 2023** (100 by 2017)
- **350m € investment**
- **Max. 90 km distance between each station on motorways**
- **10 Hydrogen Stations in each metropolitan area**

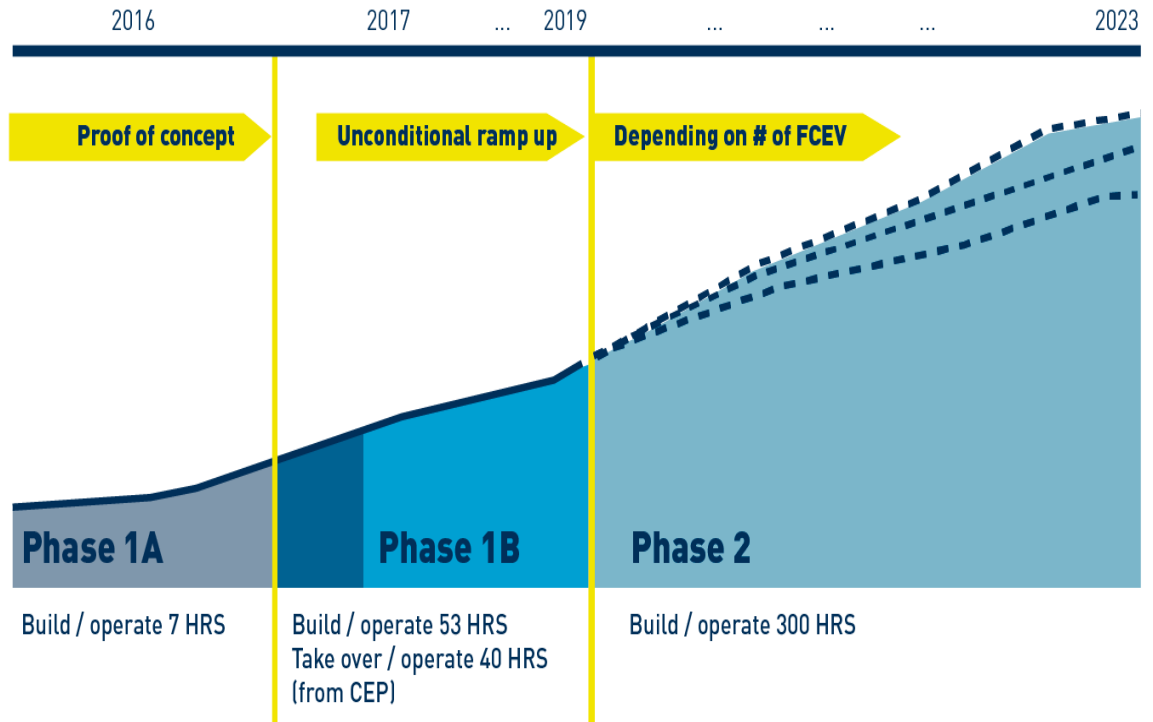


This document is **PUBLIC**

# H2 Mobility: A fully operational company



**17 BERLIN**



**100 stations by 2018**

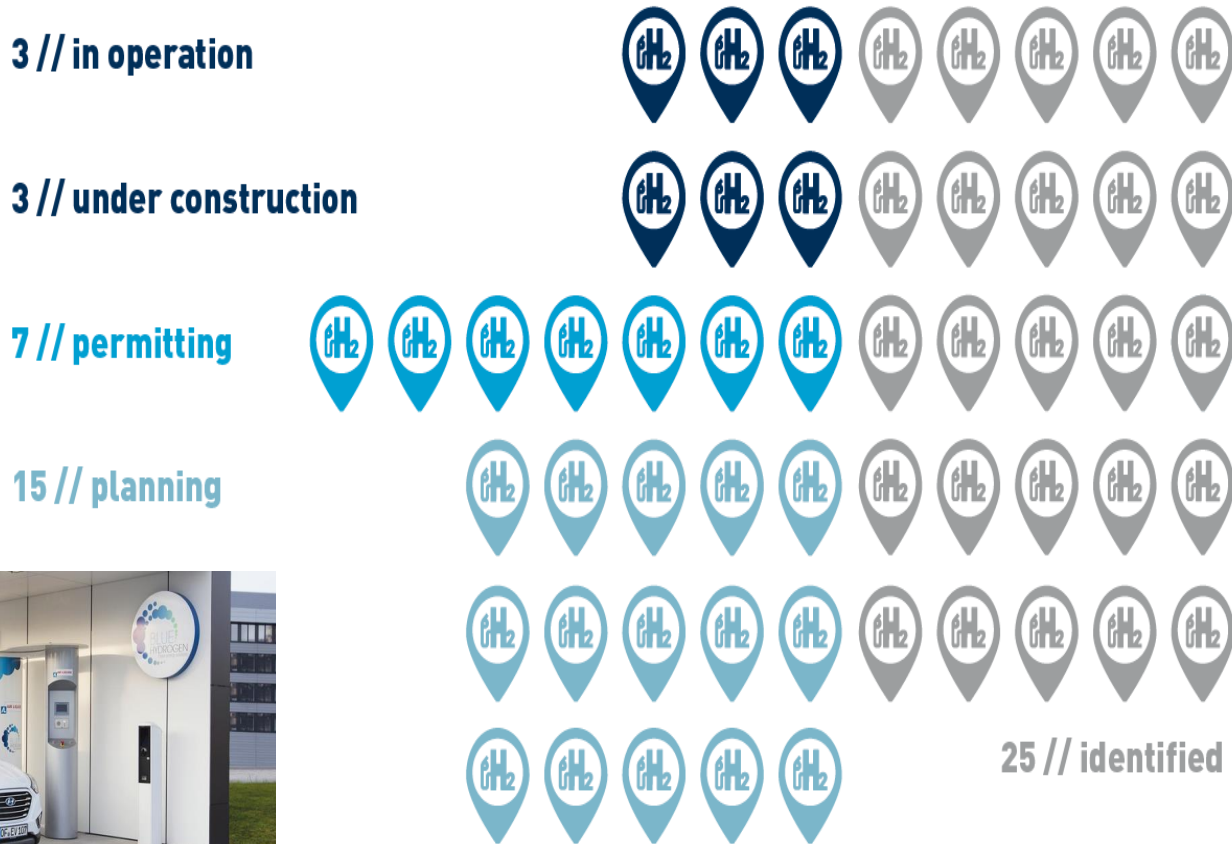
**20 stations in 2015**





# H2 Mobility: Actively executing Phase 1

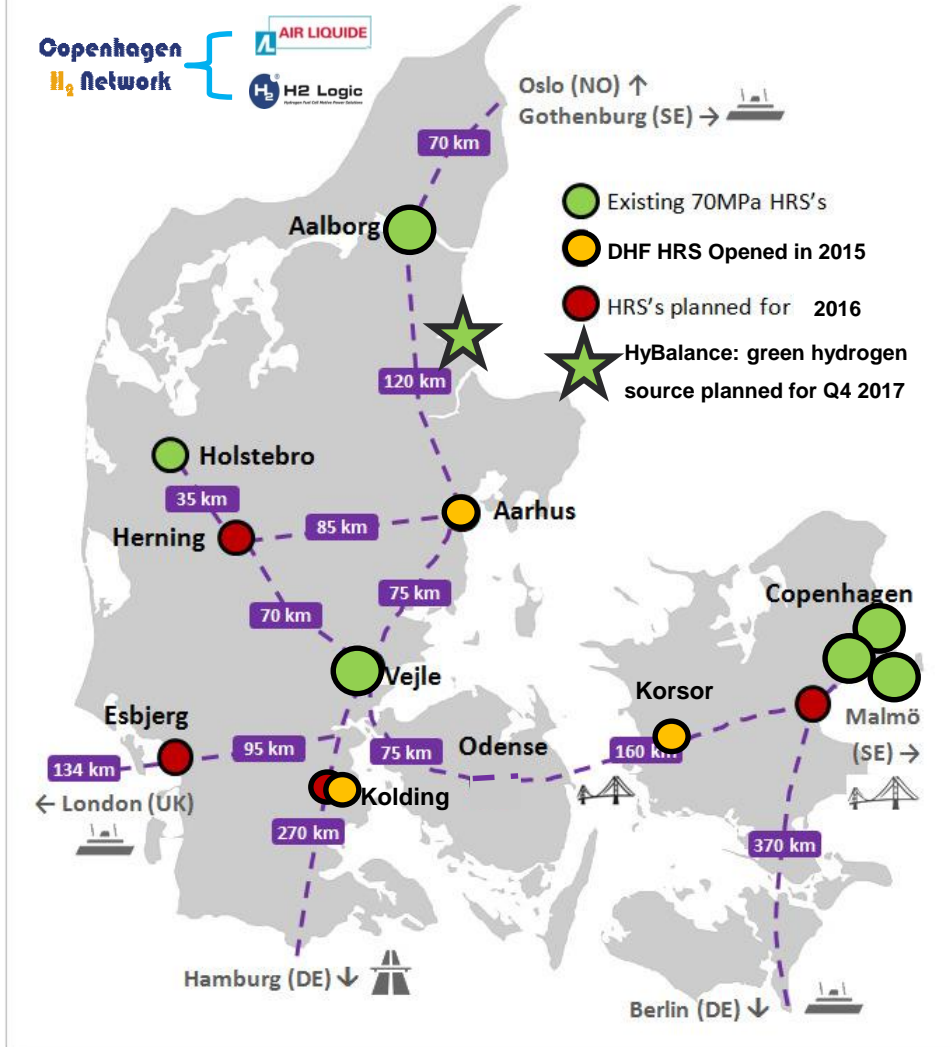
Deployment status of 53 new stations as of Dec 2016:



Offenbach H2 station

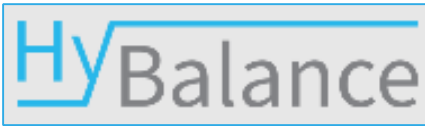
# Denmark – A nationwide H2 network powered by wind

## Country-wide HRS network by 2015 | DENMARK



# Denmark – A nationwide H2 network powered by wind

## Industrial Power-to-H2 demonstrator



<http://hybalance.eu/>

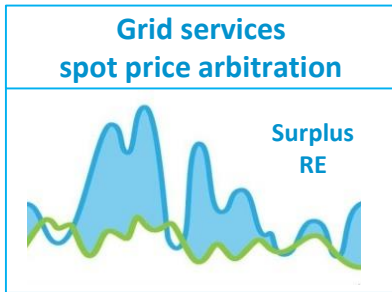


Local industrial customer

Industrial off-takers

H2

H2 @ 200b



H2



H2



Filling center

1,25 MW PEM Electrolyser

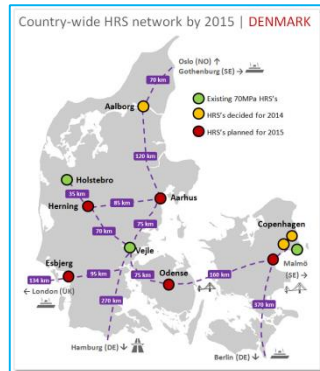
H2 @ high pressure

Complete Wind-to-H2 supply chain

Start-up in October 2017



Refueling stations




This document is PUBLIC





# France: Innovative business models for clean mobility

## HYPE Taxi Fleet Project - Paris



 The «taxi of tomorrow»

An emission-free Paris  

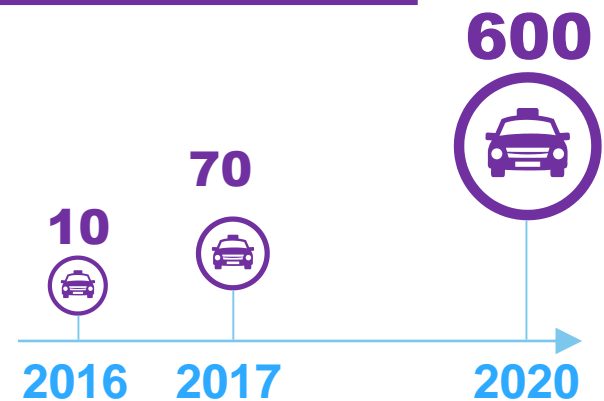
Air Liquide

Key Enabler  
of the project

Launched in Dec. 2015,  
during COP 21



## FCEV taxi fleet





# La cartographie des stations hydrogène en France

## Légende



Stations publiques ouvertes



Stations privées ouvertes



Stations en construction



Stations en projet

A l'heure actuelle, **20** stations sont ouvertes pour une capacité de production totale d'environ 500 kg d'hydrogène par jour.

Plus d'une **vingtaine** d'autres stations seront installées d'ici 2020 (auxquelles s'ajouteront les stations des projets en cours Zero Emission Valley, EASHY-MOB, etc.).







# L'hydrogène : pour une mobilité décarbonée





# Air Liquide's involvement to enable the expansion of hydrogen mobility



This document is **PUBLIC**

# Technology leveraged at every step in the chain





# January 17, 2017 – Davos – Launching of the **Hydrogen Council**

13 Companies and their CEO's joining forces to voice the vision and the ambitions of the Hydrogen industry

Hydrogen acknowledged as a key solution to empower the energy transition

A further lever to accelerate H2 infrastructure & FCEV deployments!





# 2015 → 2017: Building up scale all over the world!



From  
1 000  
to  
10 000  
FCEVs !

**Hydrogen Council**

AirLiquide ALSTOM AngloAmerican BMW GROUP DAIMLER ENGIE  
HONDA HYUNDAI Kawasaki Shell THE LINDE GROUP TOTAL TOYOTA

From  
100  
to  
300  
H2 Stations !

# Looking beyond 2017...

- Hydrogen and Fuel Cell Electric Vehicles are at the **Tipping Point** !



- Early movers have proven that **it is sustainable!**
- **More players need to join the game** to further increase the momentum: *Car OEM's, Energy companies, financial investors, governments...*