H₂ Energy
At the heart of the energy transition

Dave Edwards
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2019 Key Figures

- ~67,000 Employees
- Present in 80 Countries
- More than 3.7 Million Customers & Patients
- Revenue: €21.9bn
- Net Profit (Group Share): €2.24bn
- Investment Decisions: €3.7bn

Oxygen (O₂)  Nitrogen (N₂)  Argon (Ar)  Hydrogen (H₂)  Helium (He)  Carbon Dioxide (CO₂)  Carbon Monoxide (CO)
Air Liquide has nearly 50 years of hydrogen development for industries

**Production & Supply chain**

- Production
- Supply chain

**Distribution Networks**

- US Gulf Coast
- Northern EU
- Singapore

**Markets Segments**

- Process industries
  - Oil & Gas
  - Steel, Glass
  - Electronics
  - Transportation
  - Space

**Key Figures**

- 14 Bm³/yr
- 1,850 km H₂ pipeline
- 46 large H₂/CO plants
- 40 electrolyzers in operation
- 2 B€ sales

Public - Oct. 2020

HYDROGEN ENERGY
Air Liquide
Investments in North America

Air Liquide

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HYDROGEN ENERGY
Air Liquide new investments in North America

1st large scale renewable liquid hydrogen production plant dedicated to the Hydrogen energy markets

- **Investment:** $150M
- **Capacity:** 30 tons per day (40,000 FCEVs in the West Coast)
- **Location:** North Las Vegas, Nevada
- **Construction:** Began in 2020; operations & delivery in 2022

World’s Largest PEM Electrolyzer to supply ~100% decarbonized hydrogen for Canada and the East Coast Markets

- **Investment:** $40M (additional investment to existing site with liquefier)
- **Capacity:** >8 tons per day (20 MW PEM)
- **Location:** Bécancour, Québec
- **Construction:** Began in 2019; operations & delivery by year-end

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Nevada Construction
Becancour Site
Becancour Site - Aerial view
Hydrogen for Airport Ground Applications
Hydrogen supply to an Airport - Demand

LAX: What would a hydrogen based ground fuel infrastructure look like

In a given year, LAX ground operations consume
(Source LAWA: 2000 LAX Operations)

25M gallons of diesel
115M gallons of gasoline
1700 thousand therms LNG/CNG

Diesel consumption
13% ground support equipment
4.5% stationary equipment
8.5% on airport vehicles
74% off airport vehicles

This is equivalent to about 35tpd H2
Hydrogen supply to an Airport - Production

35tpd H2 Production

SMR - similar to our project in NV (30tpd)
Note: this is 1/8th the size of large scale, industrial SMR

Electrolyzer - 80MW - 4X our Quebec project

Onsite or Offsite production?
Hydrogen supply to an Airport - Supply

35tpd H2 Supply

Liquid Delivery - on road
~8 trailer deliveries per day

Gaseous - on road
~ 70 trailer deliveries per day (!)

Gaseous - pipeline
Small offtaker - is there an existing pipeline?
Hydrogen supply to an Airport - Storage

35tpd H2 Consumption x 2-3 days backup
= 70-100 tons of storage

Liquid storage
  Sphere(s)

Gaseous storage
  HP cylinders

Gaseous - pipeline
  No (very limited) storage needed
Typical H2 Stations - in the field and in planning

**Offroad (warehousing)**
- Current US:
  - 1 tpd, liquid
  - 4 dispensers

**LDV**
- Current CA: collocated at gasoline stations
  - 0.8 tpd, gaseous and liquid supply, some with onsite production
  - 4 dispensers, 350 and 700 bar

**HDV**
- Planned US: 10+ tpd, liquid supply, some with onsite production
  - 4-8 dispensers
Hydrogen supply to an Airport

The challenge is scale

Production, supply and distribution - proven at scale

Applications - vehicles in service and under development

Dispensing infrastructure - leverage existing
Thank you!