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Moving forward



# California Energy Commission 2021 Integrated Energy Policy Report (IEPR) Workshop July 28<sup>th</sup>, 2021




Eric Guter, Vice President, Hydrogen Mobility Solutions





# Air Products is the world's leading hydrogen producer

## Built on deep experience, strong performance, high ambitions

<p><b>1</b> only US-based global industrial gas company</p>	<p><b>19,000</b> employees</p>	<p><b>1,800</b> miles of industrial gas pipeline</p>	<p> <b>50</b> patents for hydrogen fueling</p>
<p><b>\$8.9</b> billion in sales from operations</p>	<p><b>81</b> years in business</p>	<p><b>1.5 million</b> fuelings per year </p>	<p><b>30+</b> years supporting California's clean fuels program</p>
<p><b>~\$60B</b> market cap</p>	<p><b>750+</b> production facilities</p>	<p> <b>250+</b> H<sub>2</sub> fueling projects</p>	<p><b>\$8B+</b> announced to accelerate transition to zero-carbon transportation</p>

Ready to support sustainable transportation goals by providing 100% carbon-free hydrogen for mobility

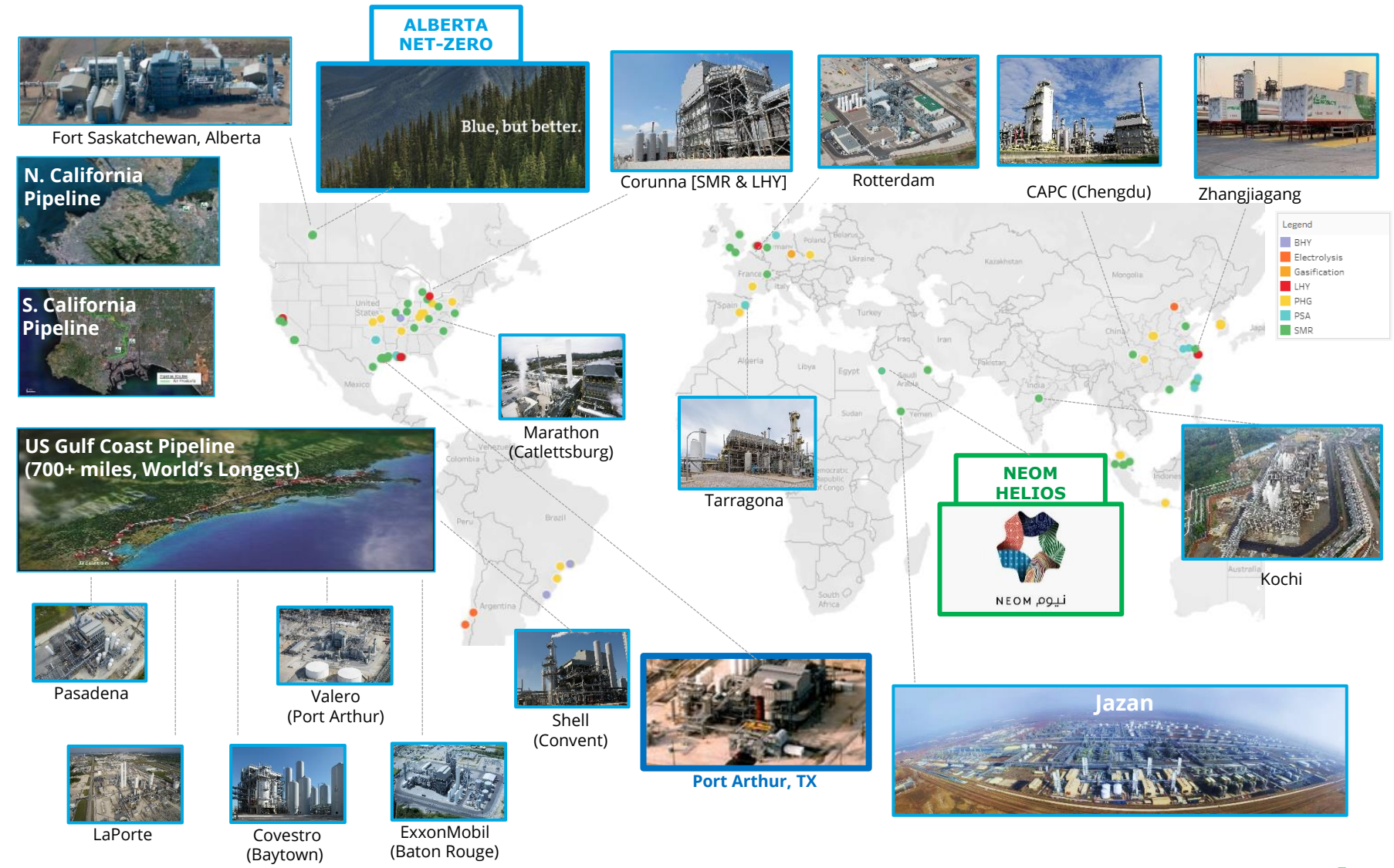
# Air Products is #1 in hydrogen

## Hydrogen Production Key Figures

**>110 Hydrogen production Facilities**  
(SMR, PHG, LHY, BHY, Electrolysis)

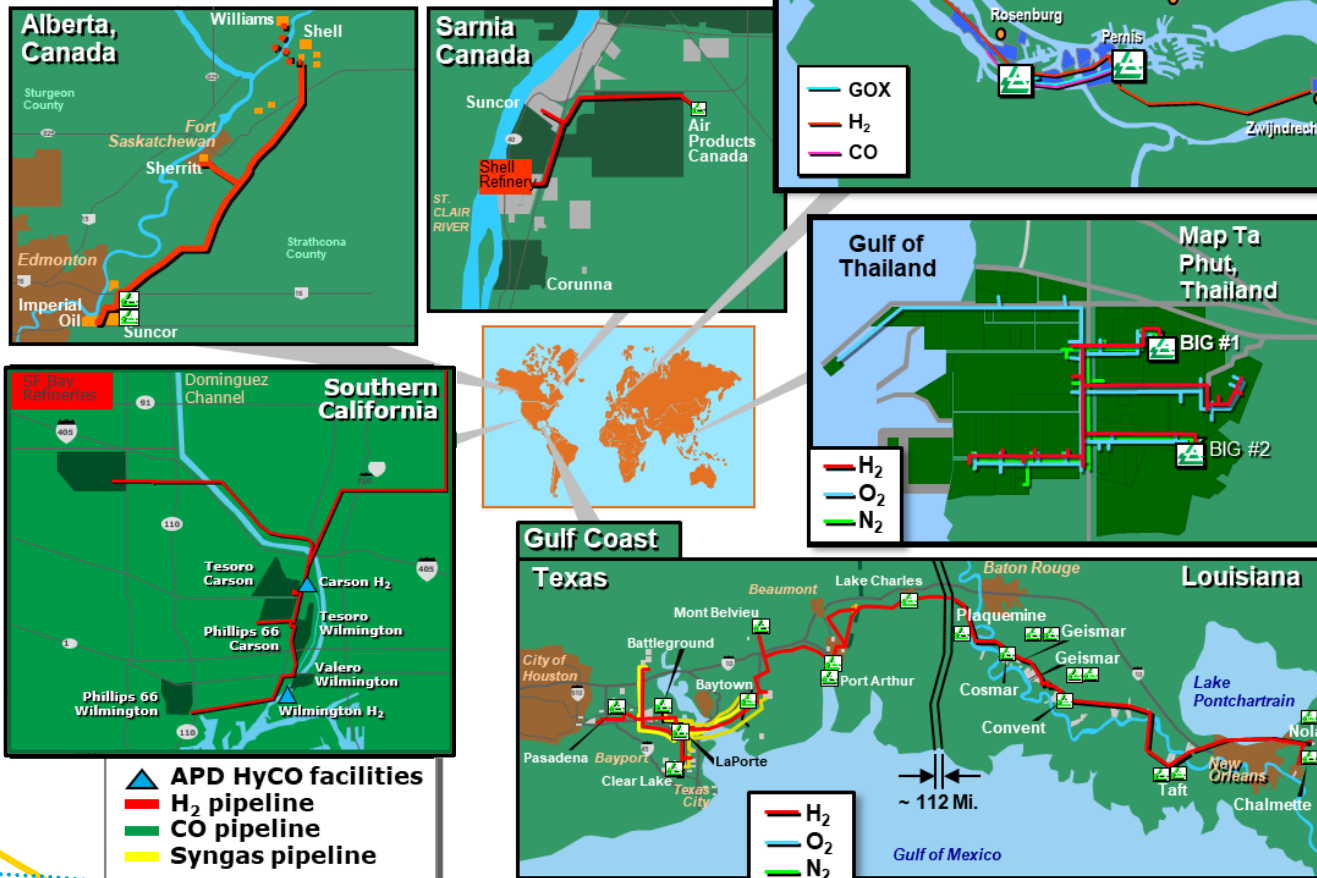
**>8,000 MTD Capacity**  
Incl. ~600MTD Blue H2 of Port Arthur

**>1,600 MTD to be built over next 5 years**



# Air Products offers a full range of distribution options

## World's Largest Hydrogen Pipeline Network



World's Longest Hydrogen Pipeline  
 ≈700 miles (>1100 Kms)

15 Million miles  
 (24 Million kms)  
 Driven / Year



NH<sub>3</sub> as fuel or as  
 carrier for H<sub>2</sub>

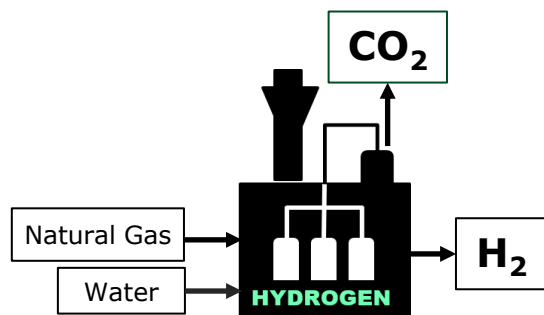




# The world is moving towards low-carbon hydrogen production

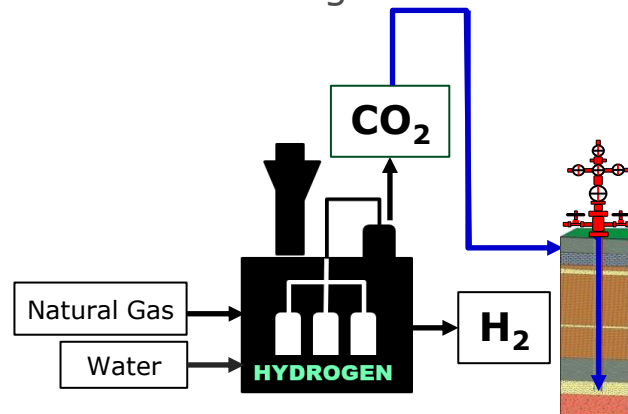
## Grey Hydrogen

- Steam methane reforming (SMR)
- Currently, ~95% of hydrogen in the world is gray and produced by SMR



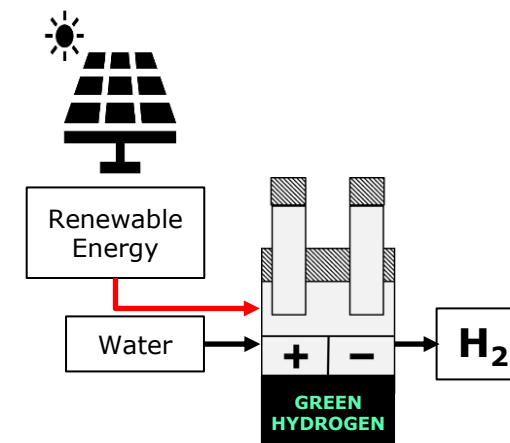
## Blue Hydrogen

- SMR with CO<sub>2</sub> capture and storage
- Enables decarbonization of plants that are already built
- Can achieve negative carbon emissions utilizing biomass



## Green Hydrogen

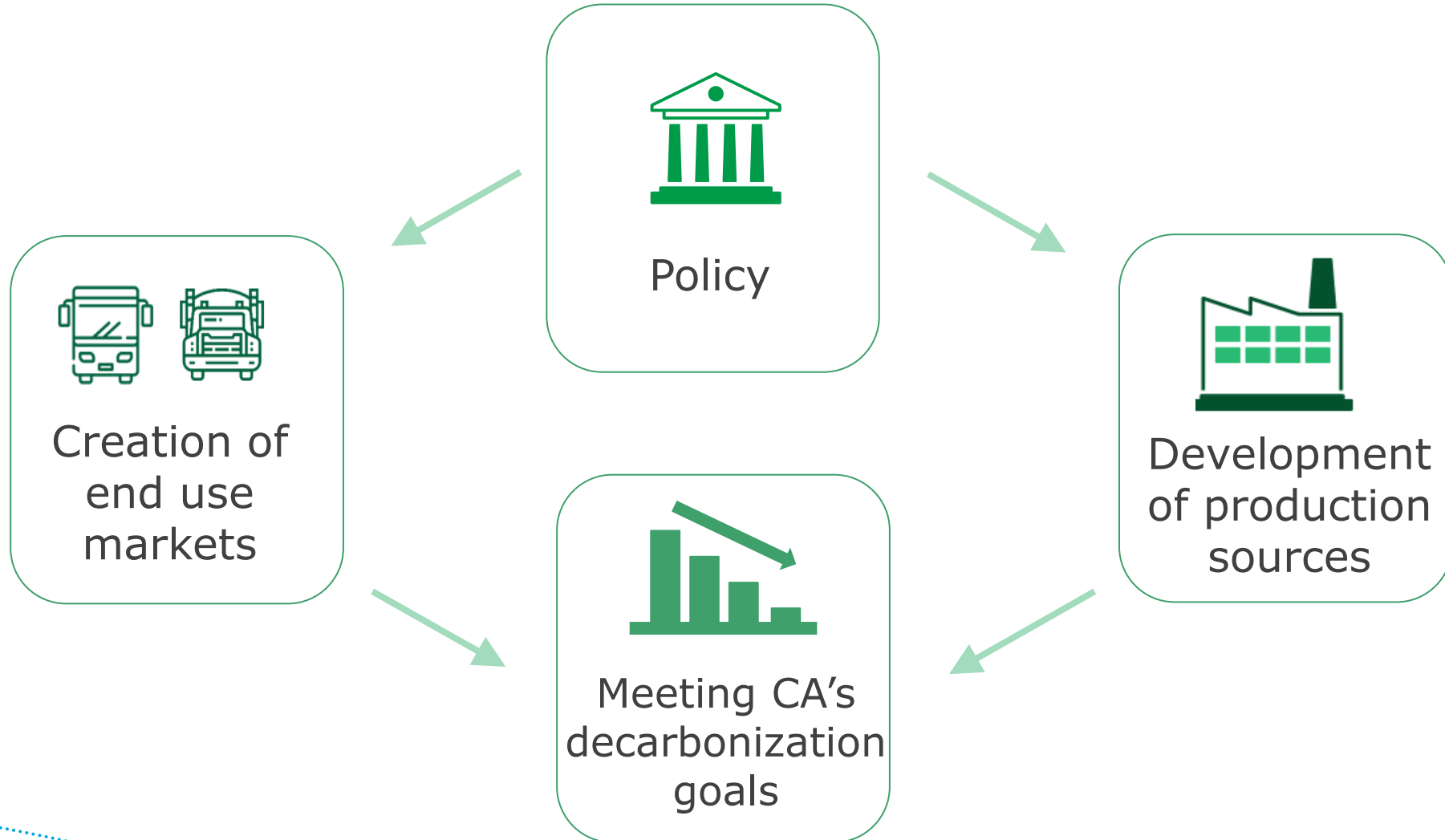
- Electrolysis of water with renewable energy
- CO<sub>2</sub>-free, requires new construction and low-cost renewable energy



**Current state**  
(~70 million tonnes H<sub>2</sub> annually)

**Carbon-free future**  
(50–100+% CO<sub>2</sub> reduction w/CC, carbon-free w/Electrolysis + Renewable Power)

# Key to decarbonization: Implementation of effective policy that is technology agnostic





# Renewable energy and hydrogen are complementary for decarbonization transportation and heavy industry



## Renewable energy & Battery electric technologies



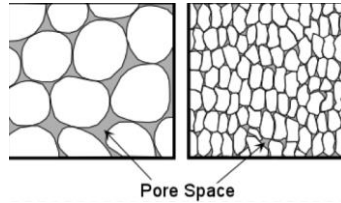
## Hydrogen & Fuel cell technologies

Mobility	Cars	Buses on shorter routes	Buses	Port equipment (drayage trucks, yard switchers etc.)
	Light- and medium-duty trucks	Commuter rail (via catenary)	Medium- and heavy-duty trucks	Rail
Industry / heating	Light industries	Heating / cooling	Heavy industries (Shipping, aviation, steel, aluminum, concrete, etc.)	
Energy storage	Short-term lithium ion		Long-term storage of renewable energy	



# Opportunities to accelerate the energy transition

## Production



Policy encouraging rapid development of new, decarbonized sources of hydrogen

- Easy access to pore space for permanent sequestration of CO<sub>2</sub> from industrial processes
- Increased financial support for qualified hydrogen production projects

## Infrastructure



Support to expand infrastructure to drive and meet growing demand

- Extend LCFS capacity credits (HRI) to heavy-duty applications
- Contracts for differences or other mechanism to support fueling station network development

## Market Certainty



Clear regulatory signals that influence fleet purchasing decisions and planning

- Long-term visibility on purchase incentives for transit, heavy-duty, and off-road fuel cell and other ZEV
- Clear policy signals to decarbonize industry and power plants, including using CCS and low-carbon hydrogen

*Streamline permitting*