Hydrogen Energy Market Engagement

Air Products and Chemicals, Inc.

David Taylor –VP Energy Businesses
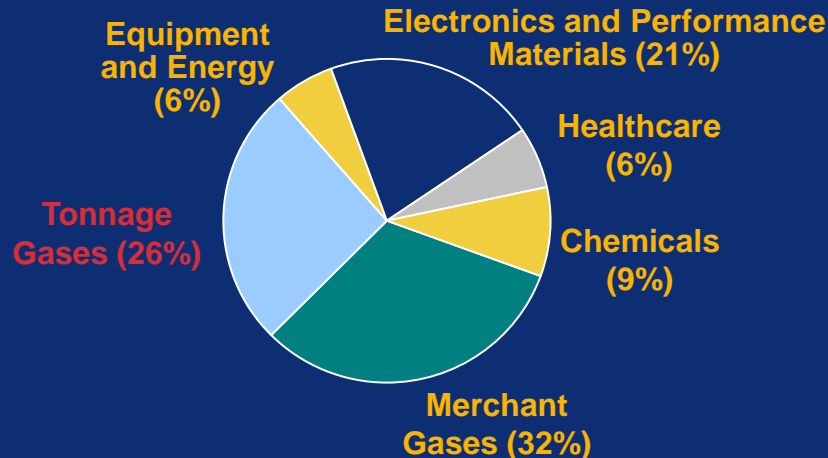
April 3, 2008

Sales into Diverse Markets
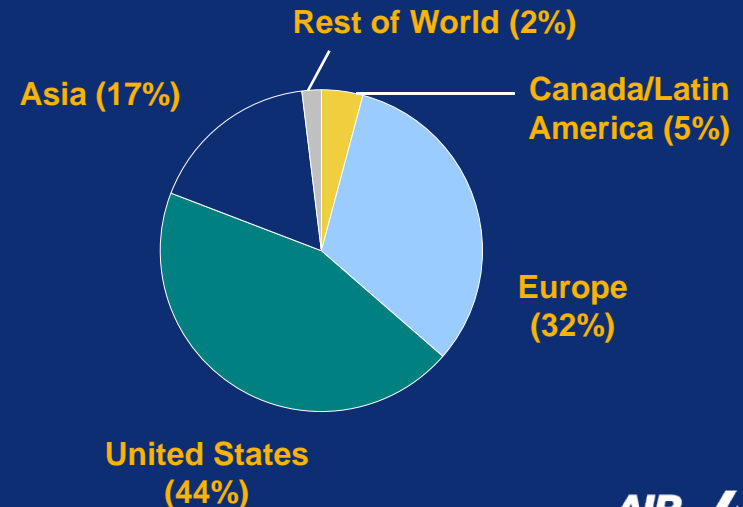
- **US$10B in sales**
- **Diverse markets and geographies**
- **Positioned for long-term value creation**

FY07 Consolidated Sales

By Reporting Segment

Electronics and Performance Materials (21%)
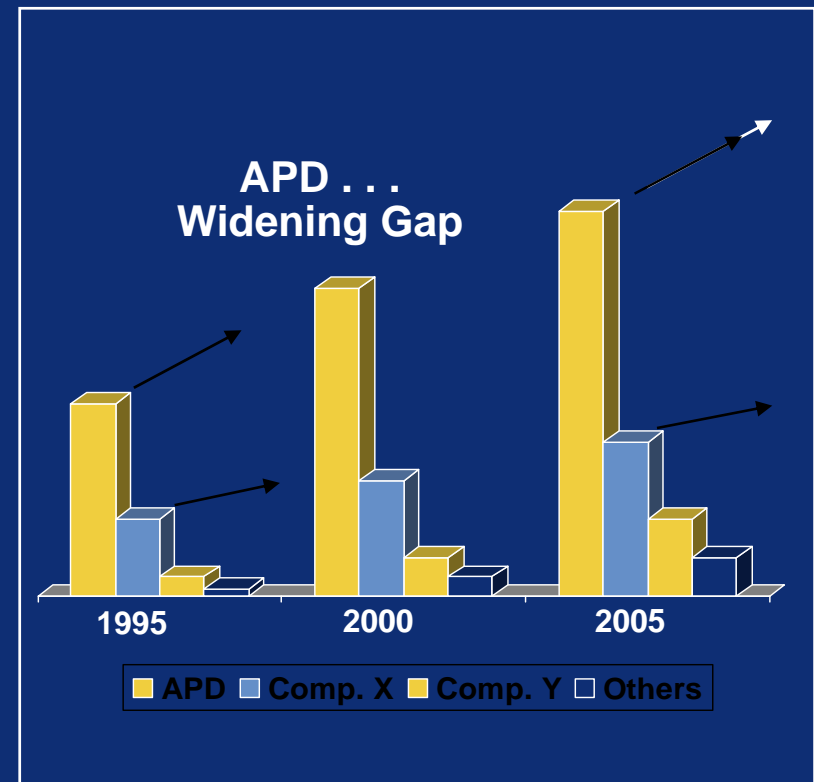
Healthcare (6%)

Chemicals (9%)

Merchant Gases (32%)

Tonnage Gases (26%)

Equipment and Energy (6%)

By Destination

Rest of World (2%)

Canada/Latin America (5%)

Asia (17%)

Europe (32%)

United States (44%)

AIR PRODUCTS

Tonnage Gases
Market Leader in Refinery Hydrogen

Global #1 HyCO Position

On-stream 2007

APD
(1940 MMscfd)

Comp X

Comp Z

Comp Y

4,600 Million SCFD
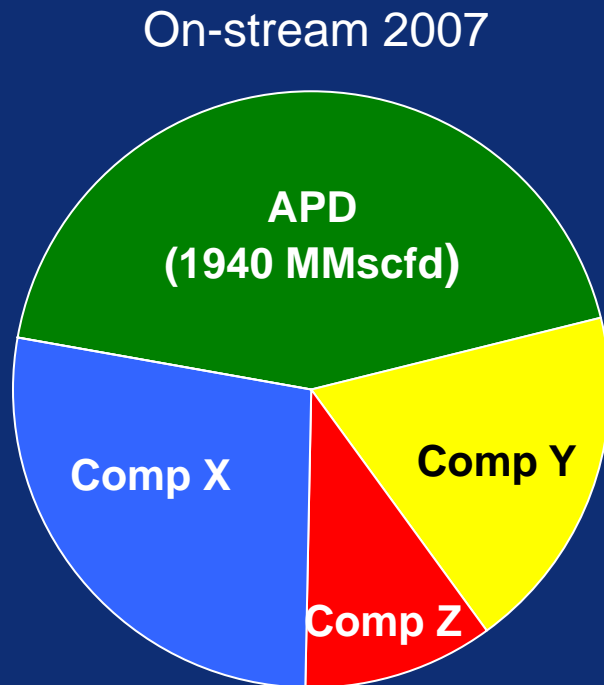
H$_2$ Plant Operating Years

APD . . .
Widening Gap

| 1995 | 2000 | 2005 |

APD Comp. X Comp. Y Others

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Air Products Hydrogen Facts

- **Our total capacity could support 7-8 million vehicles if used only for vehicle fueling. California and Texas are major hydrogen producers and could support 100,000+ vehicles with current excess capacity.**

- **As a leading supplier of hydrogen used by refiners, we help produce clean fuels and improve air quality.**
    - **Our advanced technology helps customers meet state and federal clean air regulations including Clean Air Act**

- **We build the most reliable and efficient facilities and pipeline systems.**
    - **Energy Efficiency: Our plants emit less per unit of hydrogen and recycle RFG versus competitive systems.**

- **Hydrogen is also use in glass, steel, foods, pharmaceuticals and electronics. We touch it everyday !**

Leadership in Hydrogen Fuel Infrastructure

- **Worlds largest producer of merchant hydrogen ~50% share**

- **Active since 1993**
  - **Built over 75 hydrogen station projects (20+ in CA)**
  - **Over 55,000 fuelings**
  - **in 14 countries**

- **Strong and broad IP position.**

- **Responsible for many fueling first deployments.**

AIR PRODUCTS

Leadership in Hydrogen Fuel Infrastructure

- **Turnkey Systems Integrator**
- **Have at our disposal**
  - **Methane conversion technologies**
  - **Gas clean-up technologies**
  - **Gasification**
  - **Electrolysis**
  - **Renewables**
- **Significant effort in generation R&D**
  - **Nuclear**
  - **Coal**
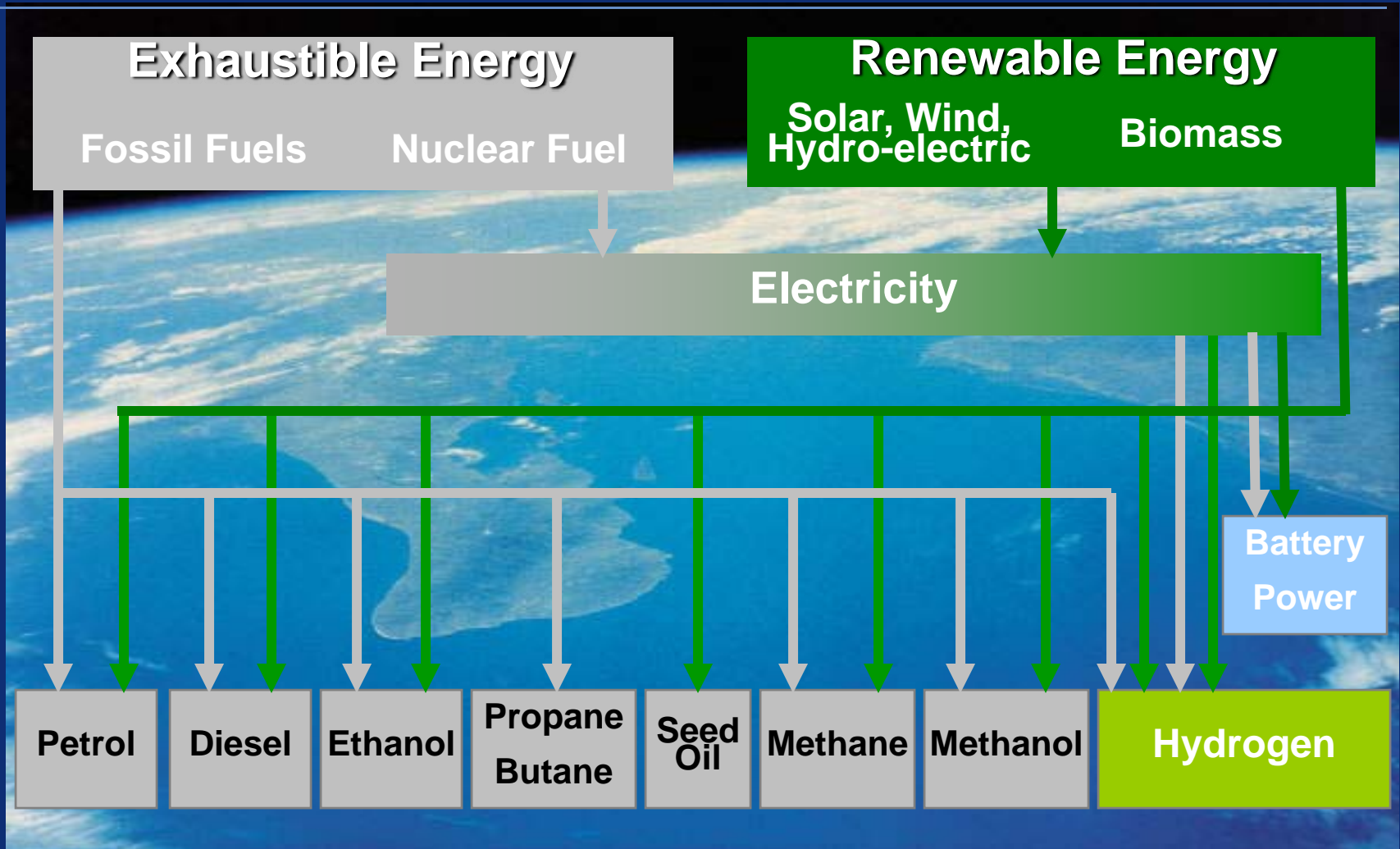- **Supplier of the most cost effective molecule to the marketplace**

AIR PRODUCTS

Drivers for alternatives energy supply are:

- **Efficiency**
- **Independence**
- **Environment**
- **Sustainability**

AIR PRODUCTS

There are several Alternative Fuels

Exhaustible Energy

Fossil Fuels   Nuclear Fuel

Renewable Energy

Solar, Wind, Hydro-electric   Biomass

Electricity

Battery Power

| Petrol | Diesel | Ethanol | Propane Butane | Seed Oil | Methane | Methanol | Hydrogen |

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Well-to-Wheel Efficiency by Vehicle Platform

Gasoline

81%   16%   19%

PHEV – (US Mix)

81%   24%   26%   42%   70%
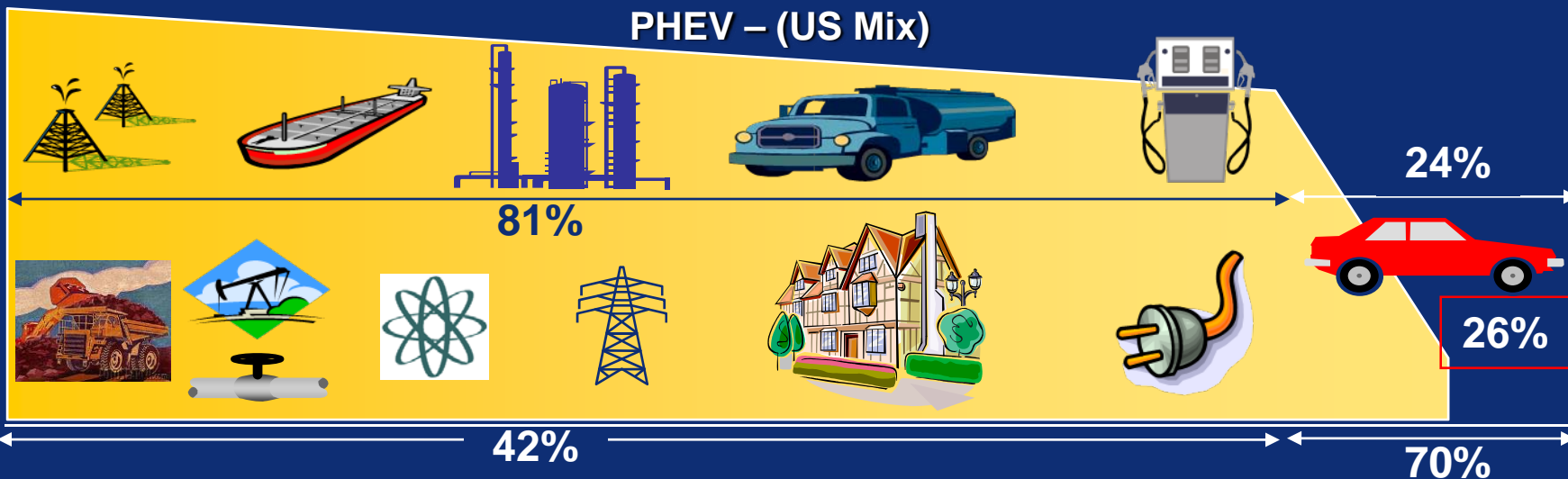
Central H2 Production - Pipeline Delivered

33%   64%   52%

AIR PRODUCTS
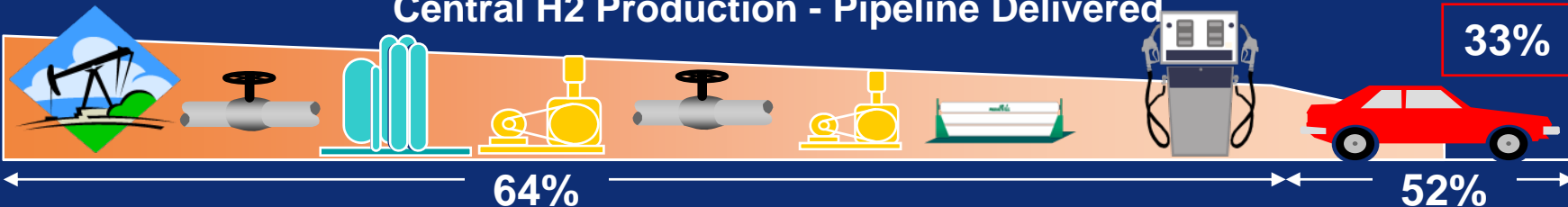
Well-to-Wheel Greenhouse Gas Emissions by Vehicle Platform

Conventional

Plug-In HEV

H2 FCV

0   50   100   150   200   250   300   350   400   450   500

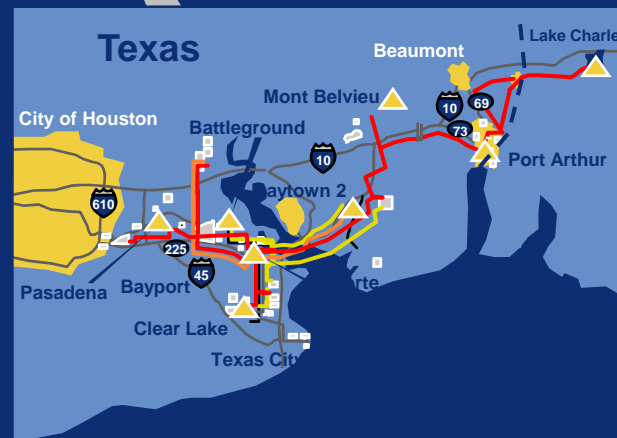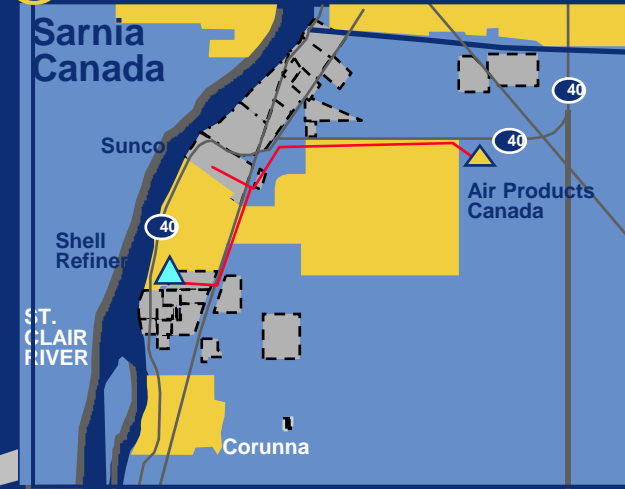**GHG's (g/mi CO2 equivalent)**

AIR PRODUCTS
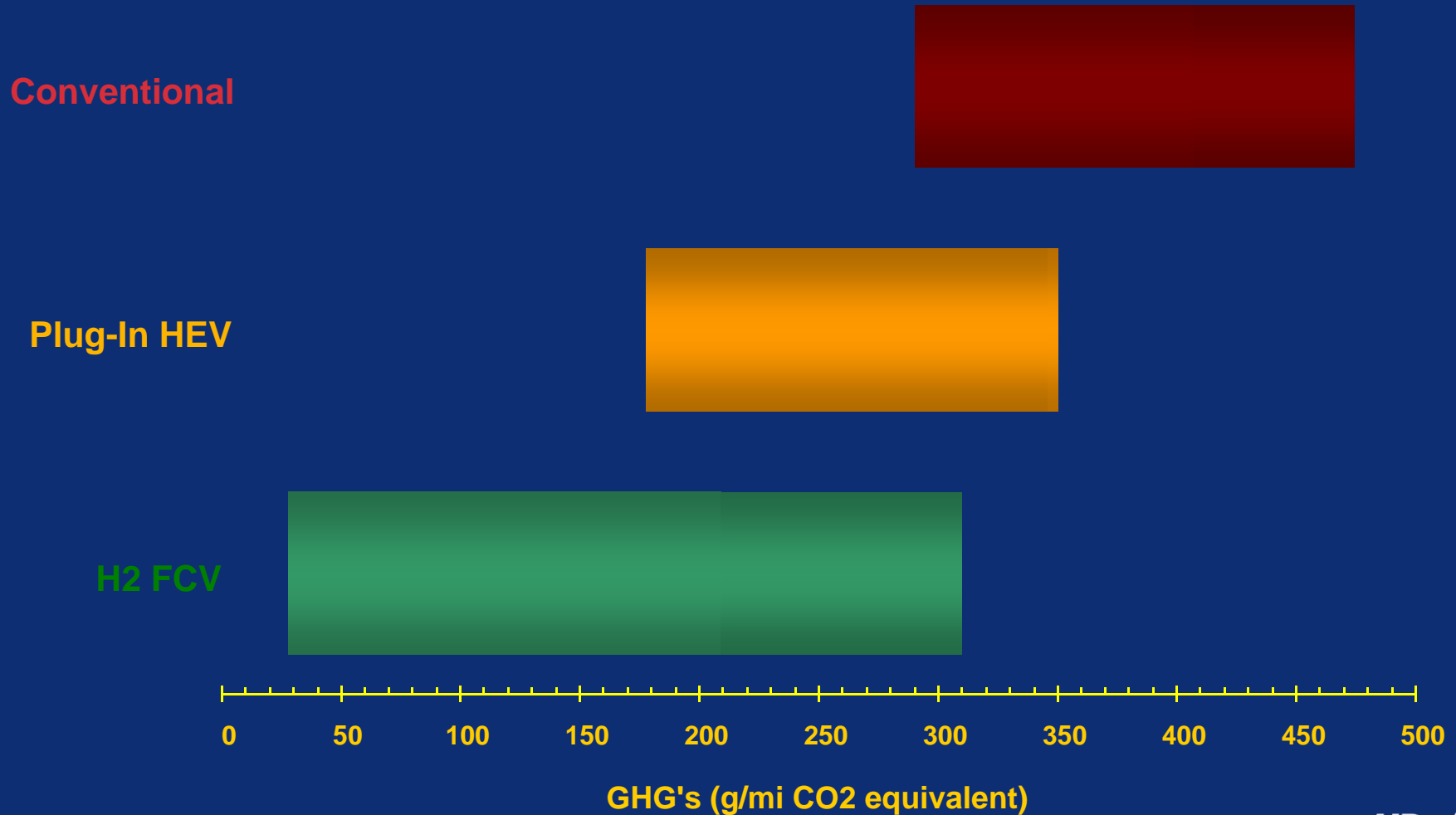
Infrastructure Transition

- **Provide technologies which have utility today while positioning for the future**

- **Focus on a regional model with abundant H2 and population.**

- **Focus on mass transit in other urban areas.**

- ☆ *Future Hydrogen Infrastructure will include:*
  - *Pipeline delivered hydrogen similar to NG*
  - *Multiple feed sources of hydrogen from:*
    - *Biomass*
    - *Geothermal*
    - *Wind*
    - *Solar*
    - *Nuclear*
    - *Coal*
    - *Methane reforming*
  - *Delivered or distributed product in the outlying areas*

Strong Hydrogen Pipeline Positions

Louisiana
- Baton Rouge
- Plaquemine
- Geismar
- Geismar
- Cosmar
- Convent
- New Orleans
- Nola
- Taft
- Chalmette

Edmonton, Canada
- CN RAIL
- Imperial Oil
- Petro-Canada
- Sherwood Park

Sarnia Canada
- Suncor
- Shell Refinery
- ST. CLAIR RIVER
- Air Products Canada
- Corunna

Rotterdam
- Europoort
- Pernis
- Botlek
- Zwijndrecht
- Tarragona Refinery
- To Moerdijk

Southern California
- SF Bay Refineries
- Dominguez Channel
- 190th St.
- VAN NESS AVE.
- Sepulveda Blvd
- Carson H2
- BP Carson
- Shell Wilmington
- Long Beach Arpt.
- Conoco Phillips Carson
- Anaheim Street
- Valero Wilmington
- Conoco Phillips Wilmington
- Wilmington H2

Texas
- City of Houston
- Battleground
- Mont Belvieu
- Beaumont
- Lake Charles
- Pasadena
- Bayport
- Clear Lake
- Texas City
- Baytown 2
- Port Arthur

Legend:
- ▲ APD HyCO facilities
- H$_2$ pipeline
- CO pipeline
- Syngas pipeline

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AIR PRODUCTS

Air Products LA Basin Hydrogen Pipeline

- **~17 miles thru urban area**

- **operate ~500 miles of H2 pipeline worldwide**

- **In North America**
  - **LA Basin**
  - **Gulf Coast**
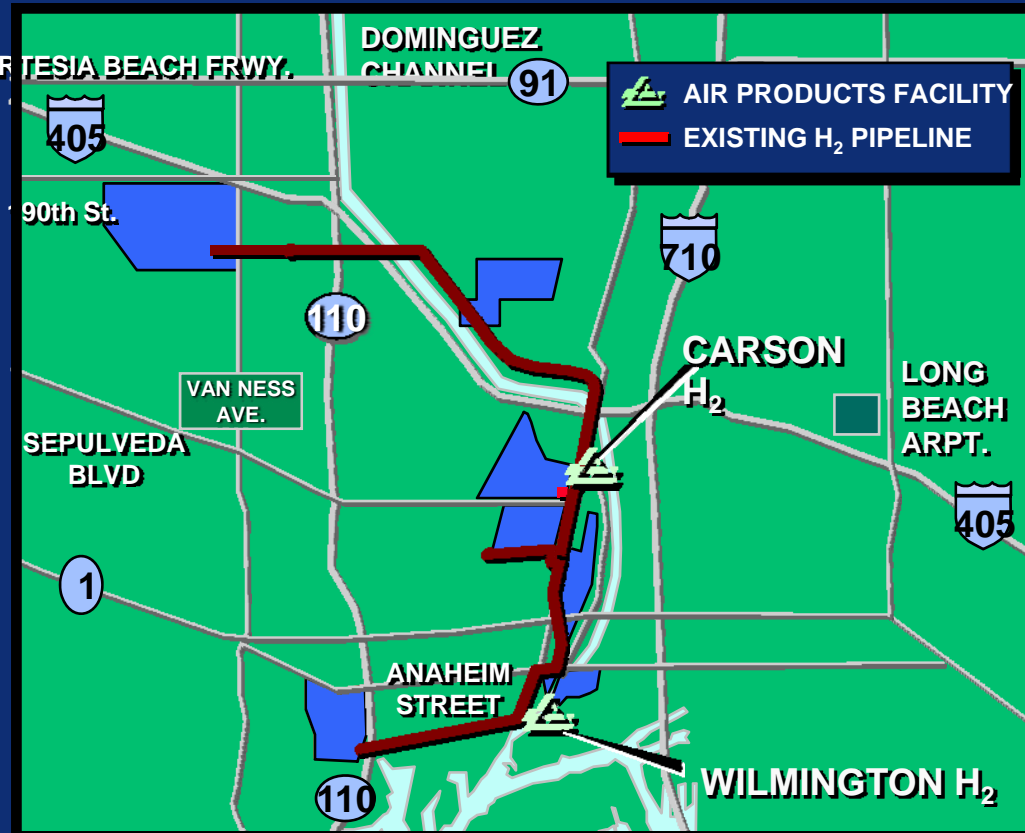
Fueling Stations

Alternate Applications build infrastructure

Off-road vehicles
H$_2$ Buses
HCNG Buses
Submarines
Cell-Towers

New Delivery Concept (NDC)

NDC
Vehicle

- New method of hydrogen distribution capable of supplying either low, medium, and high pressure gas or liquid hydrogen using a single trailer.

- Allows for increased integration of industrial hydrogen supply with hydrogen fueling stations driving improved efficiency and lower cost.
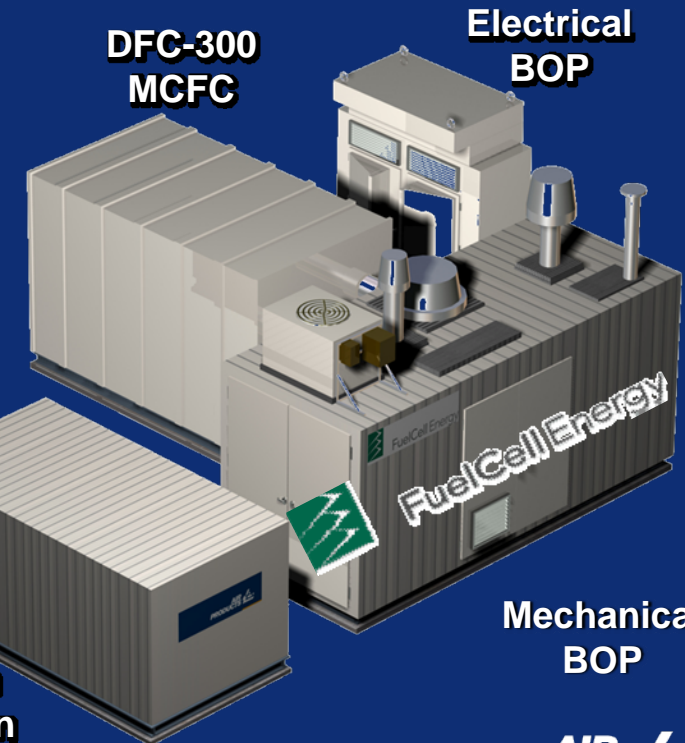
- Patented AP technology and business model

OCSD Energy Station to supply 'green' hydrogen to SoCal fueling stations

40 mile radius of OCSD

Current or Planned Stations

Feedstocks
Natural gas
Waste HC streams
Bio-gas

DFC-300 MCFC

Electrical BOP

A/E Cooling

Mechanical BOP

Hydrogen Purification

Products
Heat
Power
Hydrogen

Summary

- **Piggyback on the existing infrastructure is the lowest cost means for a hydrogen economy roll-out.**

- **Cost effective renewable hydrogen is feasible thru Hydrogen Energy Stations.**

- **Cost effective new delivery concepts are in demonstration.**

- **A hydrogen economy can only be realized with all industry stakeholders, universities, state, local and federal government working together.**

- **Let's not lose the momentum!**

Tell me more !

www.airproducts.com/H2energy