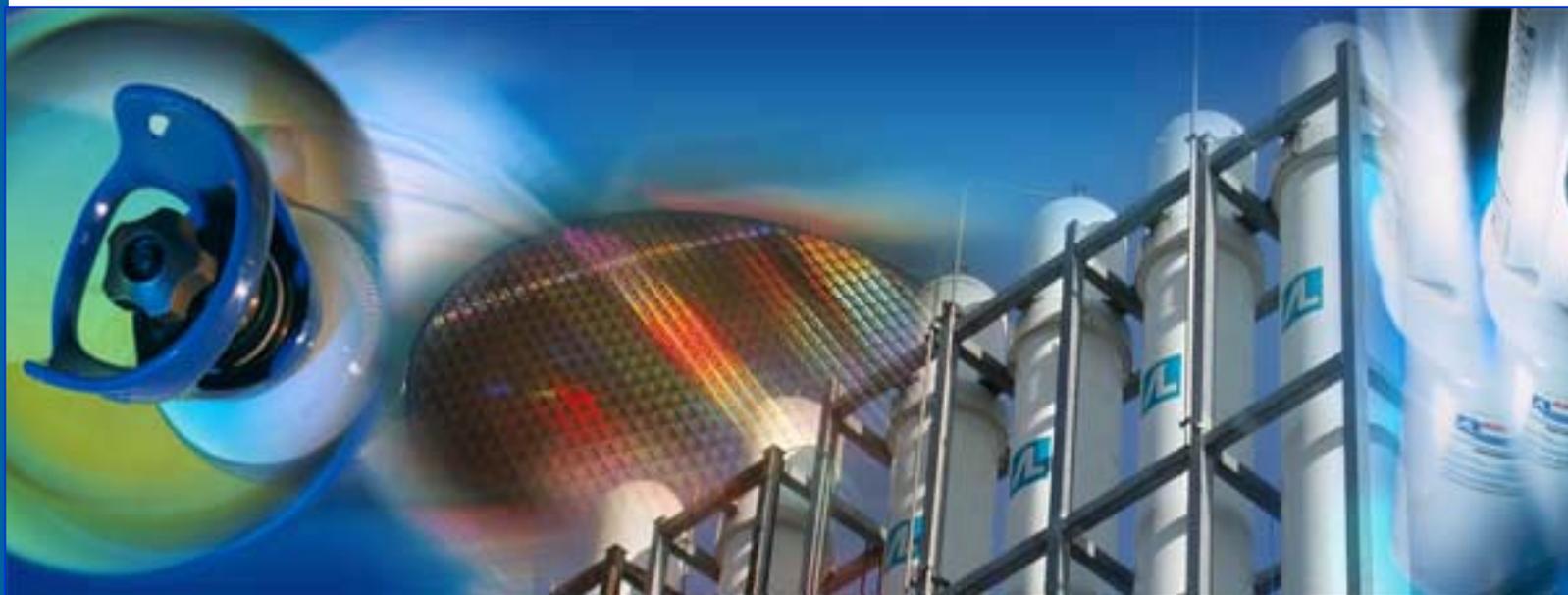




AIR LIQUIDE

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*Analyst, Investor & Journalist
Site Visit Houston*



Pierre Dufour: Executive Vice-President

John Glen: Group Finance Director

18 - 20 December 2005



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Hydrogen today...

A refinery and crude centric energy world

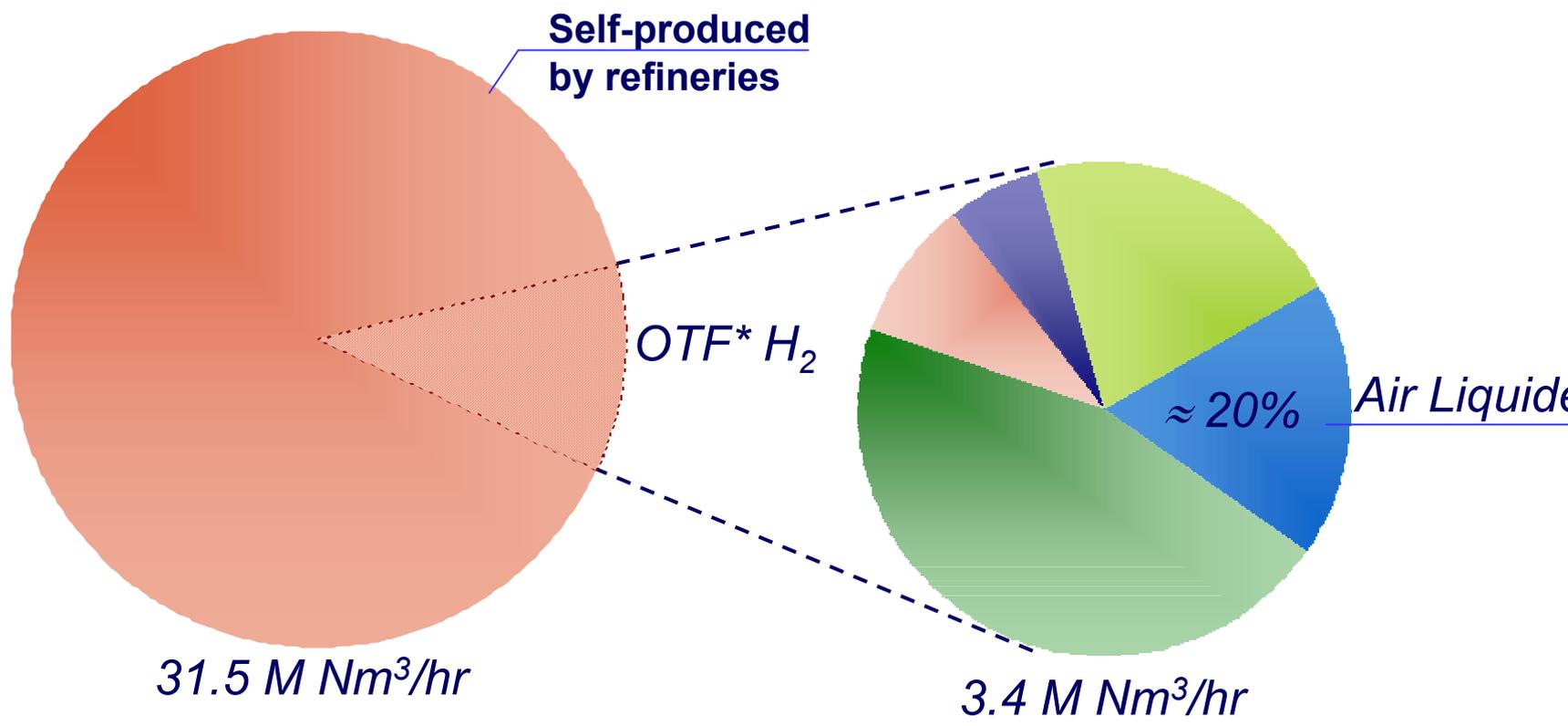
Hydrogen today

- The hydrogen market
- Air Liquide's worldwide presence
- Hydrogen growth drivers
- Consequences for Air Liquide
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World refinery hydrogen market in 2005

- Global consumption (self produced and OTF*) : 31.5 M Nm³/hr**
- Total industrial gas company OTF* production: 3.4 M Nm³/hr**

2005 hydrogen volumes



*OTF : "Over The Fence" sale of gas

** Nm³/hr: Normal cubic meter per hour

World class hydrogen plants



El Secundo - California



Jupiter - Belgium

- Capital intensity (investment / revenue)
 - ✓ 1.0 - 1.5 depending on natural gas prices
- $\approx 90 - 110,000 \text{ Nm}^3/\text{hr} \approx 80 - 100,000,000 \text{ Scf/d}^* \approx 100 \text{ M\$ investment}$

* Scf/d: Standard cubic feet per day

Incremental refining H₂ needs 2006-2011

- Global growth in hydrogen demand

Period 2006 - 2011	North America (Refineries)	Canadian (Oil sands)	Europe (Refineries)	Asia (Refineries)
Growth in demand (M Nm ³ /hr)	2.8	1.3*	1.3	1.5 to 2.5

* Oil sands hydrogen demand growth will continue to grow 8-9% beyond 2010

For reference

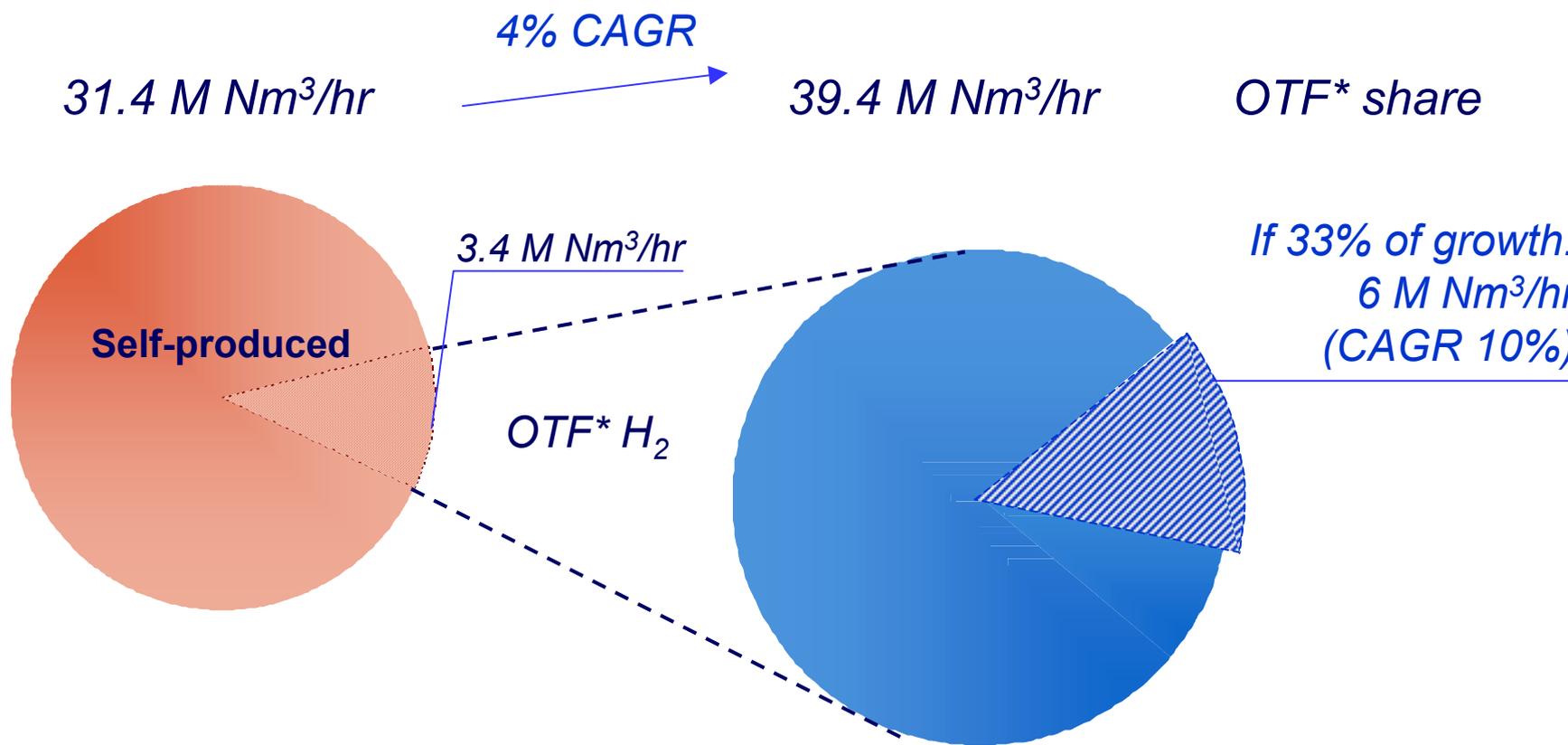
<i>El Secundo equivalent</i> X 	29 x 	13 x 	14 x 	16 - 26 x 
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- Based on estimates of refinery upgrade projections; actual decision timing may vary

Growth in the refinery hydrogen market

2006 - 2011

- Estimate 1: 1/3 outsourced

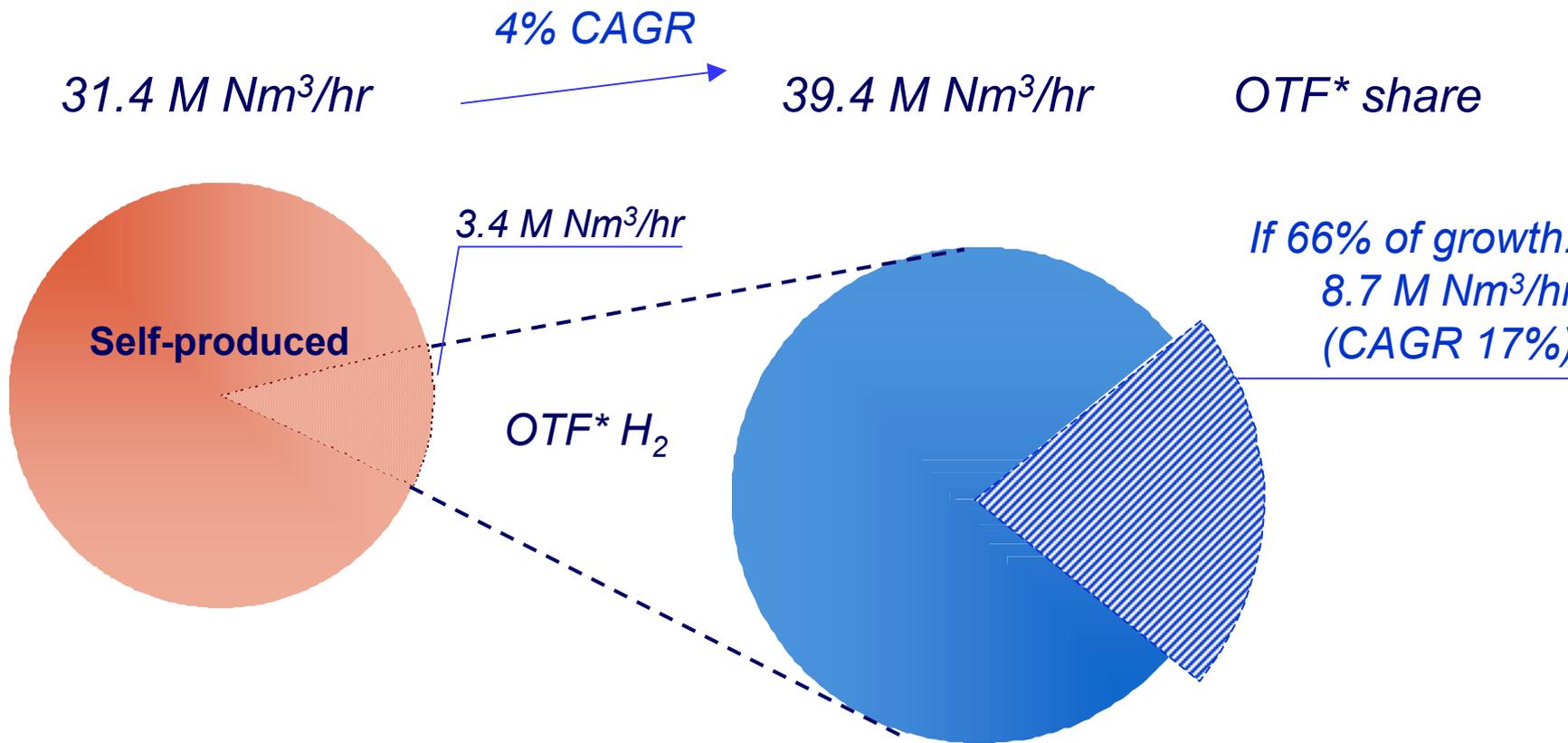


*OTF : "Over The Fence" sale of gas

Growth in the refinery hydrogen market

2006 - 2011

- Estimate 2: 2/3 outsourced



*OTF : "Over The Fence" sale of gas

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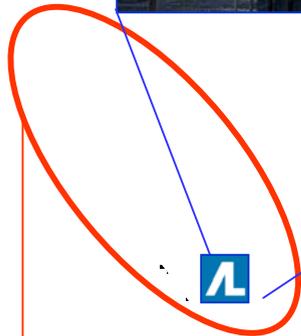
Air Liquide hydrogen presence worldwide



Air Liquide presence in the 2 main refining areas in the United States



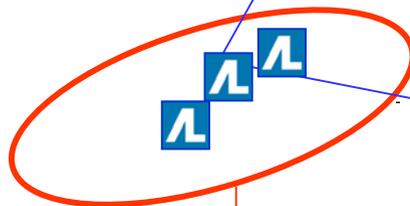
El Secundo



≈12% refining capacity



Freeport SMR

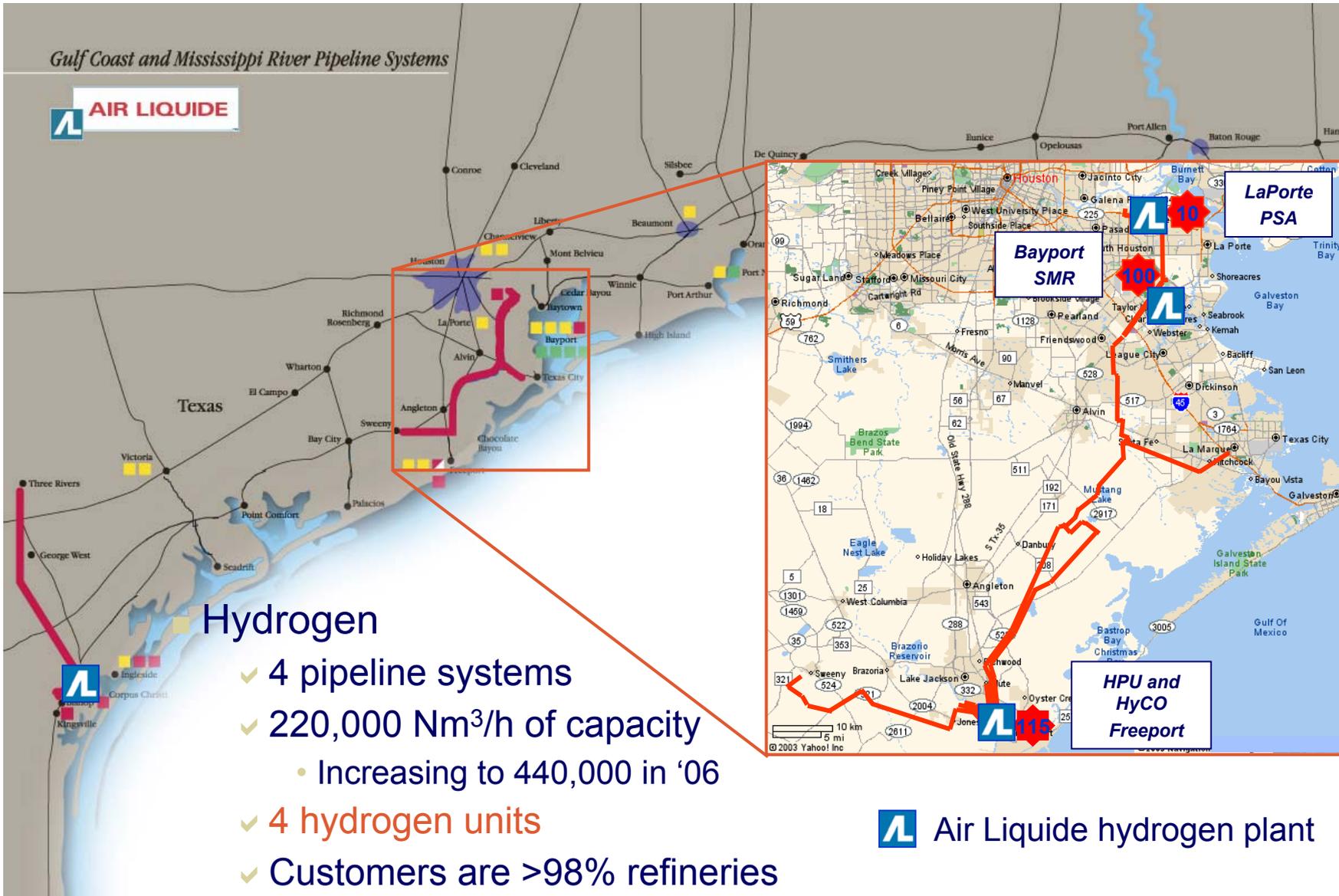


≈ 43% refining capacity



 Air Liquide hydrogen plant

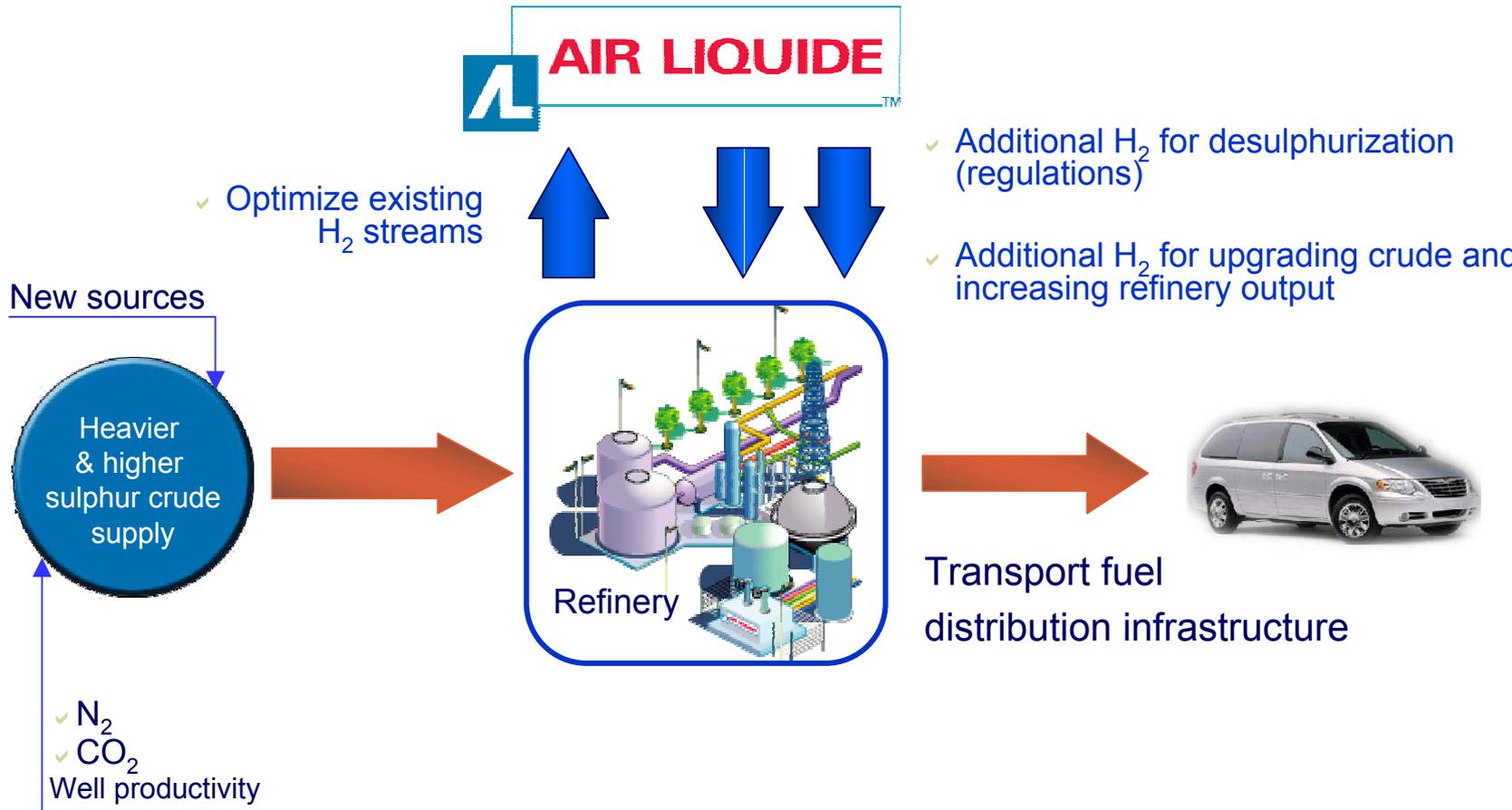
Air Liquide's US Gulf Coast air gases and HyCO pipeline



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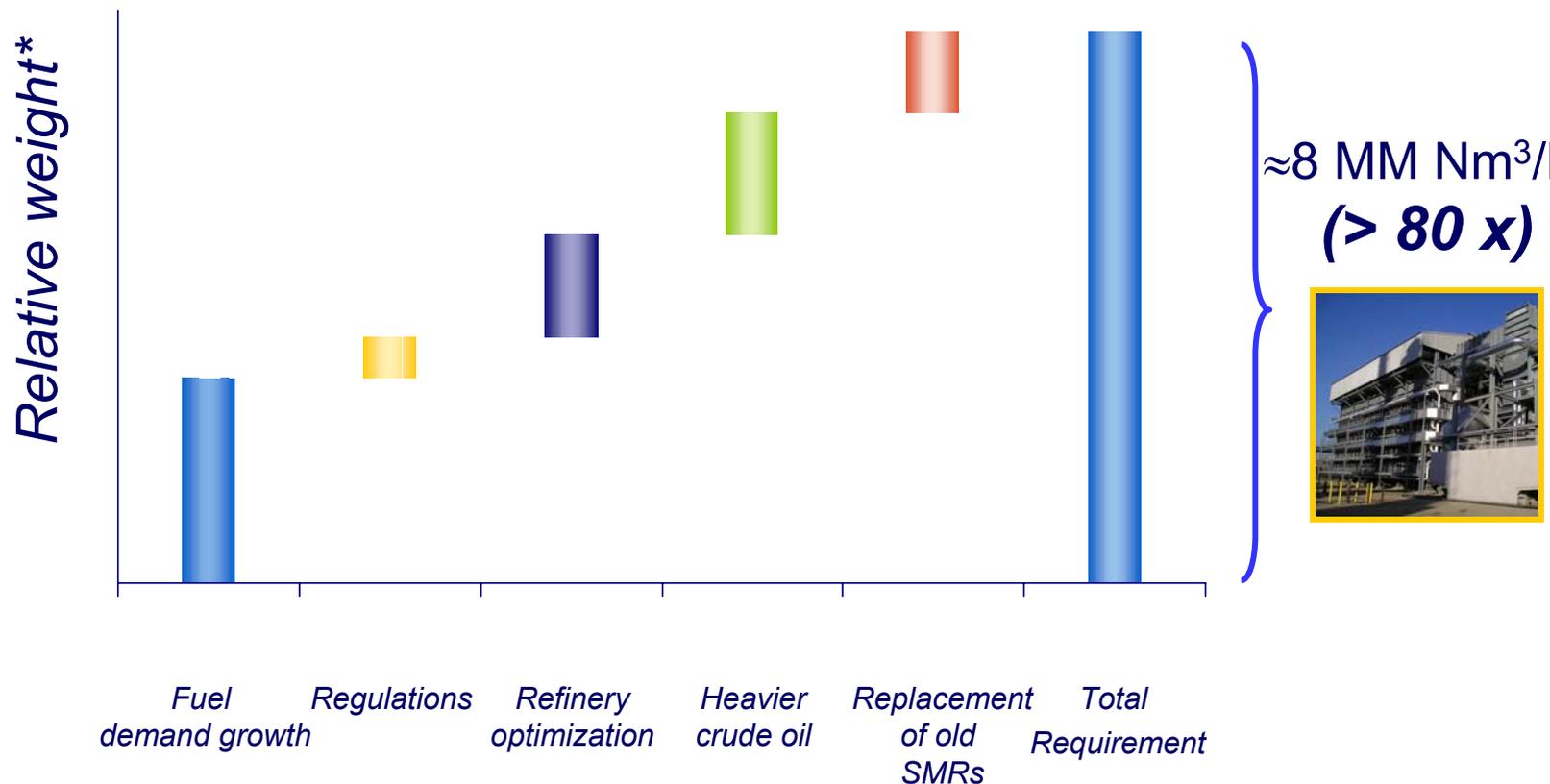
Hydrogen flows between a refinery and Air Liquide



- Existing energy model = refinery and crude centric

Refinery hydrogen investment will grow well beyond clean fuels

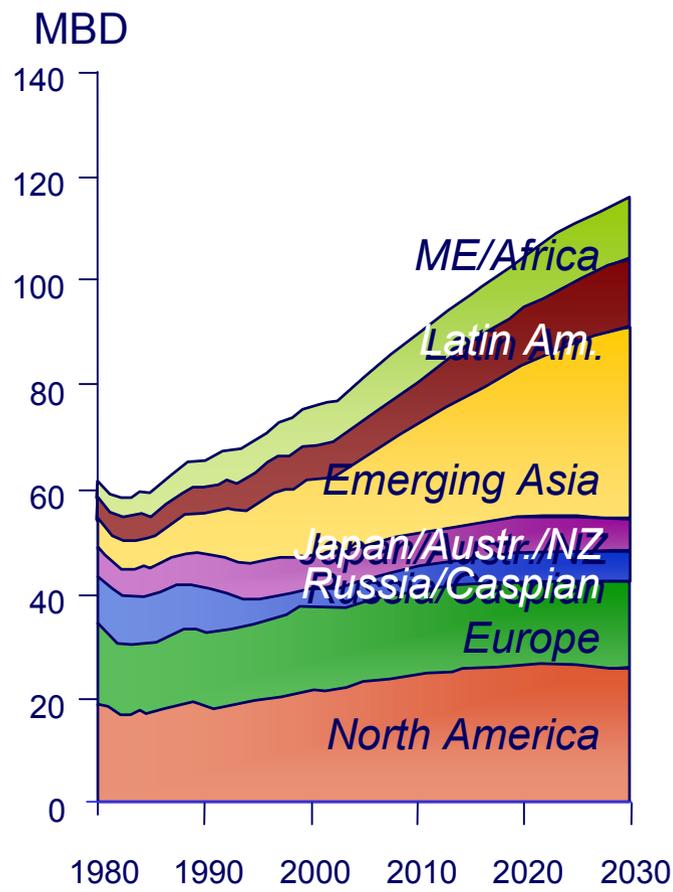
Worldwide hydrogen investment drivers 2006-2011



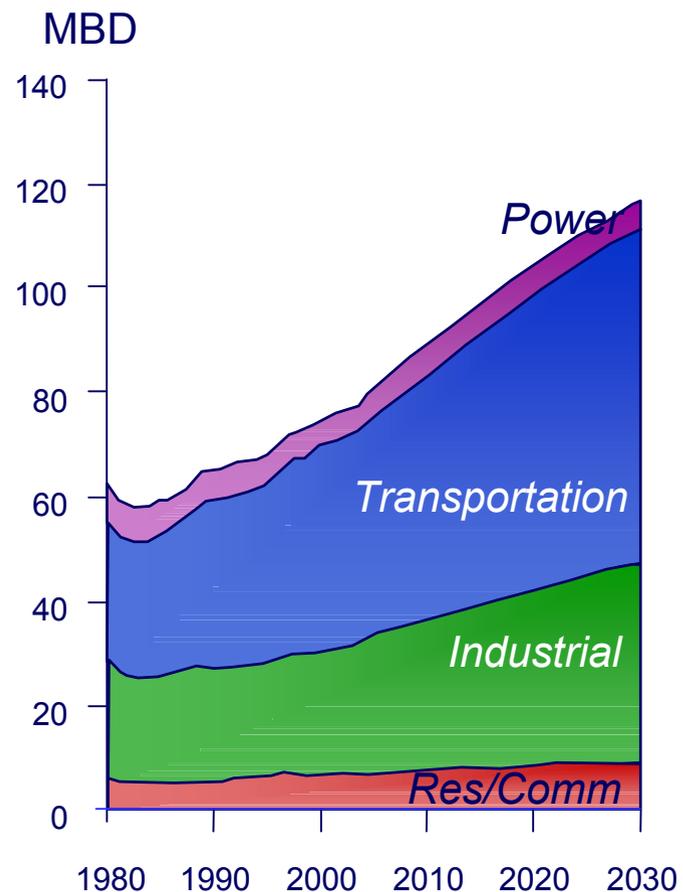
**Relative weight depends on project timing and the actual use of hydrogen in the refinery which is based on seasonality, crude slate used, and market demand*

World oil demand trends:

By region



By sector



■ Emerging Asia will drive demand

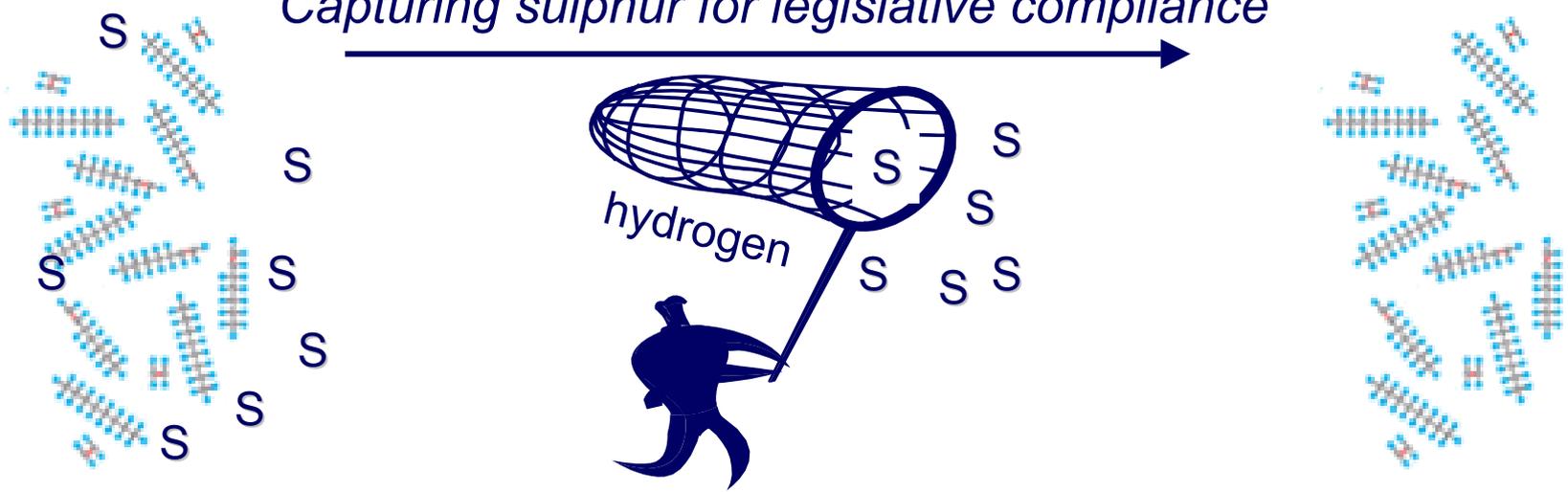
■ Transport will drive demand in all geographies

MBD: Million of Barrels per Day

Sources: ExxonMobile Outlook 2030

Two main uses for hydrogen in a refinery

Capturing sulphur for legislative compliance

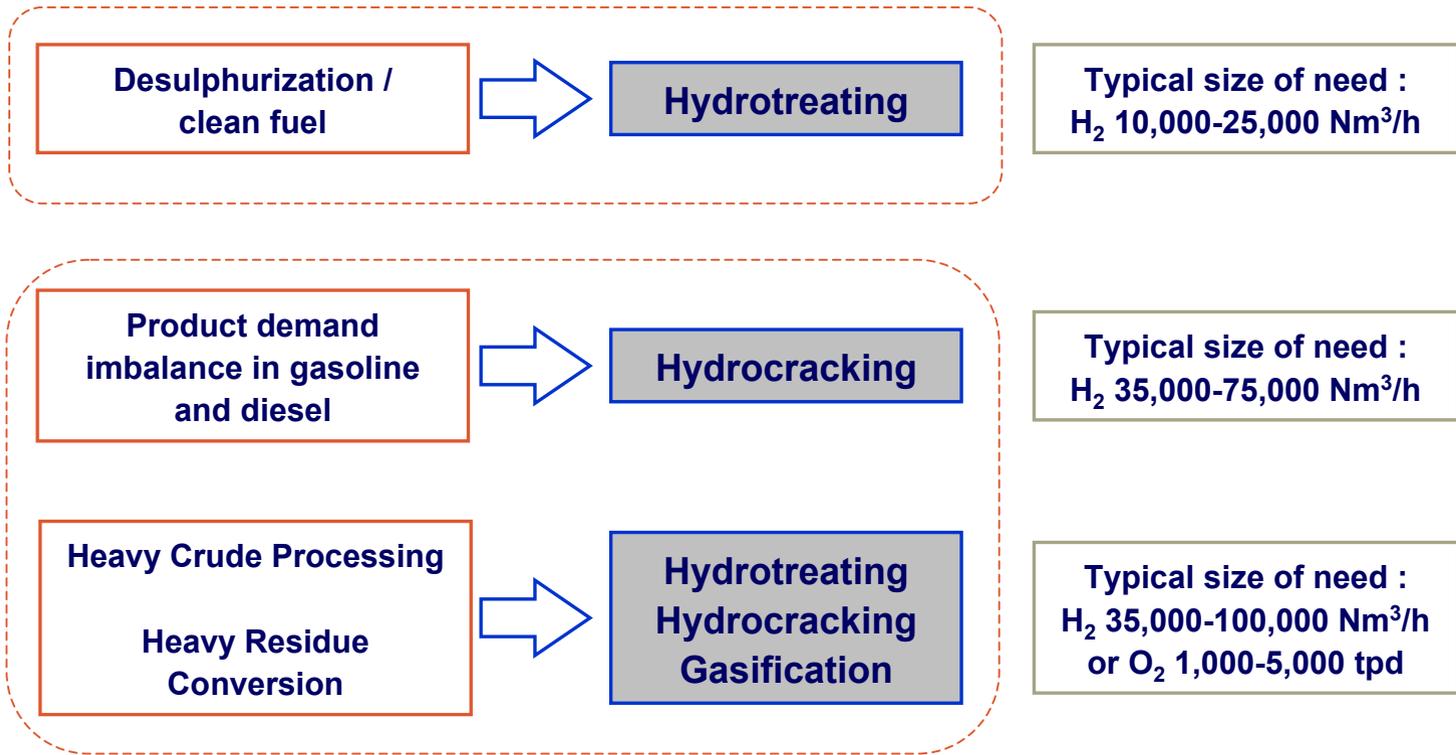


Splitting heavy and long hydrocarbons into higher value products

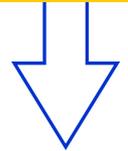
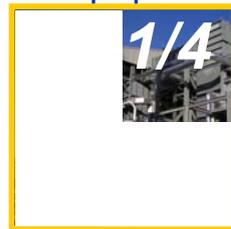


Refinery hydrogen and oxygen drivers:

many sources of hydrogen demand in refineries



“El Segundo equivalent” per refinery



Aging refinery hydrogen plants

A potential contributor to the outsourced hydrogen market

US and Canada	Europe
<p>≈ 60 plants</p> 	<p>≈ 50 plants</p> 
<p>≈ 20 sites under evaluation ≈ 10 other sites could be replacement/revamp candidates</p>	<p>≈ 5 sites under evaluation</p>
<p>27 sites are relatively new (post-1985) and would need replacement after 2010</p>	<p>> 45 sites are relatively new (post-1985) and would need replacement after 2010</p>

- Replacements are likely to occur first in the United States and Canada; an opportunity for Air Liquide

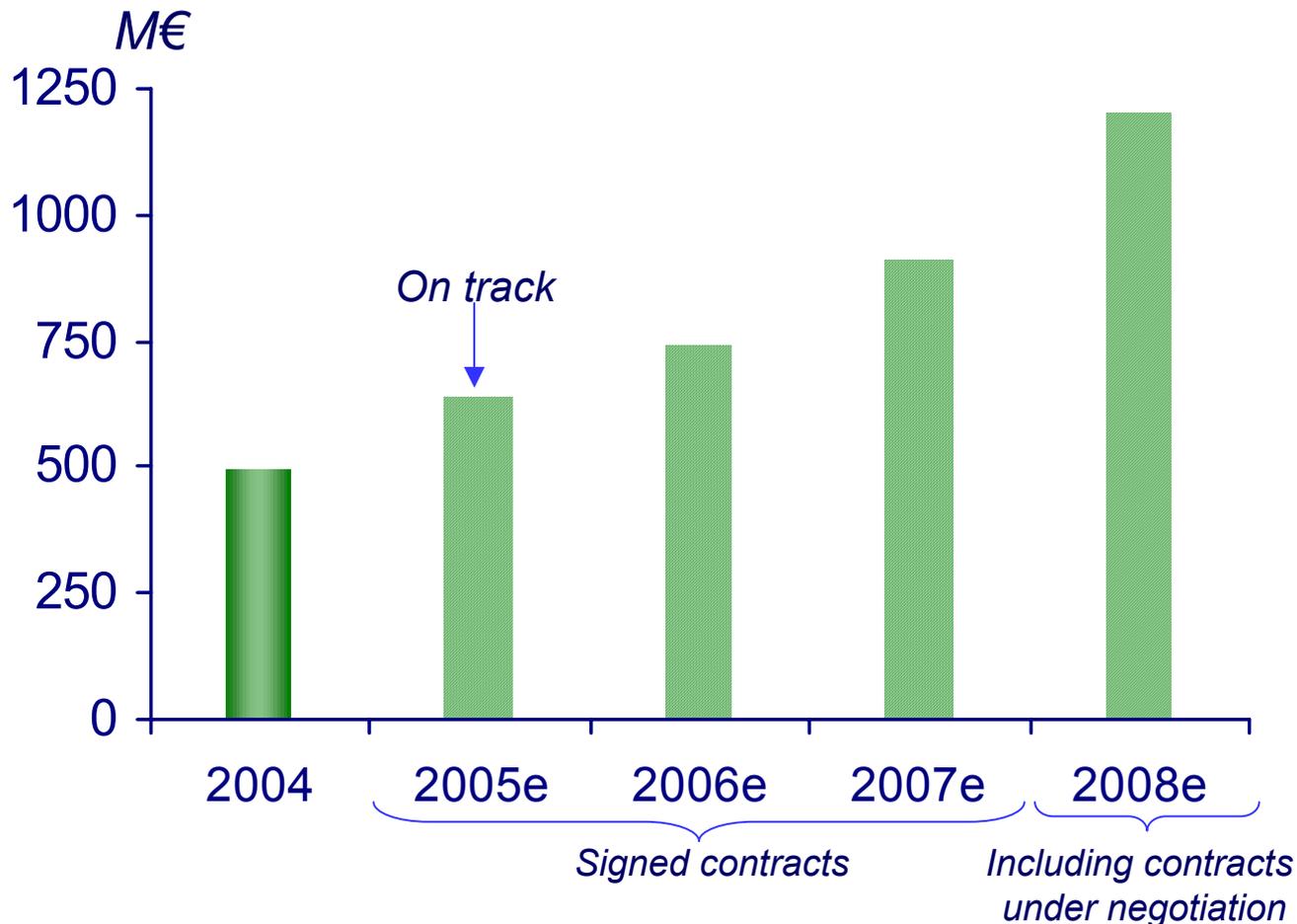
Hydrogen outsourcing drivers

- Refiners know how to run hydrogen units; so why outsource ?
- 3 key reasons:
 - ✓ Ability to provide a less capital intensive solution for the same volume of hydrogen
 - ✓ Flexibility to supply refineries more hydrogen to improve refinery margins
 - ✓ Value added integration of other products (steam, CO₂, energy) in the industrial basin by the gas company

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Air Liquide's projected H₂CO sales growth

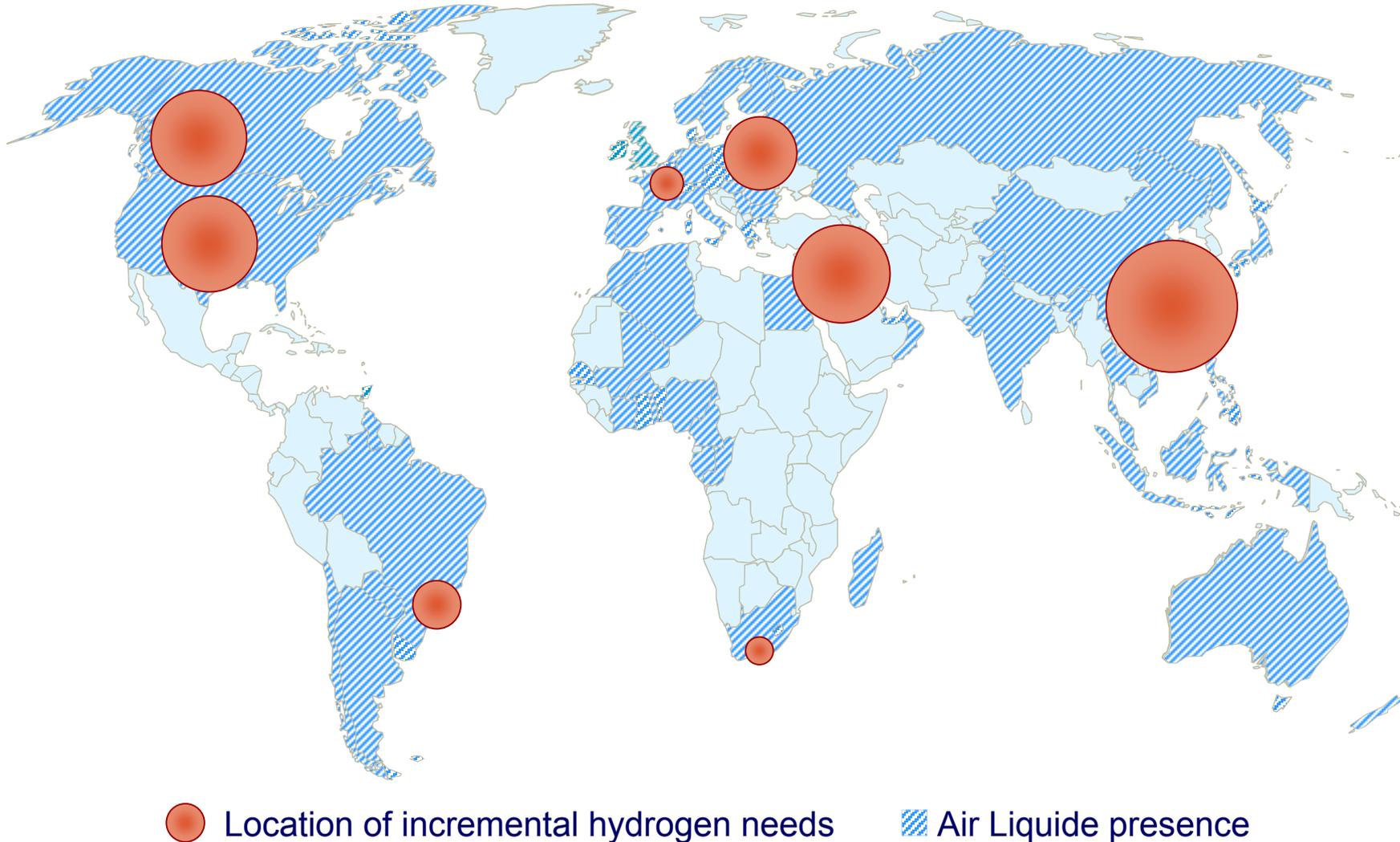


Including some H₂ for the chemical market, 2008e for refinery H₂ alone: ≈ 1,000 M€

Sales vary with natural gas price

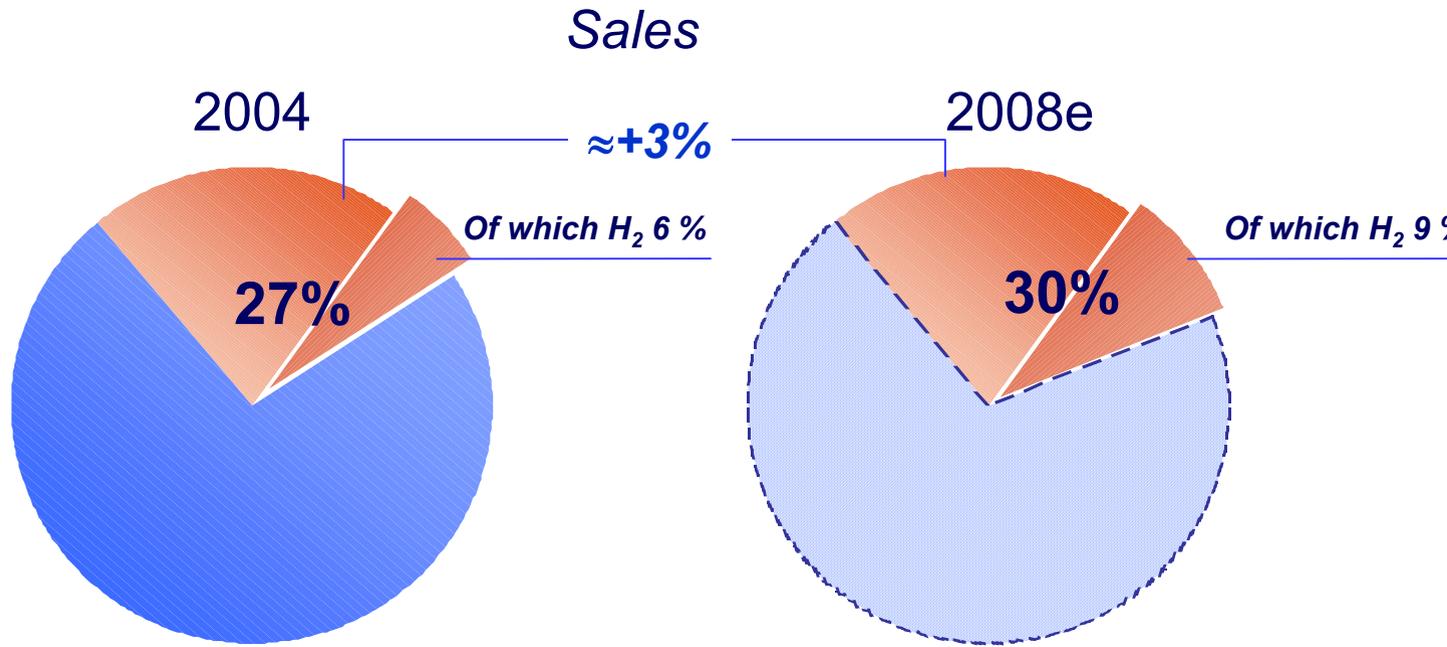
Hydrogen growth: where Air Liquide is present

- All three zones offer growth opportunities for Air Liquide



Accelerating impact of refinery H₂ on business mix

- Large Industries is an increasing part of our business mix
- Increases focus on Gas & Services



impact on

Gas & Services sales 88% ——— ≈+2% ——— 90%

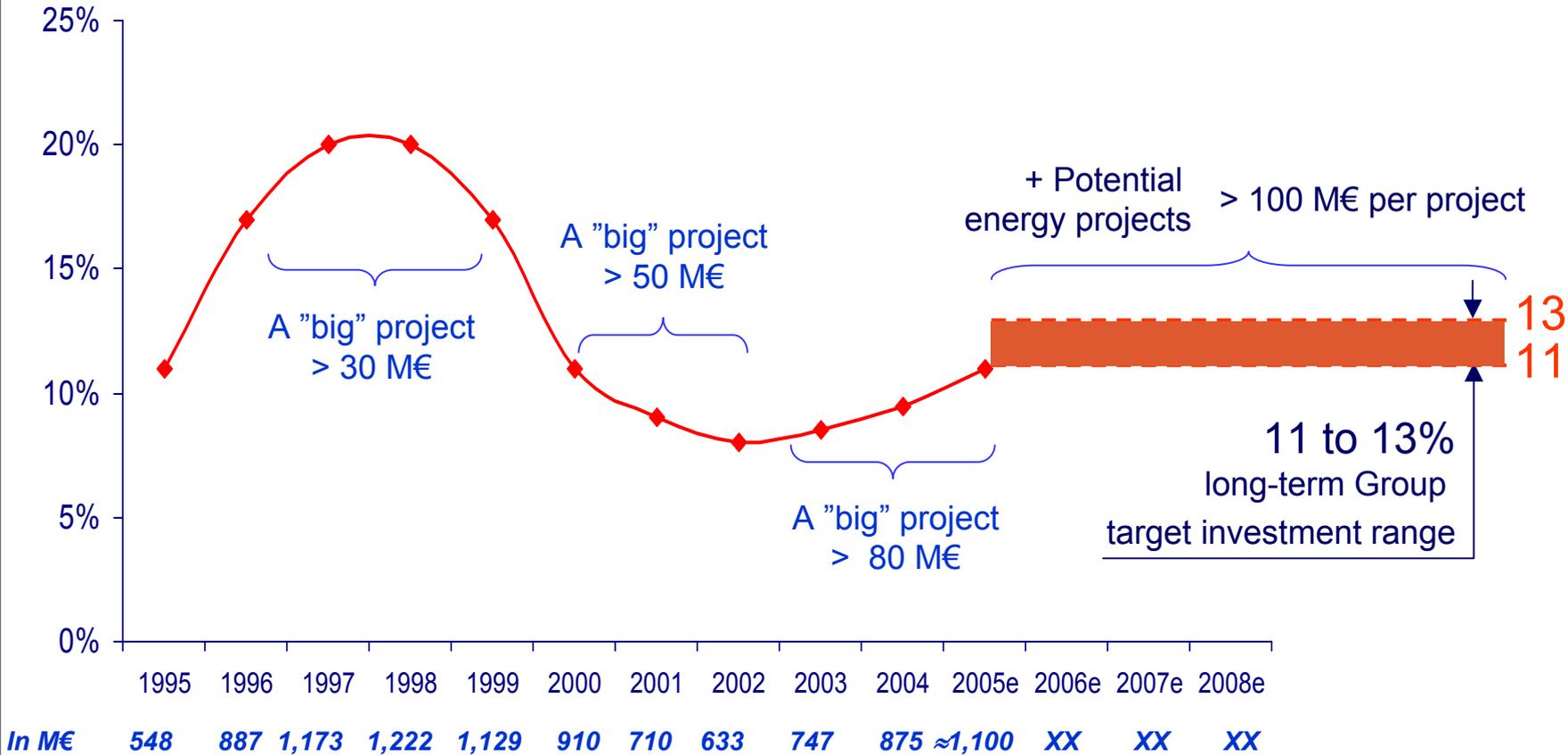
■ Large Industries ■ Other business lines

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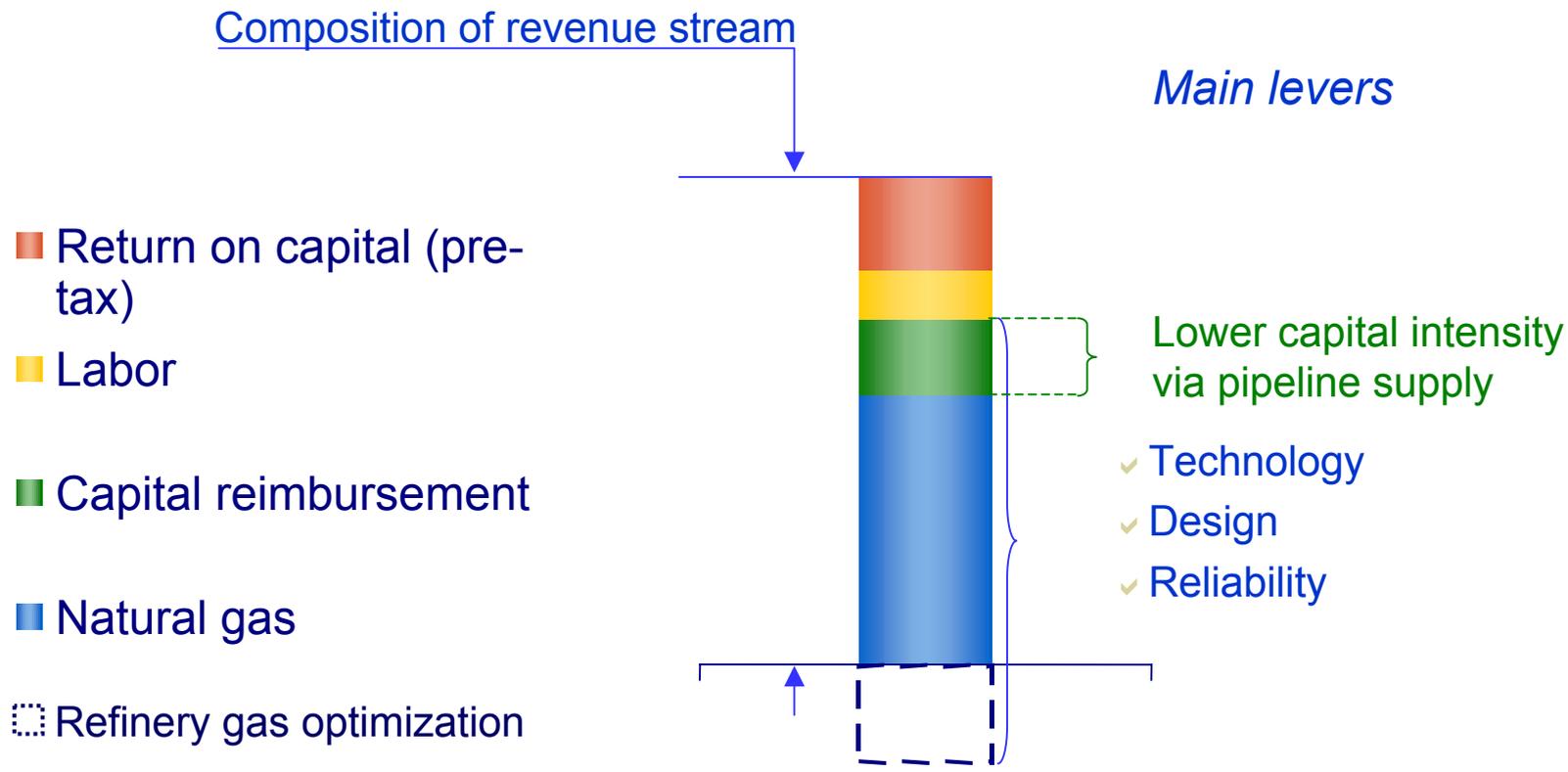
Investment cycle and project mix

Investment */ Revenues



* Group annual industrial investment

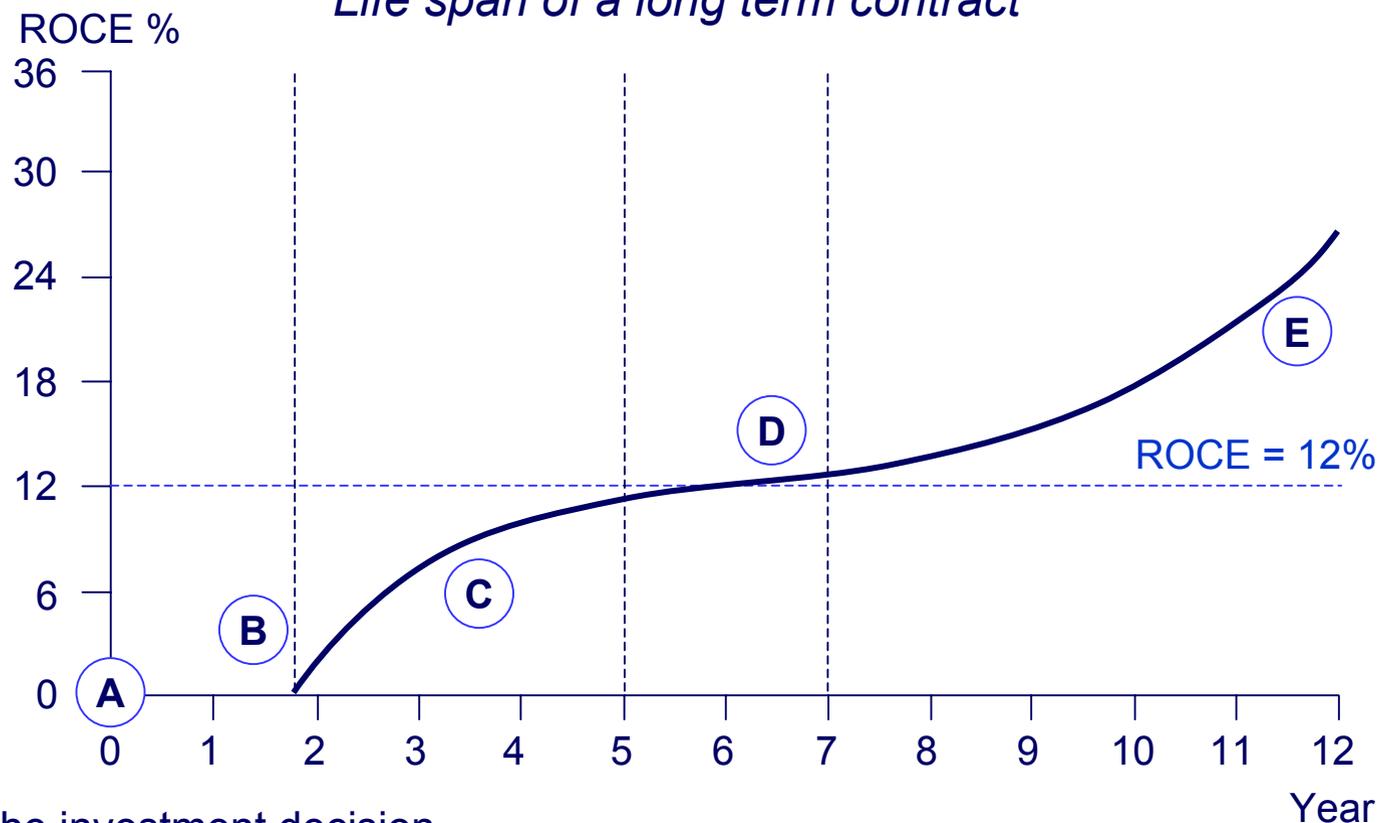
Hydrogen outsourcing levers



The evolution of hydrogen returns

Will be as profitable as air gas projects

Life span of a long term contract



- A. The investment decision
- B. Capital expenditure over 12-24 months
- C. Start up and gas production increases progressively
- D. Between years 5 and 7 (ROCE) of 12%
- E. After 15 years ROCE grow significantly

Large Industries contracts should be measured on ROCE and not on vertical ratios

	<i>Air gas</i>	<i>Hydrogen</i>	<i>Hydrogen</i>
Energy cost	Electricity at \$35 per MW/hr	Natural gas at \$3 per mmbtu*	Natural gas at \$7 per mmbtu*
Revenue	1	1	1.875
Capital intensity	2.7	1.5	0.8
Gross margin	≈50%	30-35%	13-18%
R.O.C.E.	12%	12%	12%

nb:typical

* *mmbtu: million British thermal units*

In summary

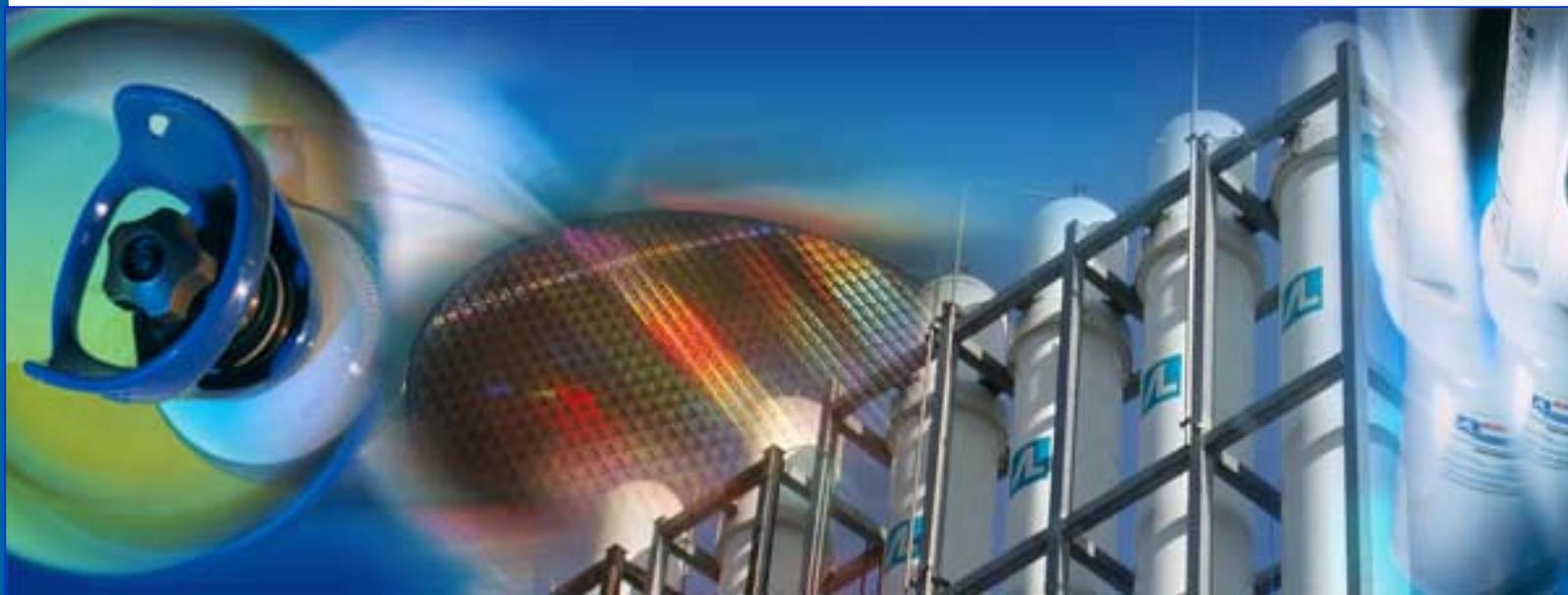
- Refinery hydrogen demand growth continues well beyond clean fuel needs
- Future needs are in geographies where Air Liquide is present
- Air Liquide's technical strengths provide optimal solutions to complex requirements, world wide
- Refinery hydrogen has a significant and positive impact on our customer and business mix
- Our solutions provide economy and flexibility for our customers, and growth and profits for Air Liquide



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