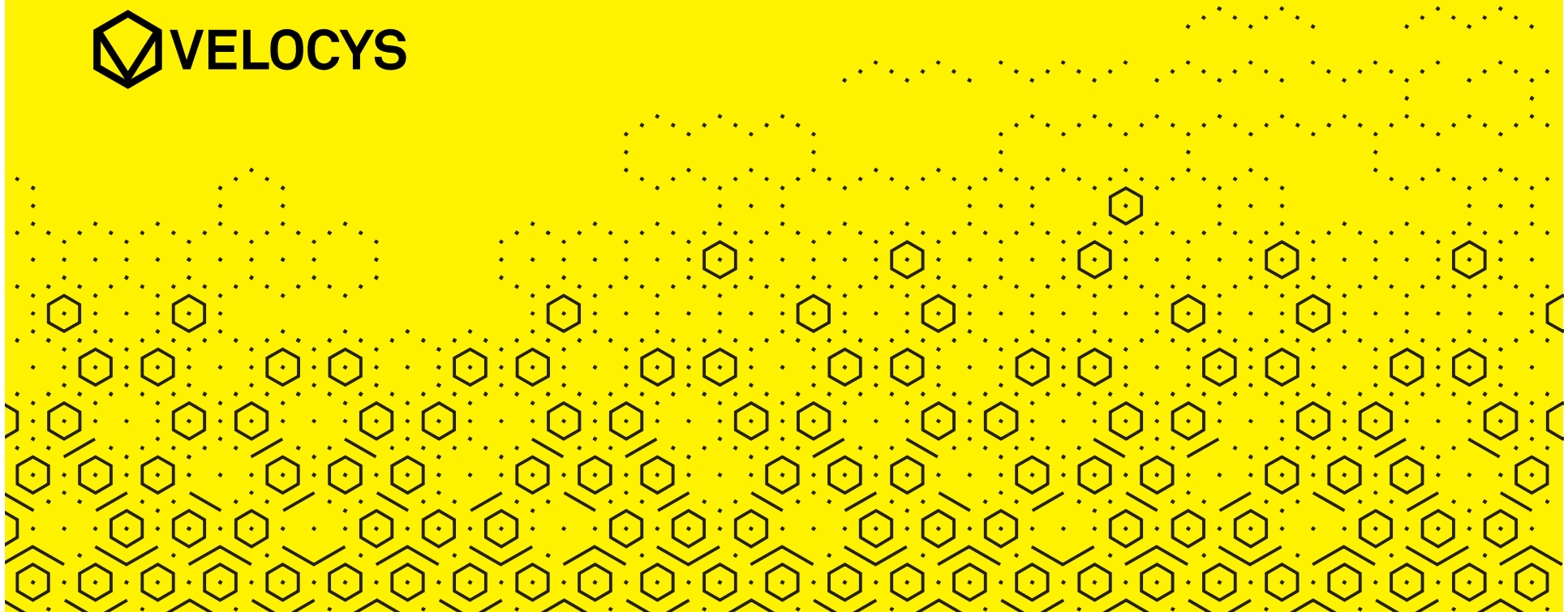


Dr Neville Hargreaves
GasTech CoTEs, March 2014

Smaller scale GTL – effective gas monetisation



Velocys

Leaders in smaller scale GTL

- **Leader** in smaller scale gas-to-liquids technology
 - 15 years and >\$300 million invested in technology development
 - Exhaustive global patent protection (>7,500 granted GTL patent claims)
- First class **partners** offering a **complete GTL solution**
 - Onshore: Haldor Topsøe, Ventech, Petrofac, Hatch, Toyo Engineering
 - Offshore: MODEC, Toyo Engineering

- **Commercial roll-out underway**



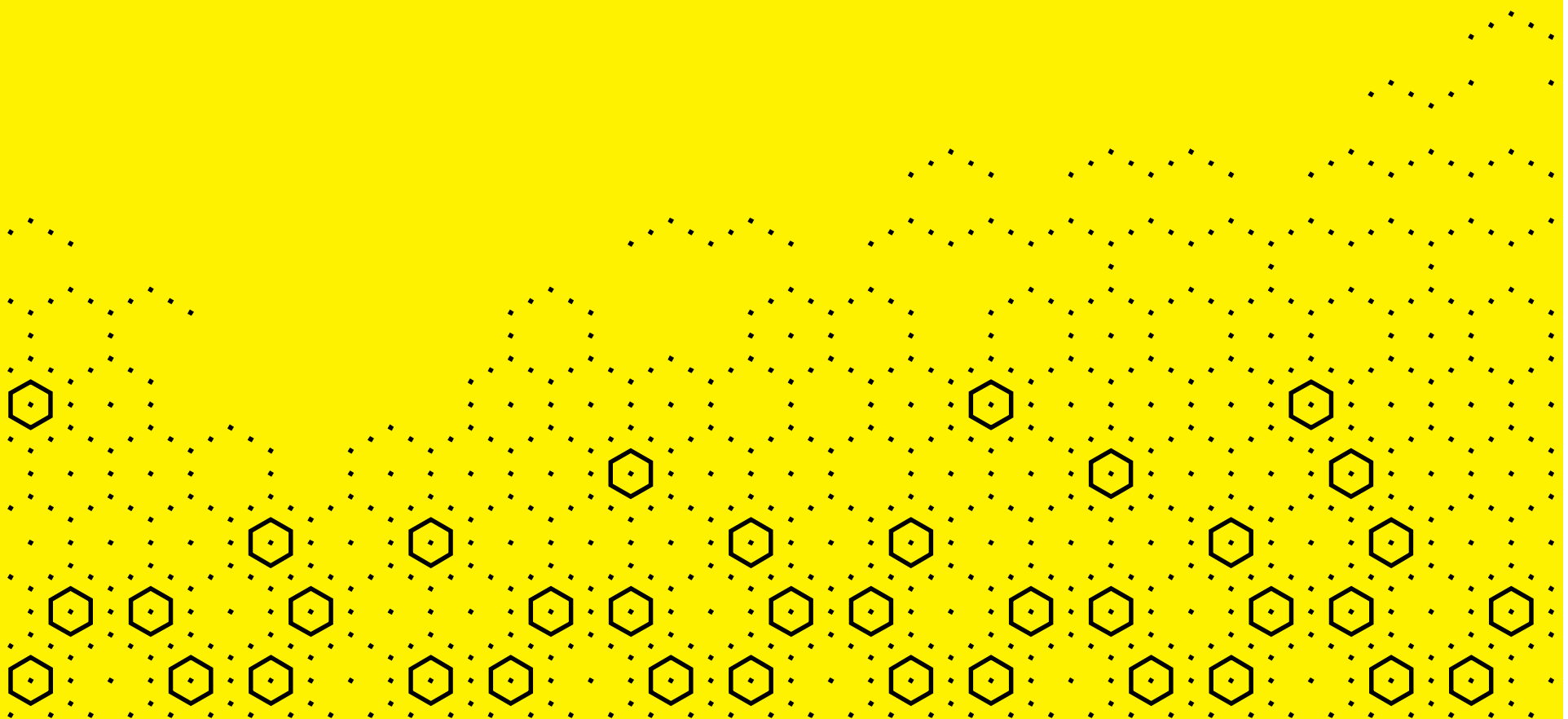
- **Well capitalised with strong commercial and technical teams**
 - Facilities in Oxford, UK, Columbus, Ohio and Houston, Texas

GTL – a serious option for gas monetisation

Questions a gas producer might have

- Why would I want to do it?
- Isn't it prohibitively expensive?
- Does it work?
- Is it commercial now?
- So why isn't everybody doing it?

Smaller scale GTL delivers high value from problem gas



Why not just do LNG?

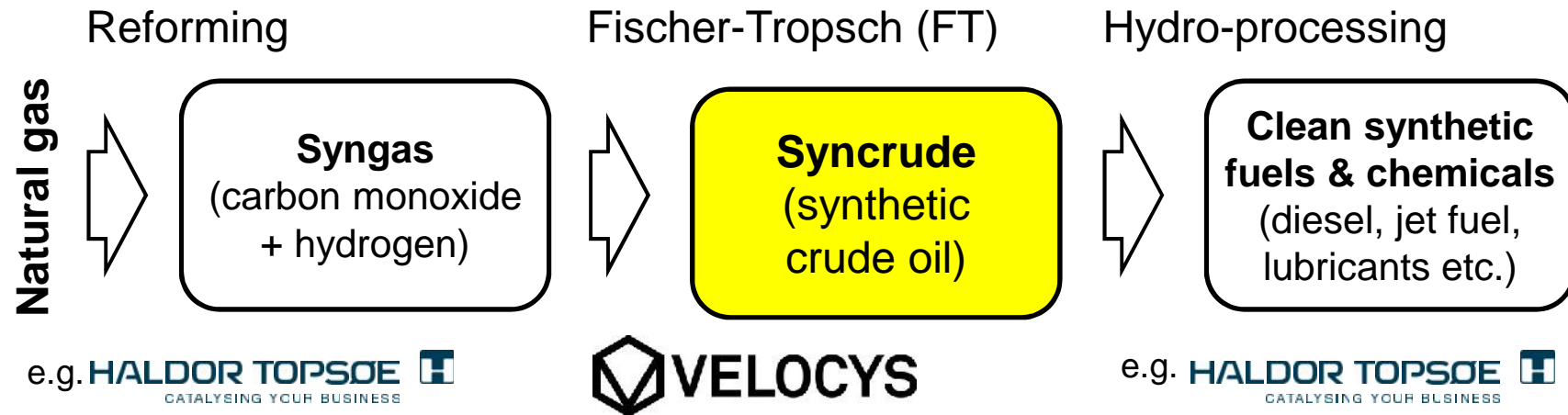
GTL delivers higher value at flexible scale

- Diesel production for local or global market
 - Demand for diesel increasing
 - No switching barriers (cf LNG for transport)
- Higher value product
 - Gas \$3/mmbtu in US, less in stranded places
 - Oil \$22/mmbtu + diesel premium
- Diversification from gas to oil prices
- Flexible scale, from 15mmscfd (150mcma) to 150mmscfd (1.5 bcma) or more



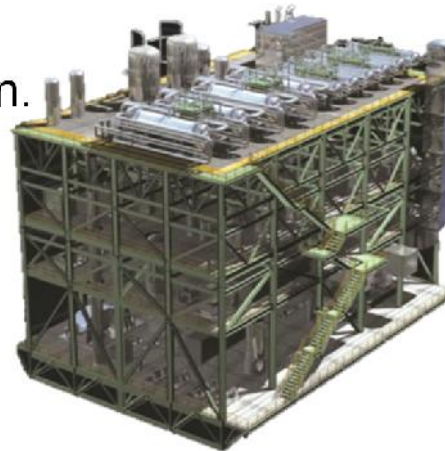
The gas-to-liquids (GTL) process

Chemical conversion of gas to refined products



LNG / CNG = physical compression.
Product **remains natural gas**

GTL = chemical conversion into **refined products** (petroleum equivalent)

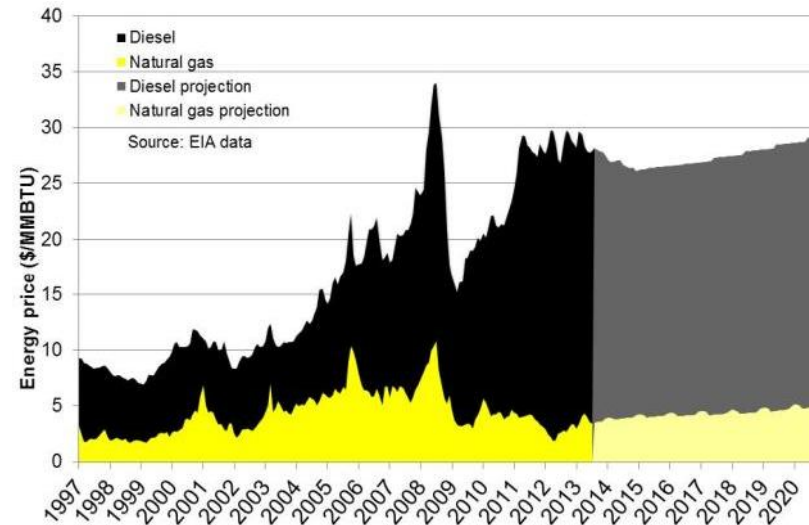


Smaller scale GTL:
gas-based mini-refinery

Market environment

Ripe for GTL

- Shale revolution ushering age of “gas surplus”
- Long-term stability of gas-oil arbitrage expected
- Other favourable drivers
 - Growing demand for middle distillate (diesel and jet)
 - Energy security
 - Environmental benefits e.g. flare elimination and carbon footprint reduction (biomass-to-liquids)
 - Strong location-specific economic and strategic factors
- Shell and Sasol plants in Qatar showcase viability of GTL



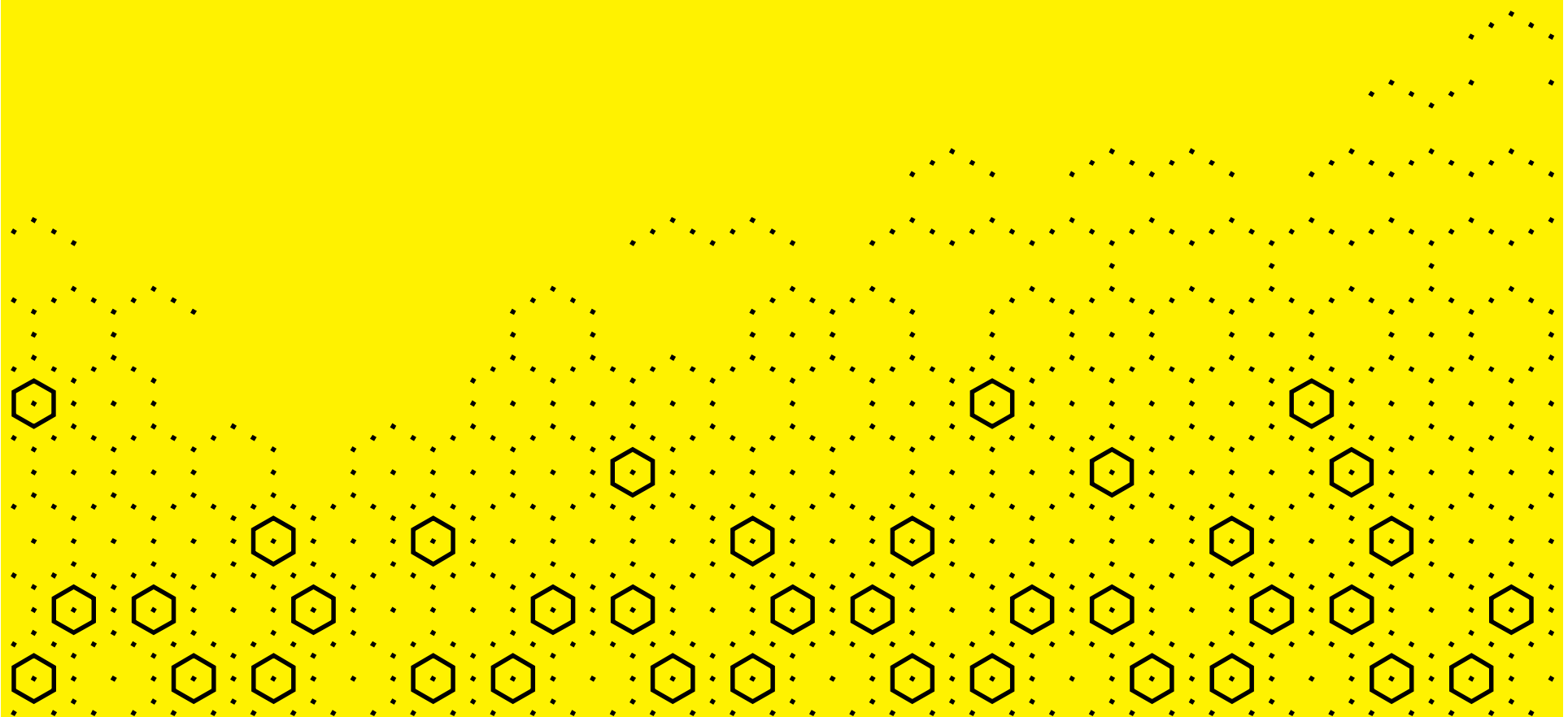
Many applications

From low-value gas to high-value fungible products

- **Shale gas:** monetising at low gas prices
- **Stranded gas:** estimated over 30% of world reserves are uneconomic to bring to market
- **Associated gas:** 5% of natural gas production is flared
- GTL allows **valuable products** to be created and shipped
 - Ultra low-sulfur diesel (70 cetane) & jet
 - Waxes, lubricants and solvents



Economic at smaller scales



Microchannel reactors v conventional GTL

- **Large-scale economics at smaller scales**
 - Microchannel technology has a significantly smaller footprint than conventional GTL
 - Smaller plants, smaller investments, smaller risk



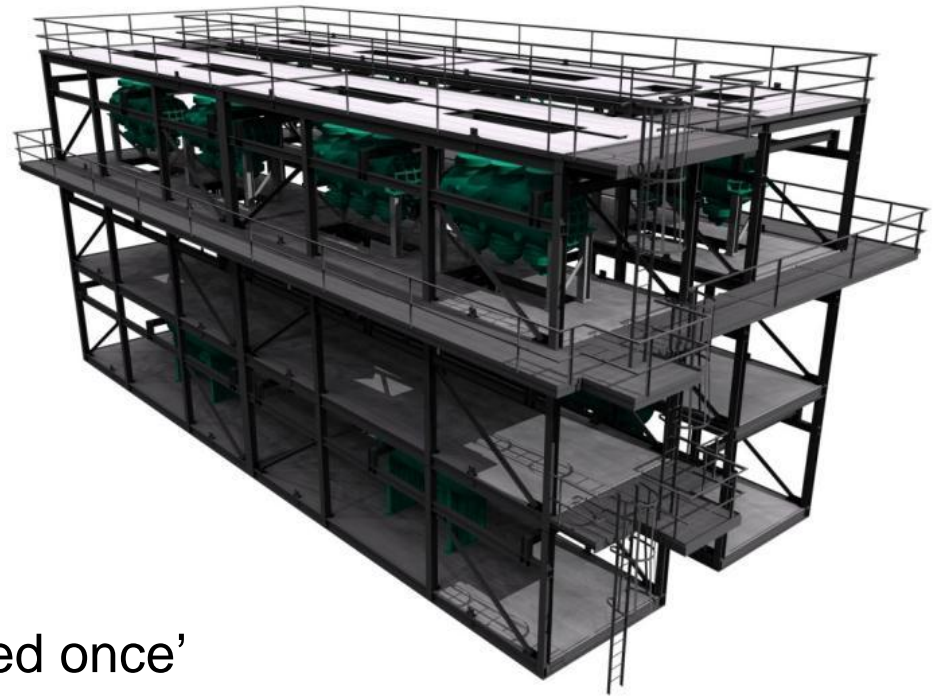
Conventional FT reactor



Microchannel reactor

Modular GTL “for the mainstream”

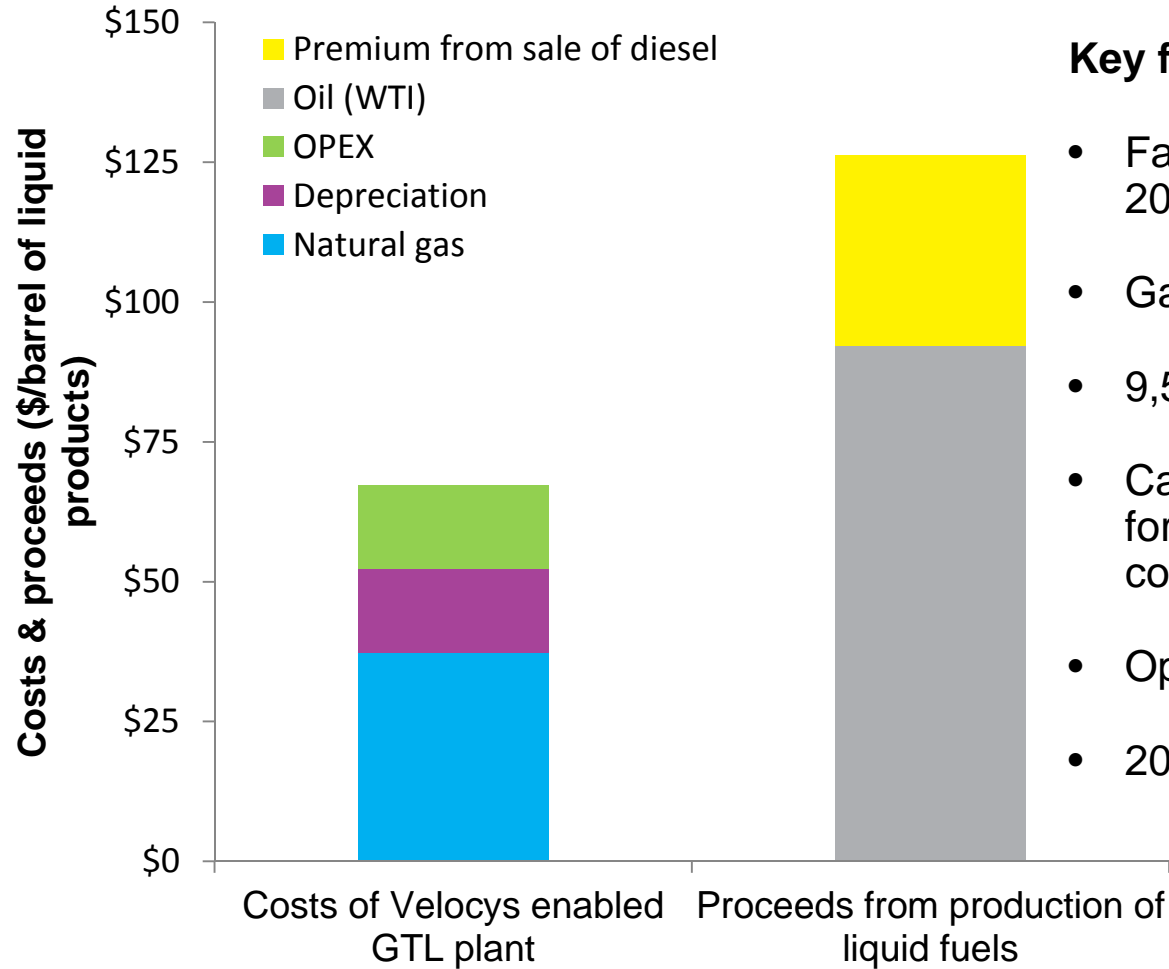
- **Broader market**
 - Smaller plants = less gas
 - Suitable for remote locations
- **Lower risk**
 - Smaller plants = smaller investments
 - Investment can be phased
 - On site construction reduced
- **Reduced costs**
 - Modules and reactors ‘designed once’
 - Quicker plant construction (18-24 months)
 - Less strain on supply chains
 - Possible integration with existing facilities



1,400 bpd FT process unit
designed by Ventech Engineers
27m L x 15m H x 13m W

Velocys enables winning economics

Base case

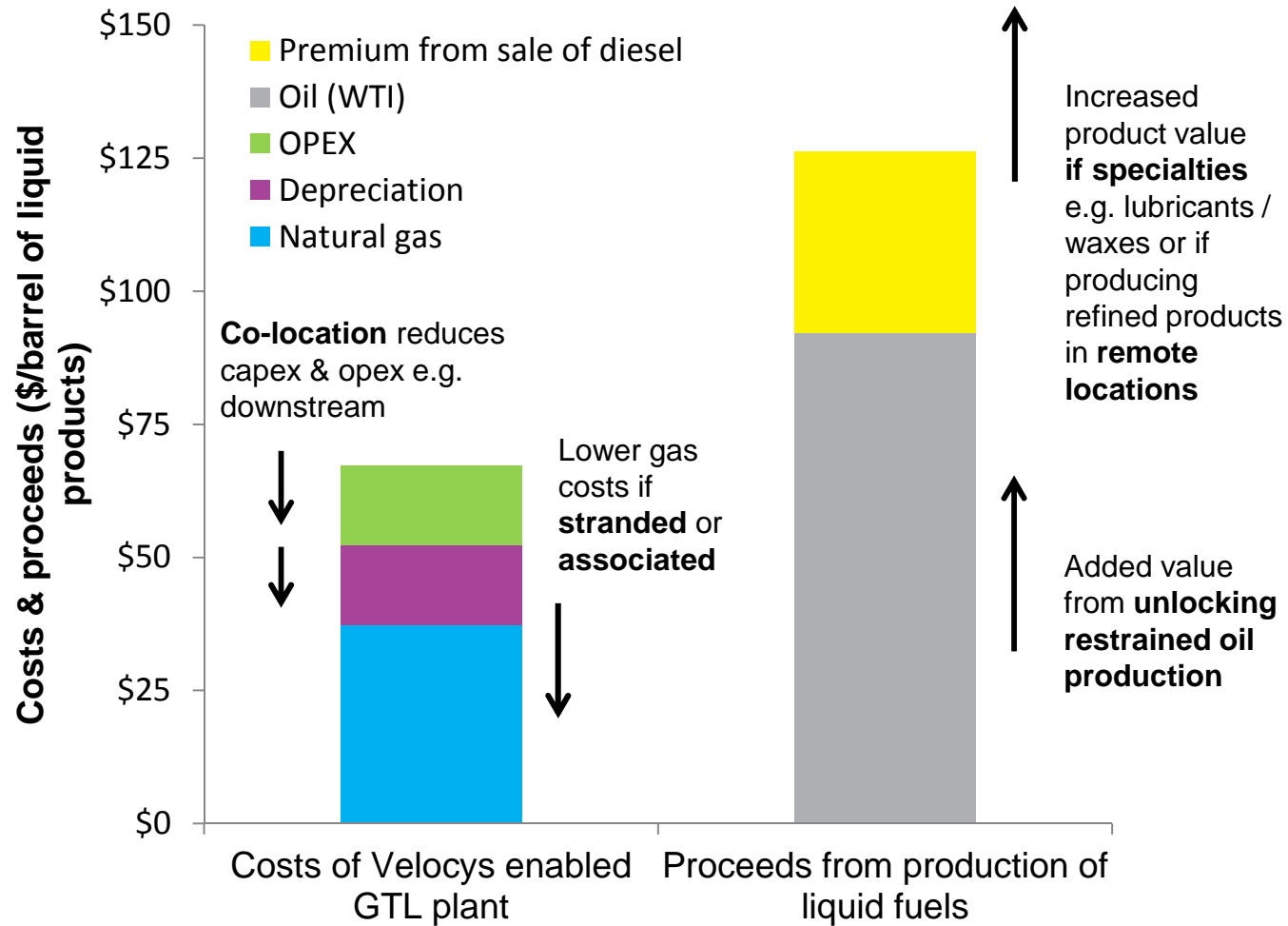


Key financial assumptions

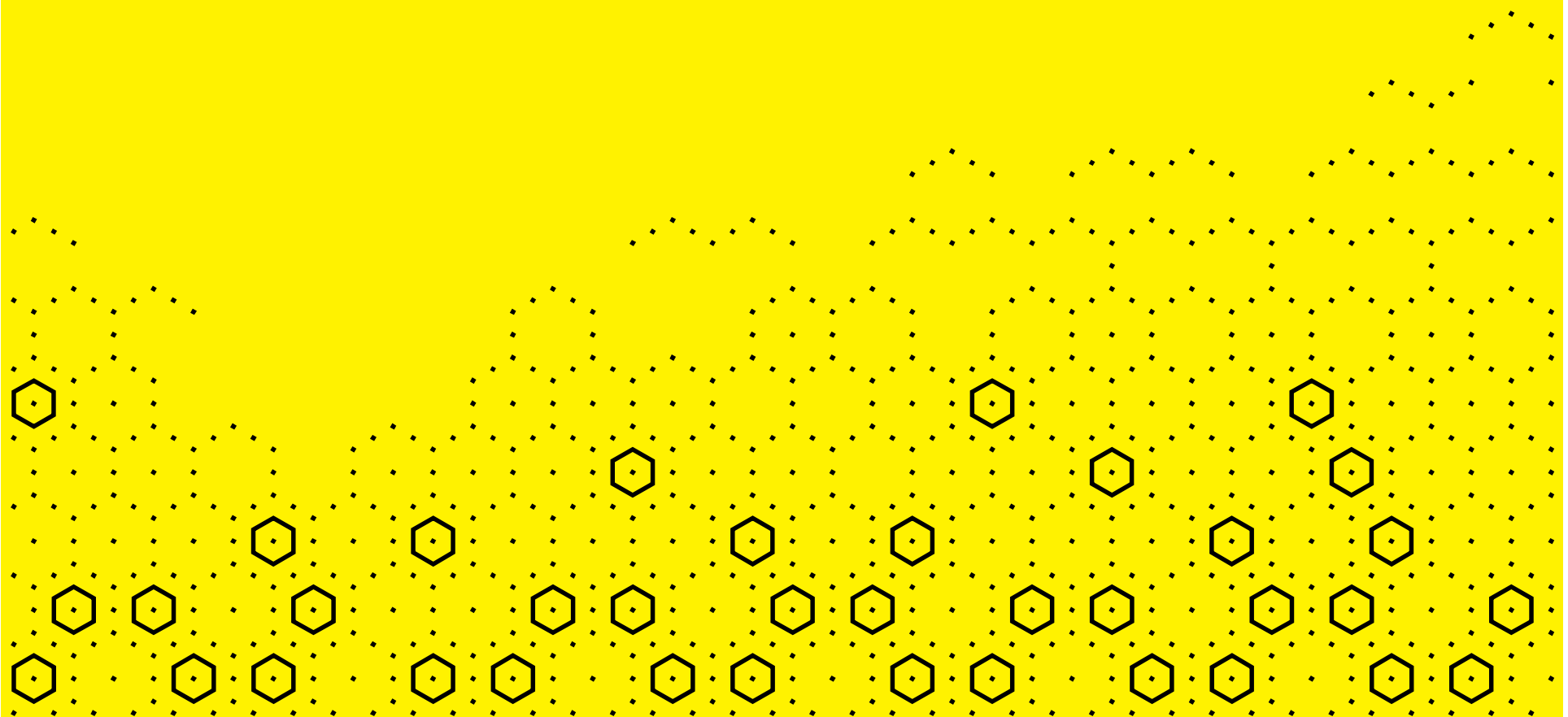
- Facility producing 80% diesel & 20% naphtha
- Gas price = \$4/mmbtu
- 9,500 scf gas per barrel
- Capital cost = \$100k per bpd for 2,500 bpd stand-alone Gulf coast plant
- Operating cost = \$15/bbl
- 20 year plant life

Velocys enables winning economics

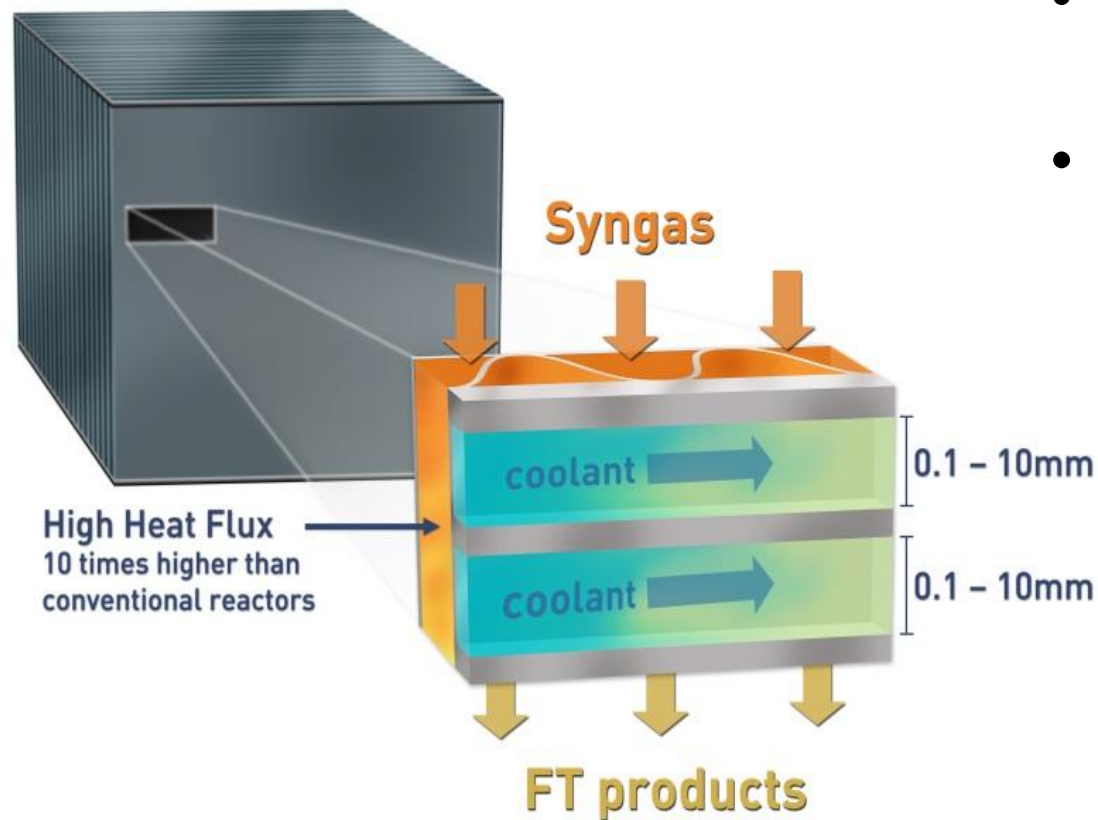
Site-specific opportunities



Demonstrated technology



Velocys Fischer-Tropsch reactor core



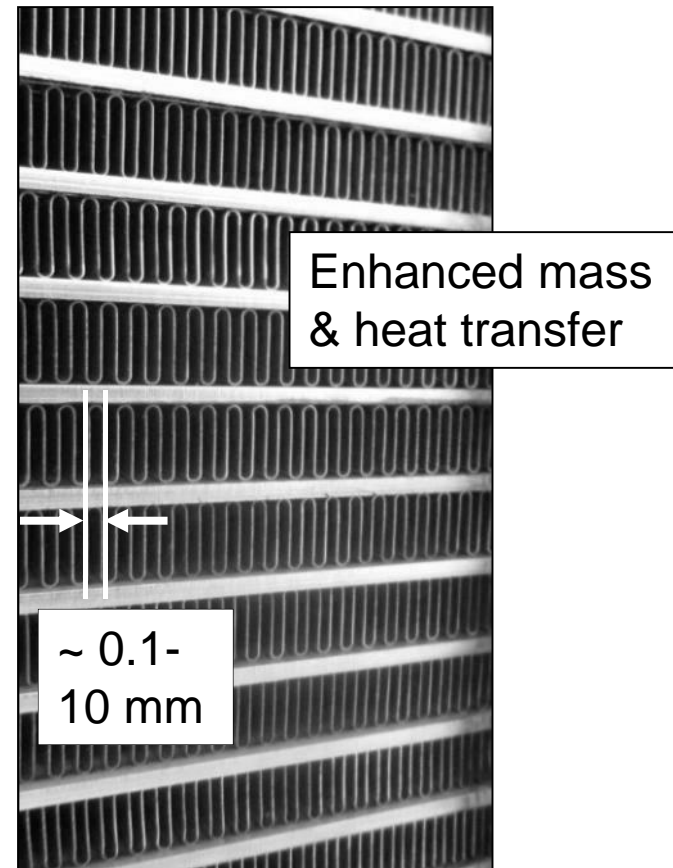
- Particulate catalyst in small channels
- Close integration of exothermic FT synthesis and steam generation

Velocys microchannel technology

Compact, robust, efficient and economic

- Strengths
 - High per pass conversion (75%+)
 - Isothermal behavior – thermally stable
 - Extremely robust to upsets
 - Economy of mass manufacturing
 - Accommodates high activity catalysts
 - Installed spares relatively cheap
 - High on-stream factor
 - Tail gas recycle only to achieve high conversion
 - Extremely high volumetric productivity
 - Ease of modularisation

Velocys FT microchannel reactor



Bore size of conventional fixed bed FT reactor 25-150 mm

Intergrated GTL demonstration

- Offshore GTL partners: Toyo Engineering, MODEC and Petrobras
- 6 bpd plant mimics complete FPSO-mounted GTL facility



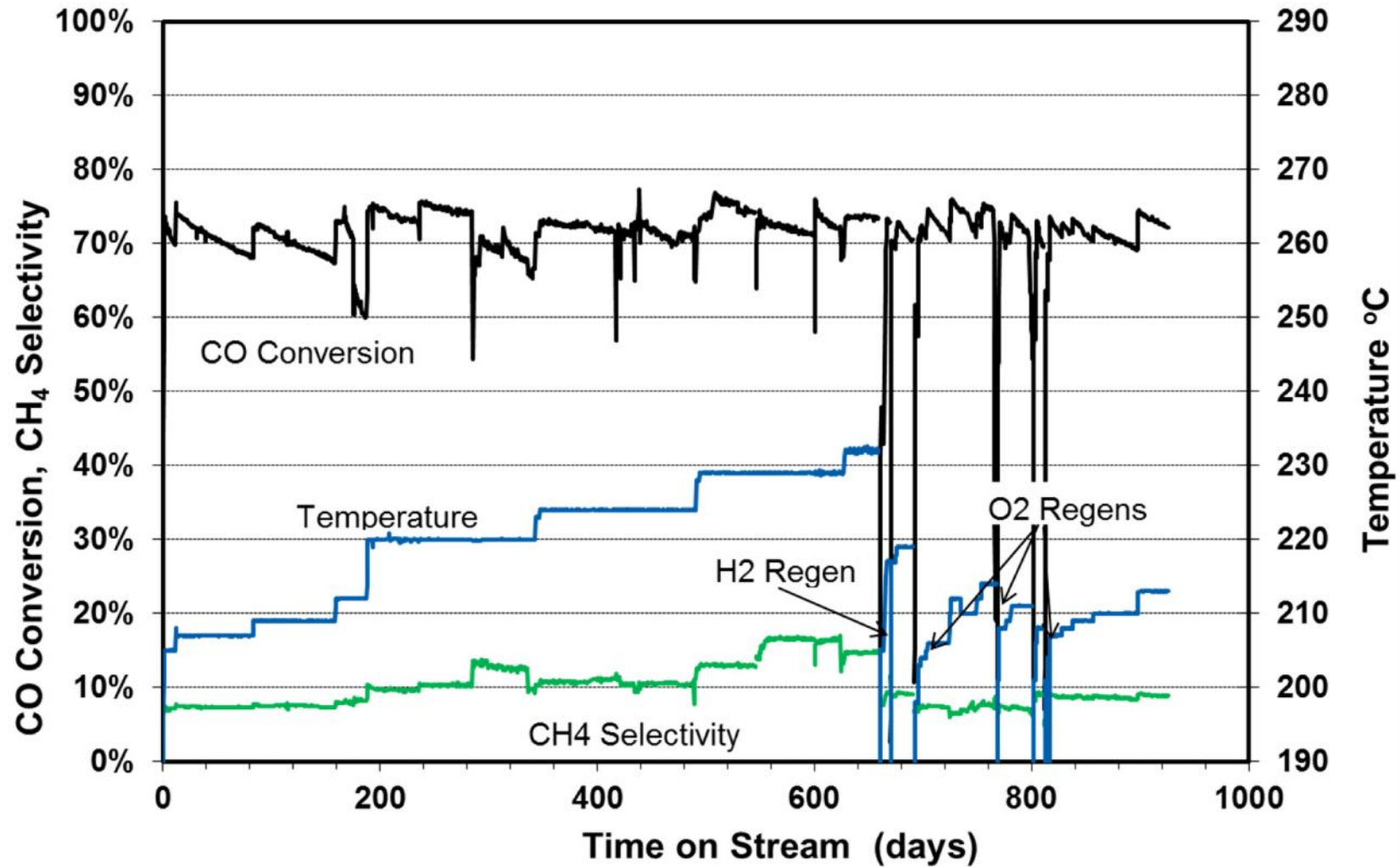
Pilot plant and training facility

Supporting sales and delivery

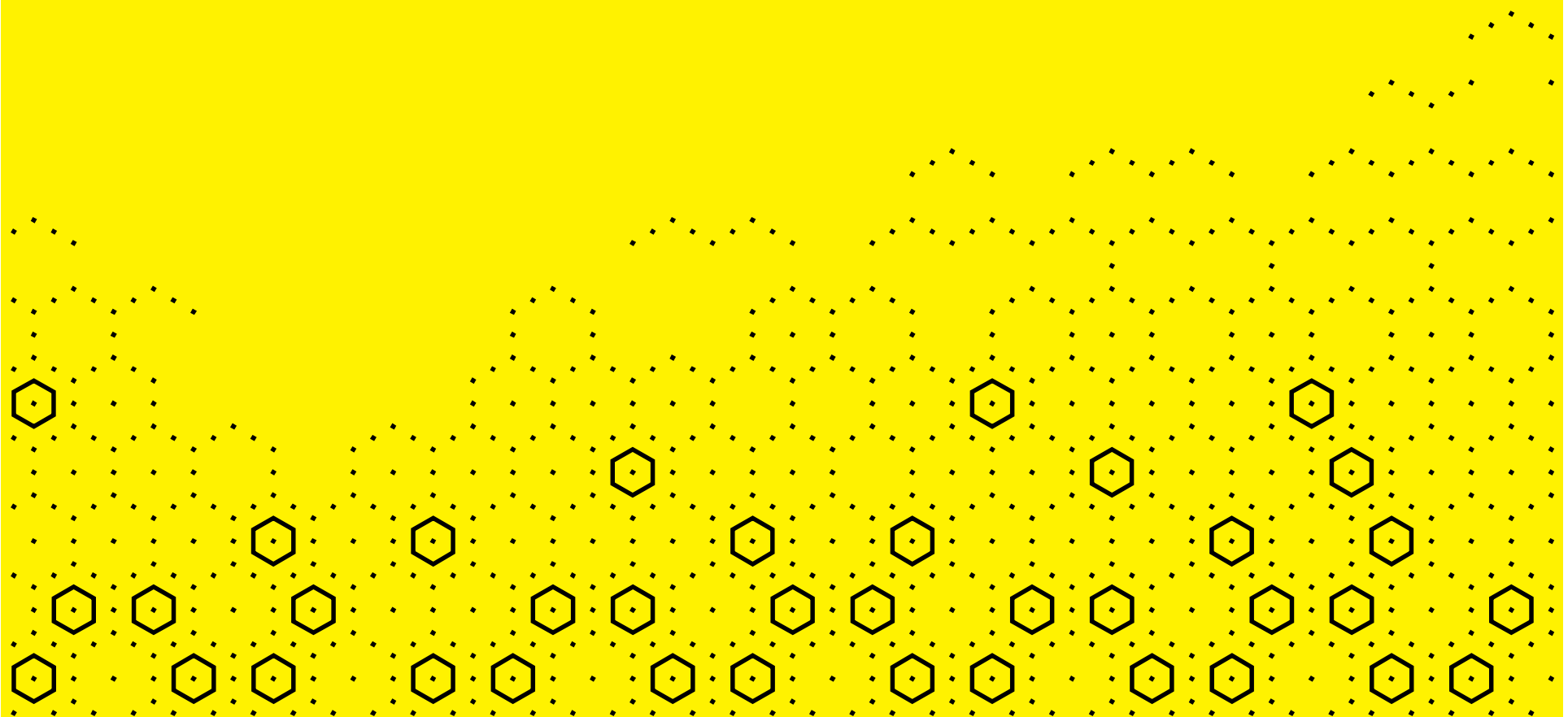
- Integrated GTL pilot plant at the Velocys Ohio, USA site
- Provides
 - Performance data to support differing client designs
 - Product for client studies
 - Permanent training facility for plant operators
- Platform for
 - Developing our own field support staff
 - Demonstrating future product generations



Exceptional catalyst stability



Smaller scale GTL is commercially ready



Manufacturing

Ramping up for mass production

- Implementing multi-million dollar state-of-the-art production cell at chosen supplier
 - Cost-effective mass production
 - Consistent high quality
 - In place by end 2013
 - Initial capacity supports **10,000 bpd/yr** of orders
- Production cell is replicable and scalable
 - Cost effectively
 - Lead-time within plant order duration
- Plans in place to support a **4x capacity increase**



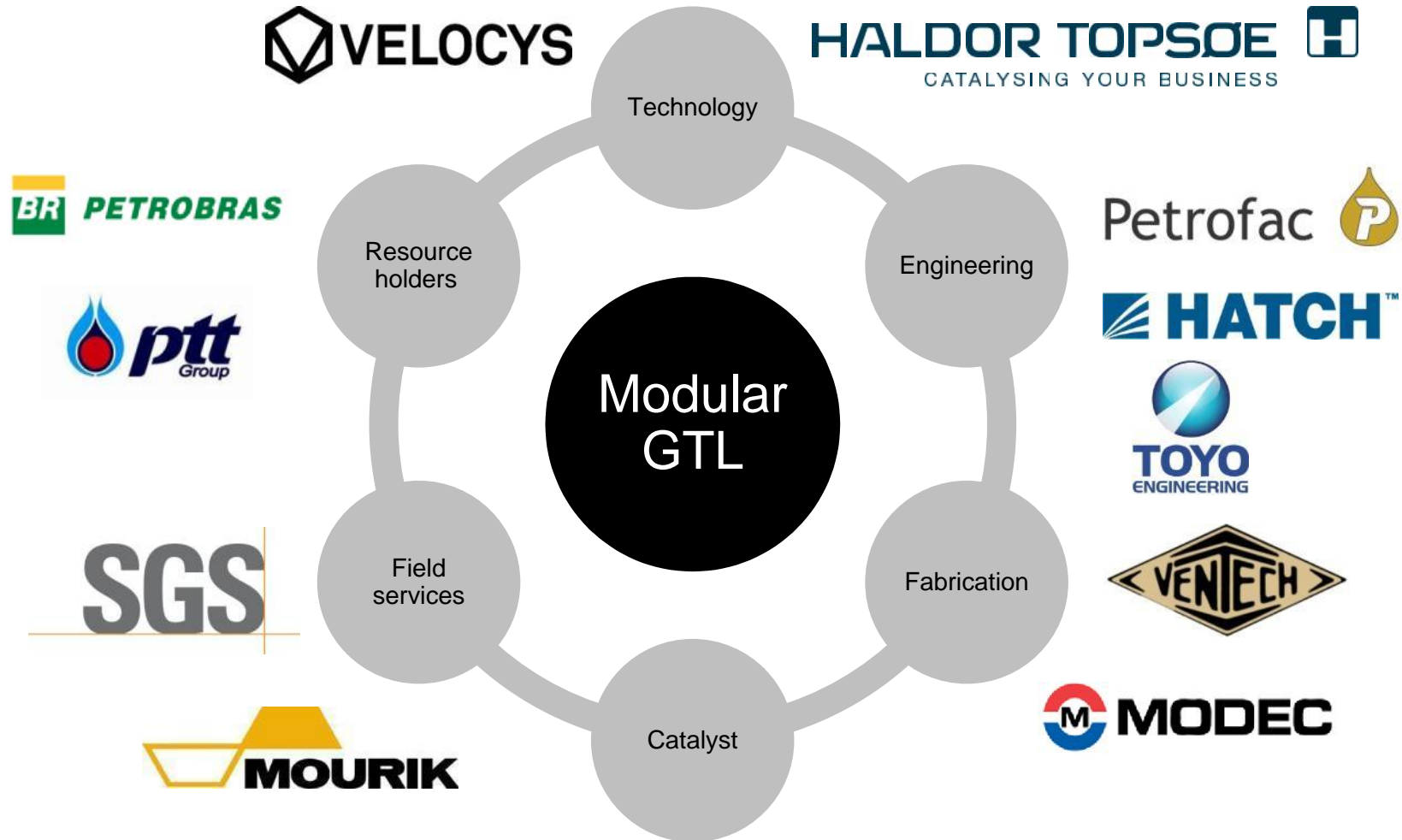
Reactor manufacture



Designed for production

Complete GTL solution

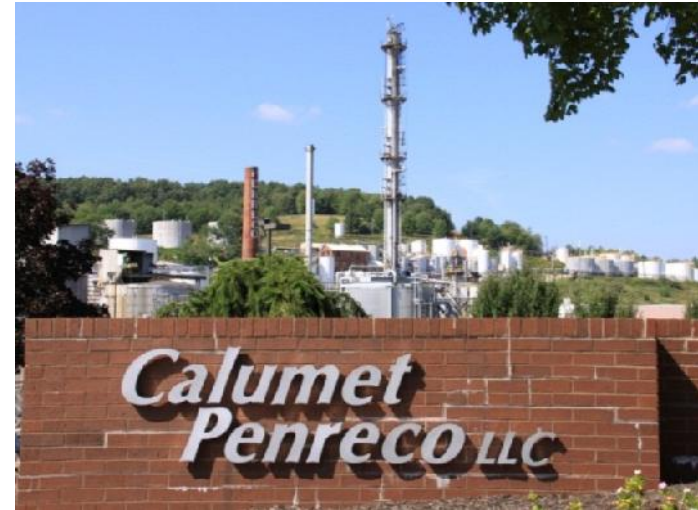
Together with world-class partners



Commercialisation underway

Announced selection for four commercial projects and a JV

BA's GreenSky London



Red Rock Biofuels

JV with Waste Management, NRG Energy and Ventech

Monetising renewable gas with natural gas through GTL

- **WM** (Fortune 500)
 - North America's leading provider of comprehensive waste management services
 - Role: renewable gas and certain locations
- **NRG** (Fortune 500)
 - Owns largest independent power generation portfolio in US
 - Role: advisor on project development and management
- **Ventech**
 - Global leader in design and construction of modular refineries
 - Role: engineering and fabrication



First JV project

Adjacent to WM landfill in East Oak, Oklahoma, USA



- WM piloting GTL since 2010
- Engineering completing; final permit submitted
- **Final decision to proceed this year**
- Development activities for additional facilities will begin shortly



Example

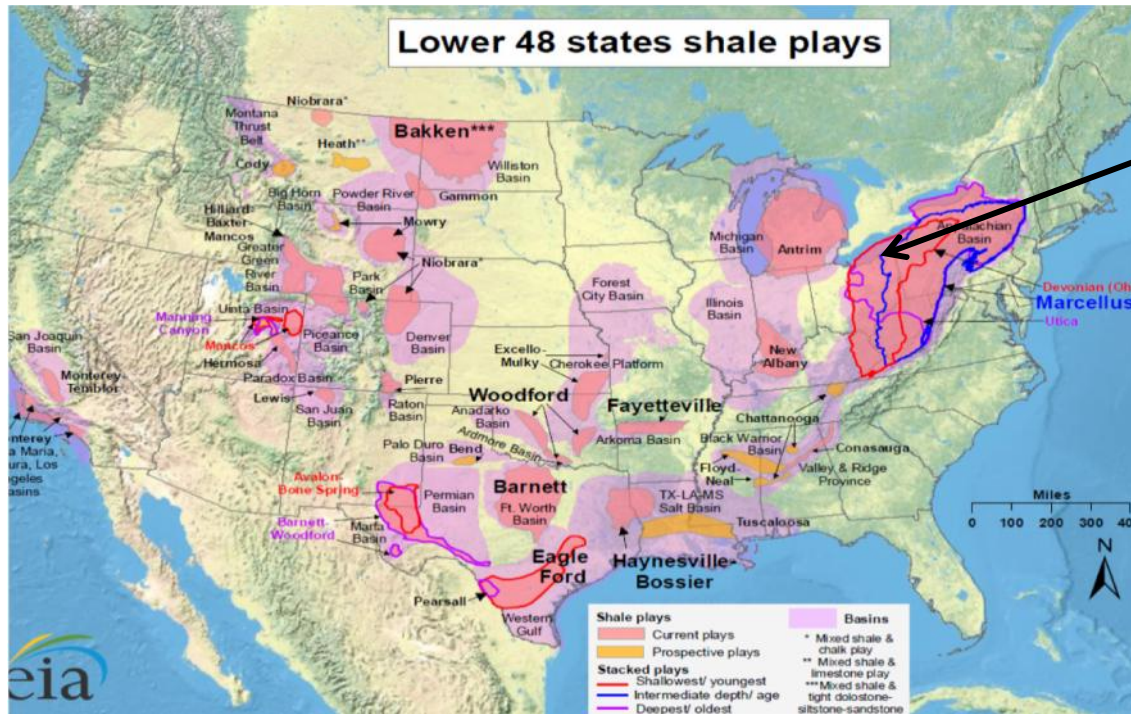
Pinto Energy

- Velocys selected in 2012 by Pinto Energy
 - Houston-based developer of GTL facilities in North America
 - **Portfolio of sites** for development of smaller scale GTL
- 2,800 bpd GTL plant in Ashtabula, **Ohio**, USA
 - **Substantial existing infrastructure** enhances economics
 - First phase of a **multi-train** facility
- Ventech began engineering in April 2013
- Air and water permits recently **filed**



Pinto Energy: Ashtabula project

Tapping into local shale gas (Marcellus & Utica)



Ashtabula
GTL Site

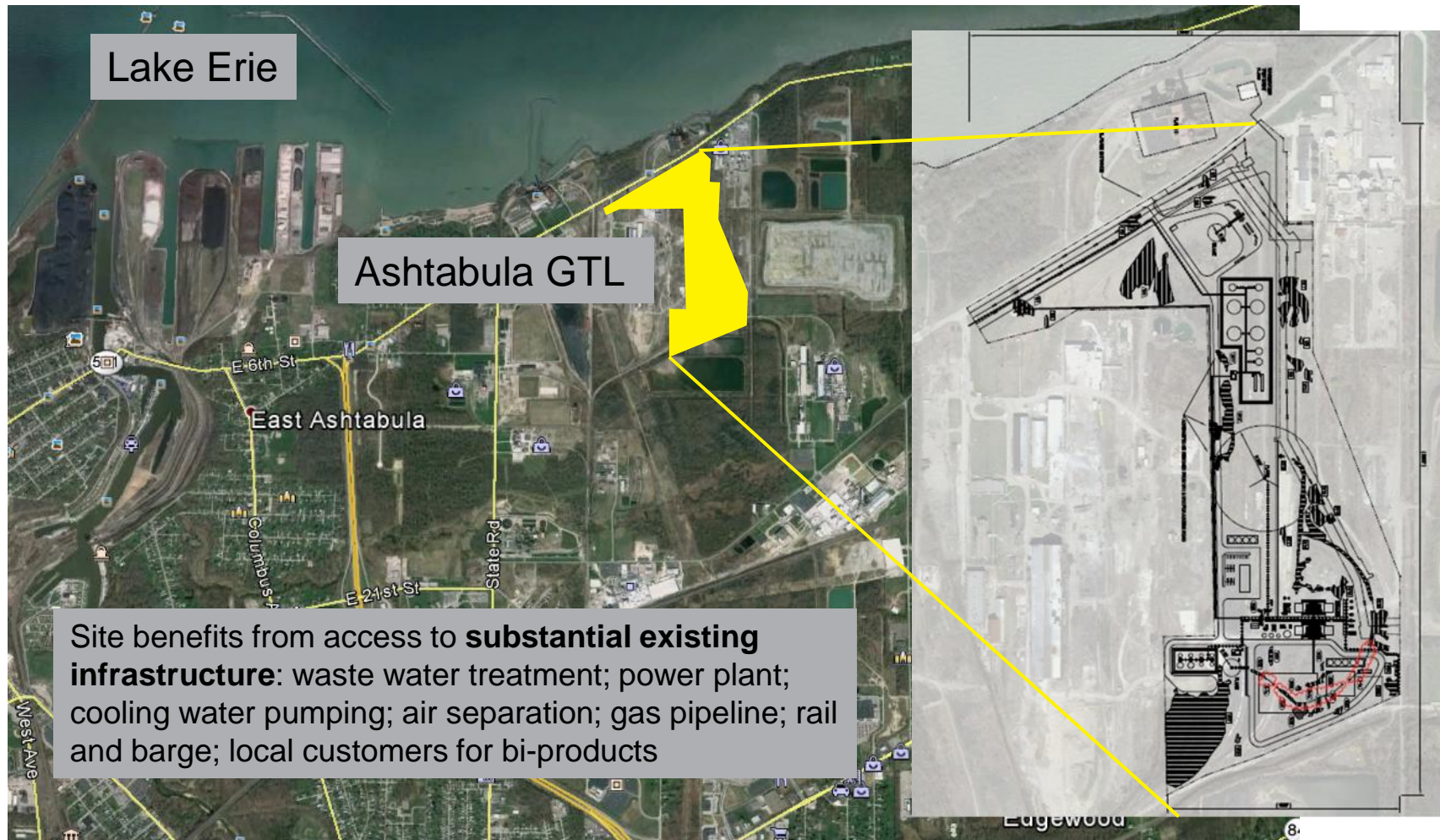
Will convert abundant low-cost natural gas into:

- Design complete end 2013
- Final notice to proceed H1 2014
- Plant start-up early 2016

- High value specialty products (solvents, lubricants and waxes)
- Ultra clean transportation fuels

Pinto Energy: Ashtabula project

Location and layout



Sales

Growing and maturing pipeline

- Paid Velocys engineering hours growing fast
- Due diligence complete with several customers
- **Depth** and **variety** of sales pipeline encouraging

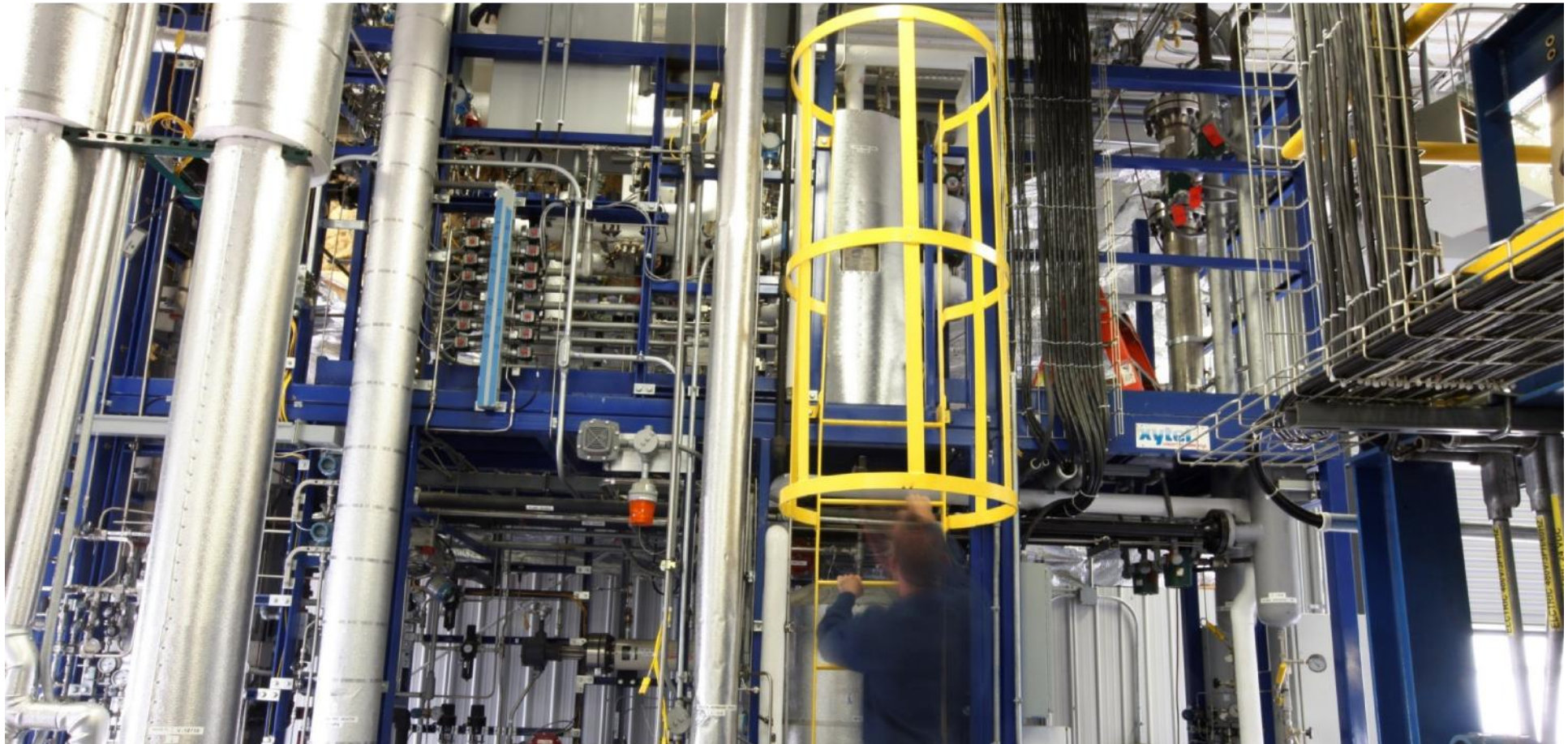
We do **not** announce projects by name until clients have made them public – our pipeline is greater than what is announced

- Most opportunities are **GTL** in **North America**
 - Interest from **Russia / CIS** increasing (1 sale, 3 in engineering)
 - BTL growing; some interest in CTL
 - **Strategic drivers** underpin many opportunities
- Partners provide **global reach** across different applications

GTL – a serious option for gas monetisation

Questions a gas producer might have

- Why would I want to do it?
- Isn't it prohibitively expensive?
- Does it work?
- Is it commercial now?
- So why isn't everybody doing it?
- Higher and more robust value
- No
- Yes
- Yes
- Actually, lots of people are



Changing the way fuels are made



Contact information



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