

Liquium

Clean liquid fuel
for heavy industry

*Dr Paul Geraghty, CEO & Co-Founder
AEA Conference 2023*



The problem

NH₃ is hard to make!!

Catalyst: Iron/Ruthenium
Thermochemical reaction (i.e. Haber-Bosch)
Temperature >400 °C
Pressure >200 bar/atm

- High temperatures = Poor reaction and energy efficiency
- High pressures = Expensive infrastructure and instrumentation
- Economic only at very large scale
- Poor alignment with renewable energy

Our Solution

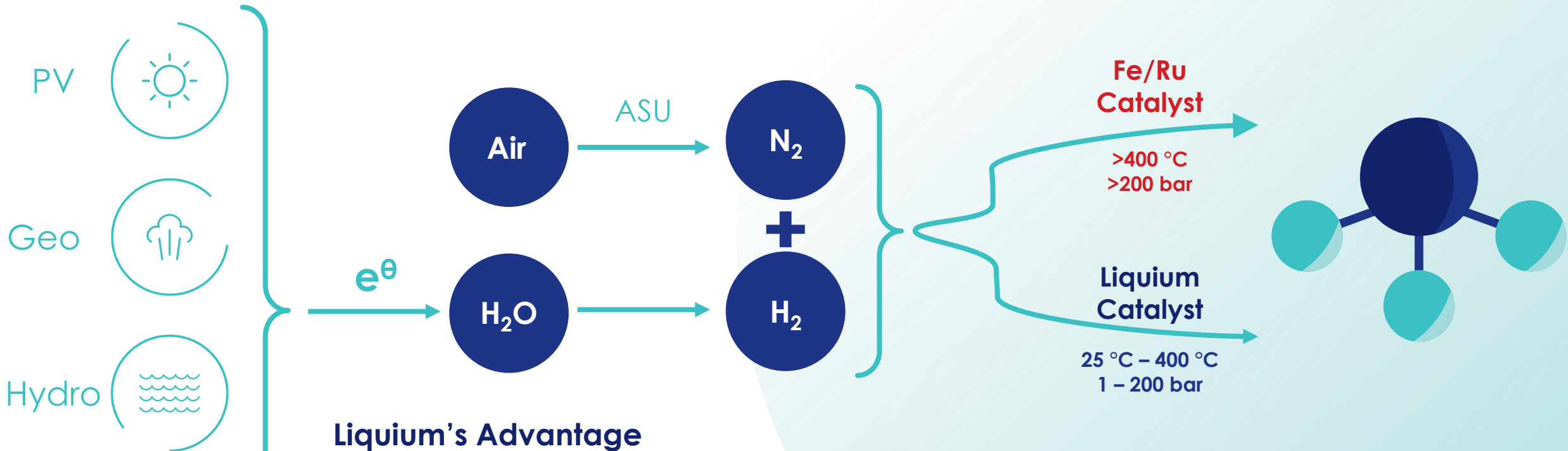
A new catalyst platform for ammonia production

We make NH₃ easier and cheaper!!

Catalyst: Liquium materials
Thermochemical reaction (i.e. Haber Bosch)
Temperature 25 °C – 400 °C
Pressure 1 – 200 bar/atm

- Low temperatures = Improved reaction and energy efficiency
- Low pressures = Cheaper infrastructure and instrumentation
- Lower economic barrier to market entry but scalable to large demand as well
- Great alignment with renewable energy
- Drop in solution for existing market

Value proposition – Enable green ammonia



Liquium's Advantage

1. Industrially relevant catalyst that aligns to existing industrial conditions (No new engineering design required).
2. Lower temperature improves reaction efficiency, purification and process conditions
3. Lower pressure improves cost profile of instrumentation and infrastructure
4. Agile operating conditions, supports wide variety of operating conditions to align with RE
5. Commercially feasible at smaller scale but will also scale to today's industrial standard

The business model

Liquium has three technology pathways:

- (1) Retrofit Haber Bosch plants
- (2) Large scale Liquium-designed plant,
- (3) Modular Liquium-designed plant.

Targeting a large IP portfolio and licensing strategy with key strategic partners

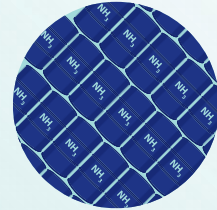
Capacity	0.5TPD
CAPEX	\$1.5M
OPEX	\$500K/yr
Price	\$2,000/T
Gross Margins	Negative



Small pilot

Markets: All. 3rd party validation, application demonstrations

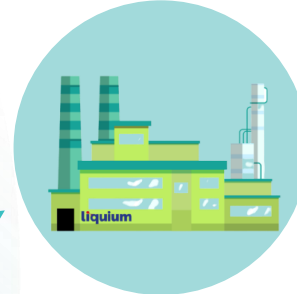
Capacity	10TPD
CAPEX	\$10M
OPEX	\$5M/yr
Price	\$1,500/T
Gross Margins	Negative



Industrial pilot

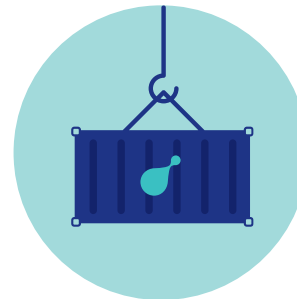
Markets: Sample samples for vendor certification for agriculture. Marine pilot sample.

Capacity	25TPD
CAPEX	\$25M
OPEX	\$8M/yr
Price	\$1,000/T
Gross Margins	10%- 15%



Demonstration plant Retrofit Haber-Bosch

Markets: Sales contracts with agriculture companies. Samples sales for vendor certification with Marine transportation



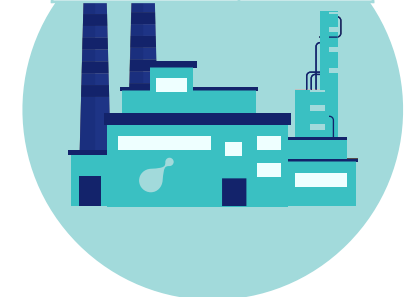
Demonstration plant Novel Liquium design

Commercial plant Retrofit Haber-Bosch

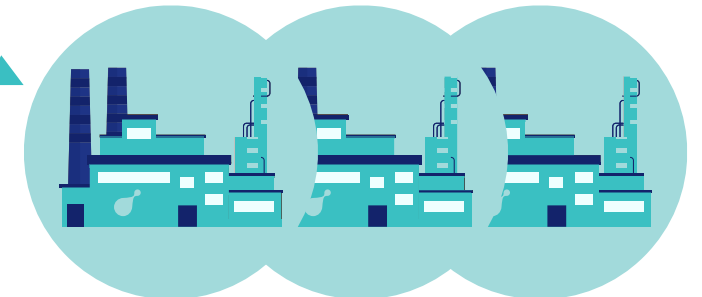


Capacity	100+ TPD
CAPEX	\$60M
OPEX	\$15M/yr
Price	\$750/T
Gross Margins	25-35%

Market: Marine transportation



Commercial plant Novel Liquium design



Commercial plant 1, 2, 3... Novel Modular Liquium design

Liquium's technology is forecasted to gain positive gross margins at demonstration scale. This reduces the company's cash burn (and subsequent fundraising requirements) prior to full commercialization. It also provides a mid-sized commercial package for markets that favor smaller, decentralized product throughputs.

*Gross margins are indicative only, initial numbers will be generated from first small pilot study

Go to market strategy



Hydrogen & industrial chemicals



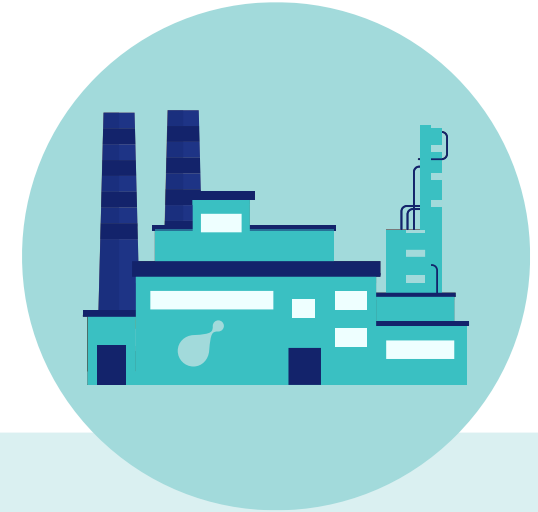
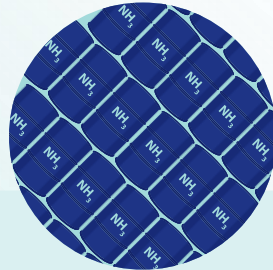
Catalyst manufacturers



Energy generators



Maritime sector



liquium

1-10 kg/day

- Chemistry & physics characterisation
- Chem & process engineering principals
- IP Generation

100-500 kg/day

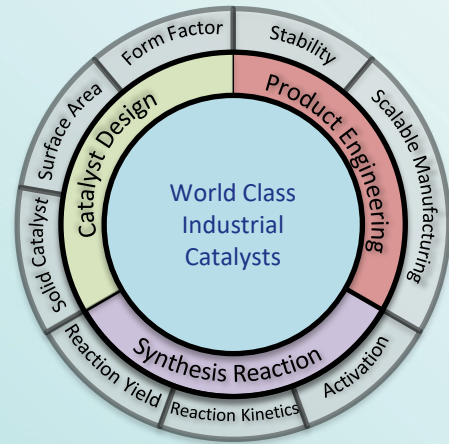
- Pilot plant optimized
- Grow materials and engineering team
- Build key partnerships and commercial opportunities across value chain

1-10 tonne/day

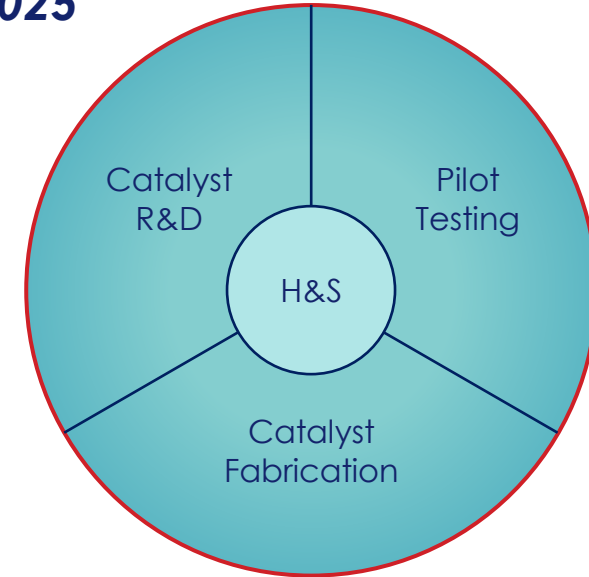
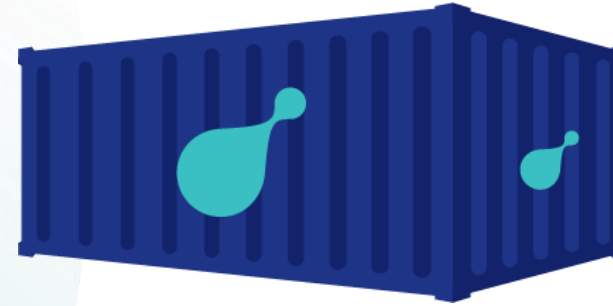
- Demo plants sites under development
- Validate different operating business models for different market applications
- Key partners for shipping, power, and fertilizer secured.
- Off-take agreements agreed

Outlook for 2023/2024: Growing to be more than a materials company

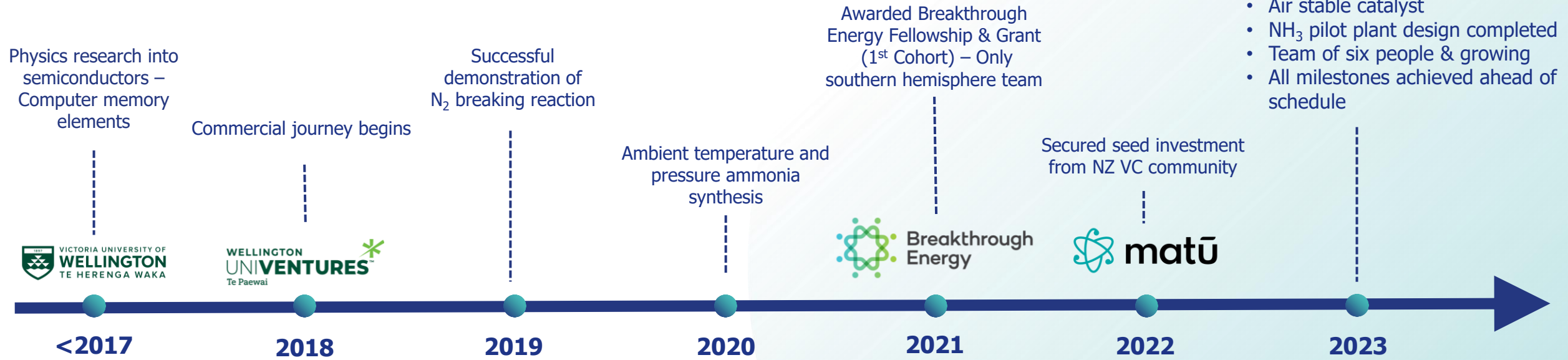
2023



2024/2025



Where this began



- Developed three generations of catalysts (>20)
- Air stable catalyst
- NH₃ pilot plant design completed
- Team of six people & growing
- All milestones achieved ahead of schedule



Breakthrough Energy
Fellows



AEA 2022
ASIAN ENTREPRENEURSHIP AWARD



Our Team



Back (Left to right): Dr Franck Natali, CTO and Founder Director; Dr Paul Geraghty, CEO & Co-Founder; Dr Pauline Calloch, Senior Scientist; Dr Mohsen Maddah, Scientist.

Front (Left to right): Dr Jay Chan, Senior Scientist and Co-Founder; Dr Sherry Xu, Senior Scientist.

Board of directors



John Worth
Chair Director
CEO/Managing Director at Geo40



Greg Sitters
Investor Director
Managing Partner at Matu



Dr Franck Natali
Liquium CTO
Founder Director



Dr Anne Barnett
Director
CEO at Wellington UniVentures

- Seeking investment partners for both Seed 2 (Open Now!) & Series A round (2024/2025).
- Target close Seed 2 before Q4 2023 – Aligns to new pilot opportunity
- Outcome: Procure pilot, install, operate, build up fabrication capabilities, grow team.
- Why? Move with pace and intent to capture opportunity now

“We believe we can play a critical role in the uptake of green ammonia as the next clean liquid fuel to decarbonise heavy industries.”

Contact Paul Geraghty: paul.geraghty@liquium.nz