



Hydrogen

# HYDROGEN PRODUCTION DISRUPTION

HAZER GROUP LTD ASX:HZR

September 2018



# VALUE PROPOSITION



**Disruptive, global and scalable low cost, low emission solution to a decarbonised hydrogen future.**



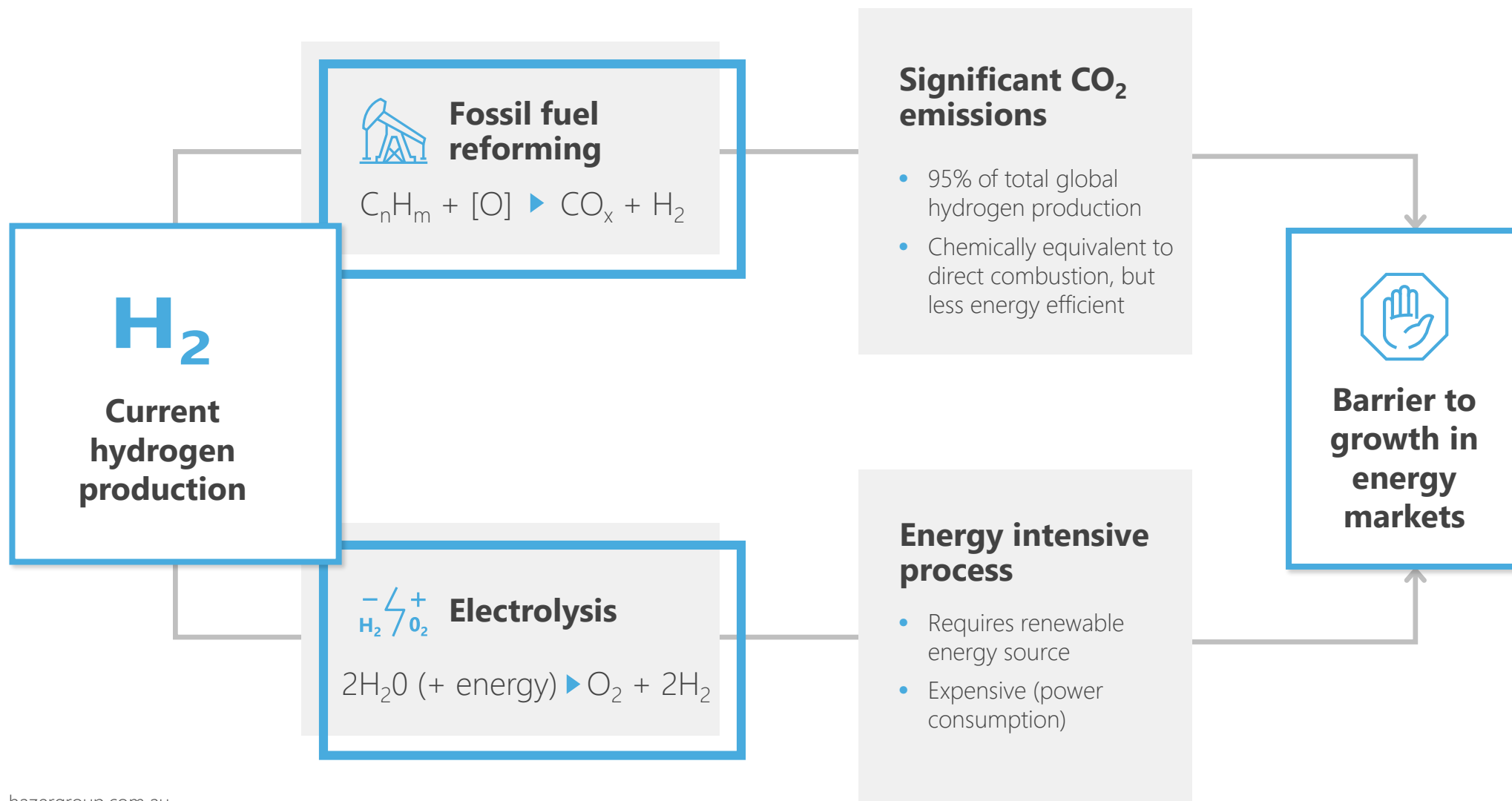
**Technical development successfully progressed to enable transitioning into commercial phase with a strong focus on additional partnerships and offtake.**



**Multiple potential revenue streams.**

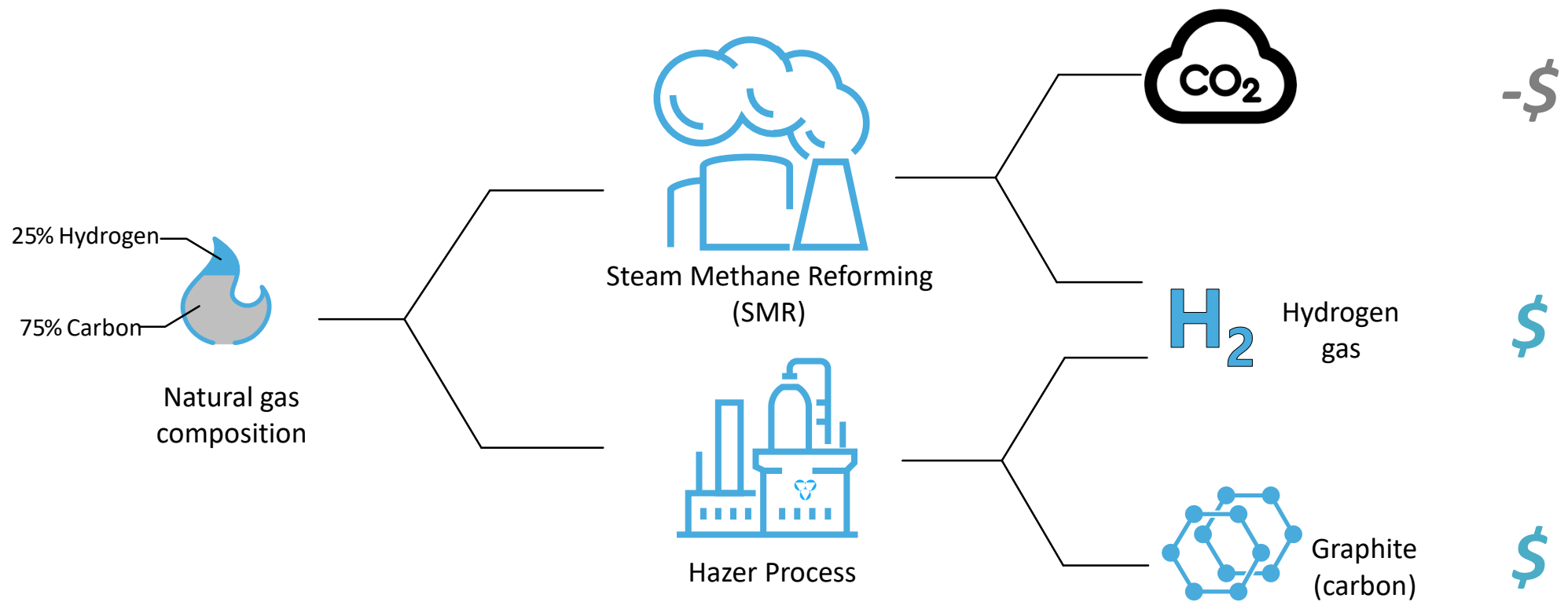
# WHY CURRENT HYDROGEN PRODUCTION IS RIPE FOR DISRUPTION?

Production is high in emissions or expensive



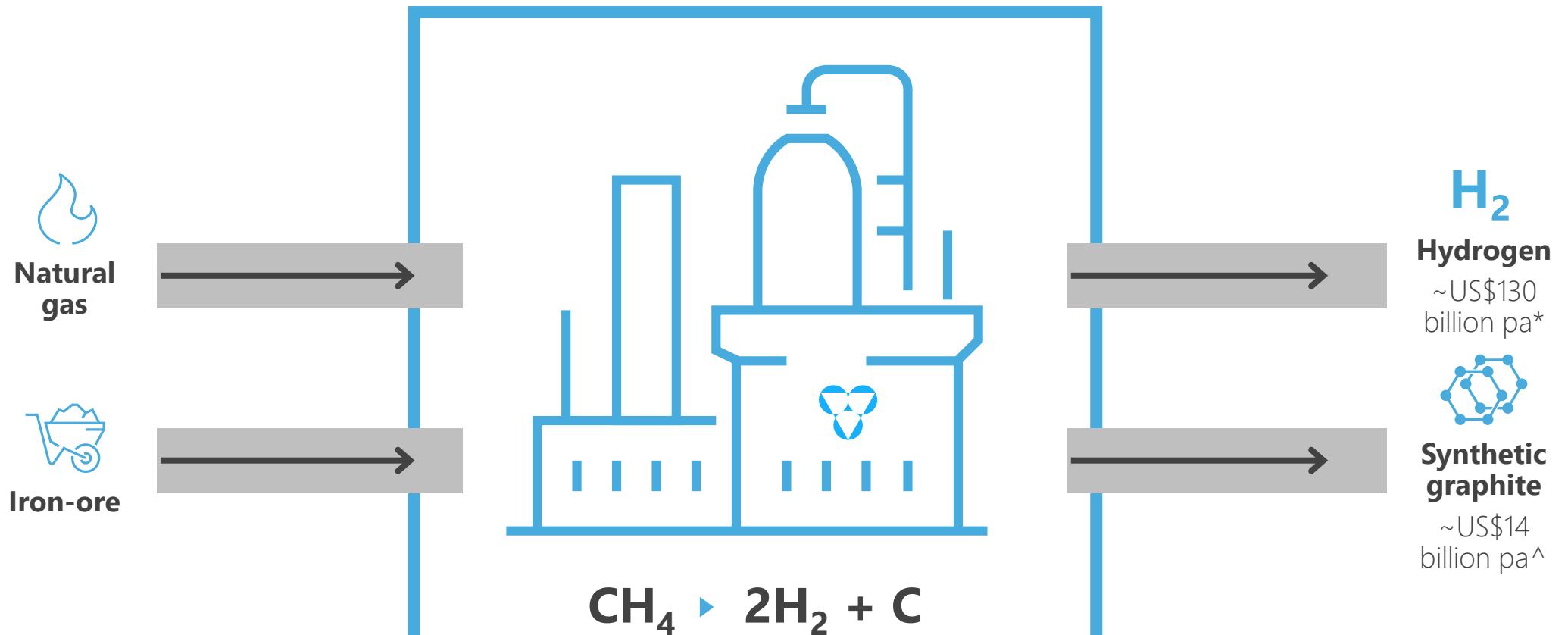
# THE HAZER ADVANTAGE

Capturing more value of feedstock gas and dual revenue streams



# THE HAZER PROCESS

Hydrogen and graphite from natural gas



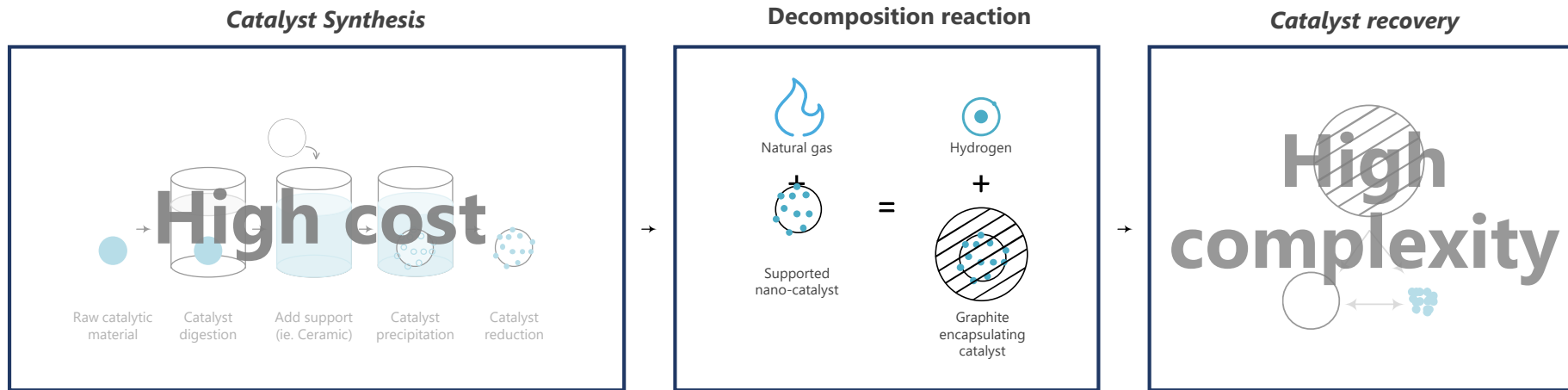
\* "Global Hydrogen – A US\$2.5 Trillion Industry?",  
Morgan Stanley Research Report July 22 2018

^ "Global Market Study of Graphite Market",  
Persistence Market Report, pg 14

# THE BREAKTHROUGH

## Methane Decomposition - Simplified approach to old science

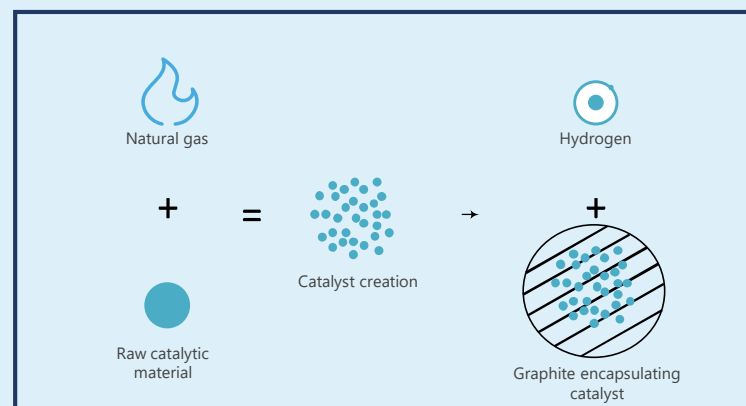
### Traditional methane decomposition research



### Hazer Group

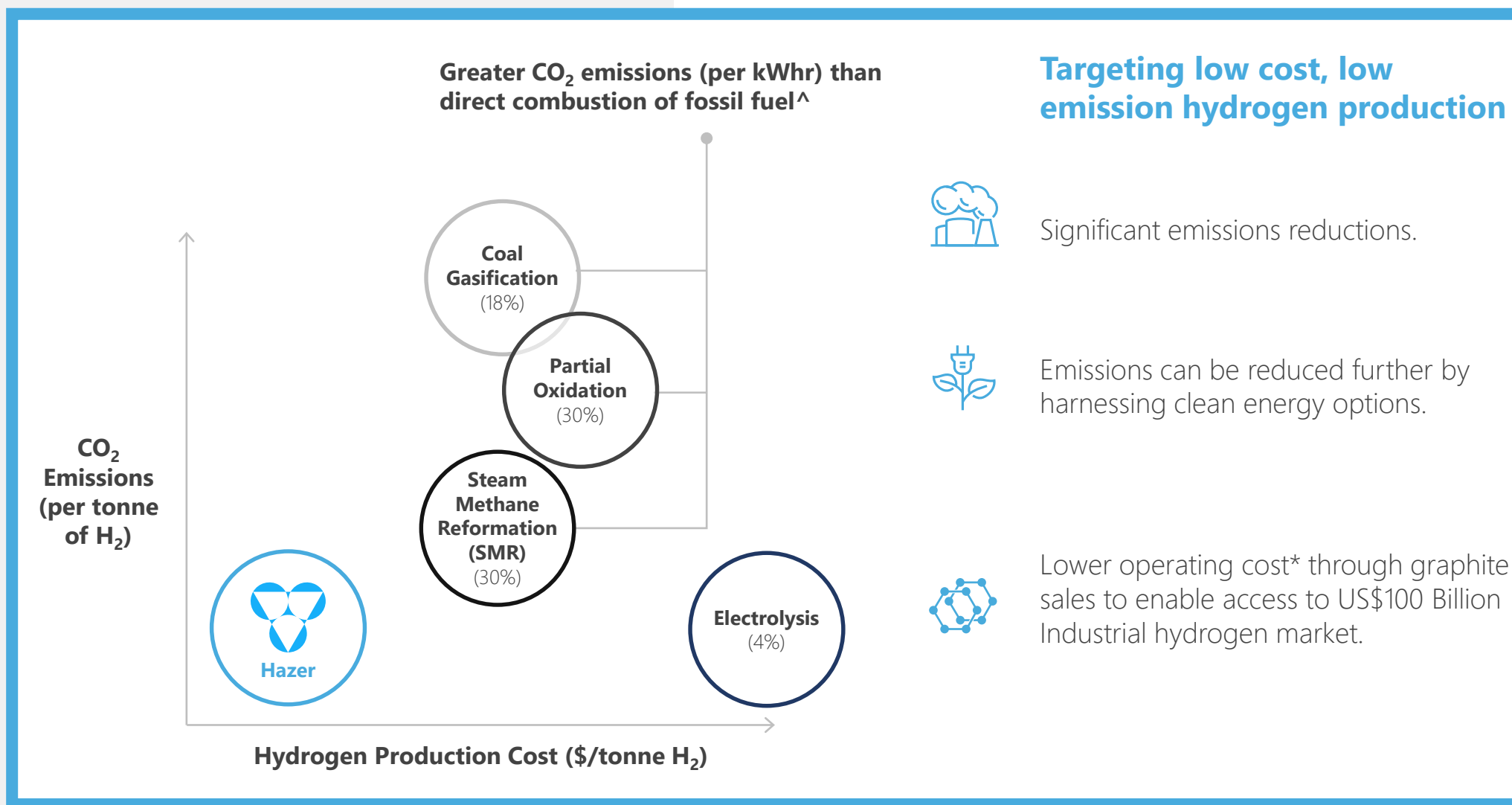
- Reaction creates catalyst from cheap material
- No need for catalyst synthesis
- No need for catalyst recovery and reuse

### Decomposition reaction



# HAZER HYDROGEN COMPARISON

Positioning as a low cost, low emission alternative



\*Economic modelling as per previous ASX Announcement 28<sup>th</sup> February 2018 <sup>^</sup>Conceptual diagram only with numbers in brackets showing best estimates current market share

# OPPORTUNITIES IN THREE MAJOR GLOBAL MARKETS



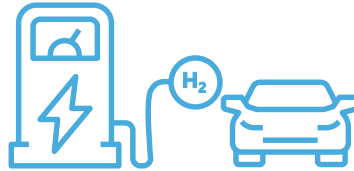
## Industrial hydrogen US\$130 billion\*

### Low emission, low cost alternative

Currently primarily addressed by fossil fuel reformation processes (high CO<sub>2</sub> byproduct).

Hazer has potential to deliver significant cost savings with graphite revenue offset.

Industry is beginning to turn toward cleaner solutions.



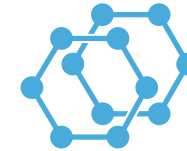
## Clean hydrogen and energy US\$12 billion<sup>a</sup> by 2023 (FCV)

### Multiple applications

Clean (low carbon) hydrogen has price or value premium to standard hydrogen.

Key component of clean energy future ( $H_2 \Rightarrow H_2O + \text{energy}$ ).

Fundamental cost, energy limitations for existing clean hydrogen production options.



## Synthetic graphite US\$14 billion<sup>^</sup>

### High quality, low cost graphite source

Growth - energy storage (batteries)

Graphite has a wide range of desirable properties and is used in a range of industrial materials applications.

Current methods of graphite production (natural or synthetic) are costly and have significant environmental impacts.



# MULTIPLE CLEAN HYDROGEN APPLICATIONS

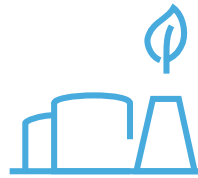


## Clean energy – Vehicle fuel and stationary power

Fuel Cell Vehicle (FCV) models being developed.

Potential distribution via traditional clean energy systems, including hydrogen injection into gas pipelines

Cost, energy and carbon emission barriers for existing hydrogen production methods .

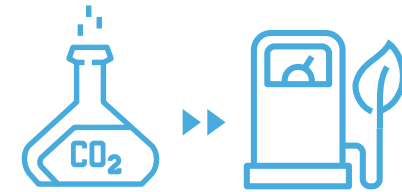


## Clean Industrial Hydrogen Market

Traditional industrial hydrogen users are seeking cleaner alternatives.

This offers opportunities to disrupt the large and growing industrial hydrogen market

Recent attention has been in iron production, and green ammonia.



## Carbon Capture and Utilisation (CCU)

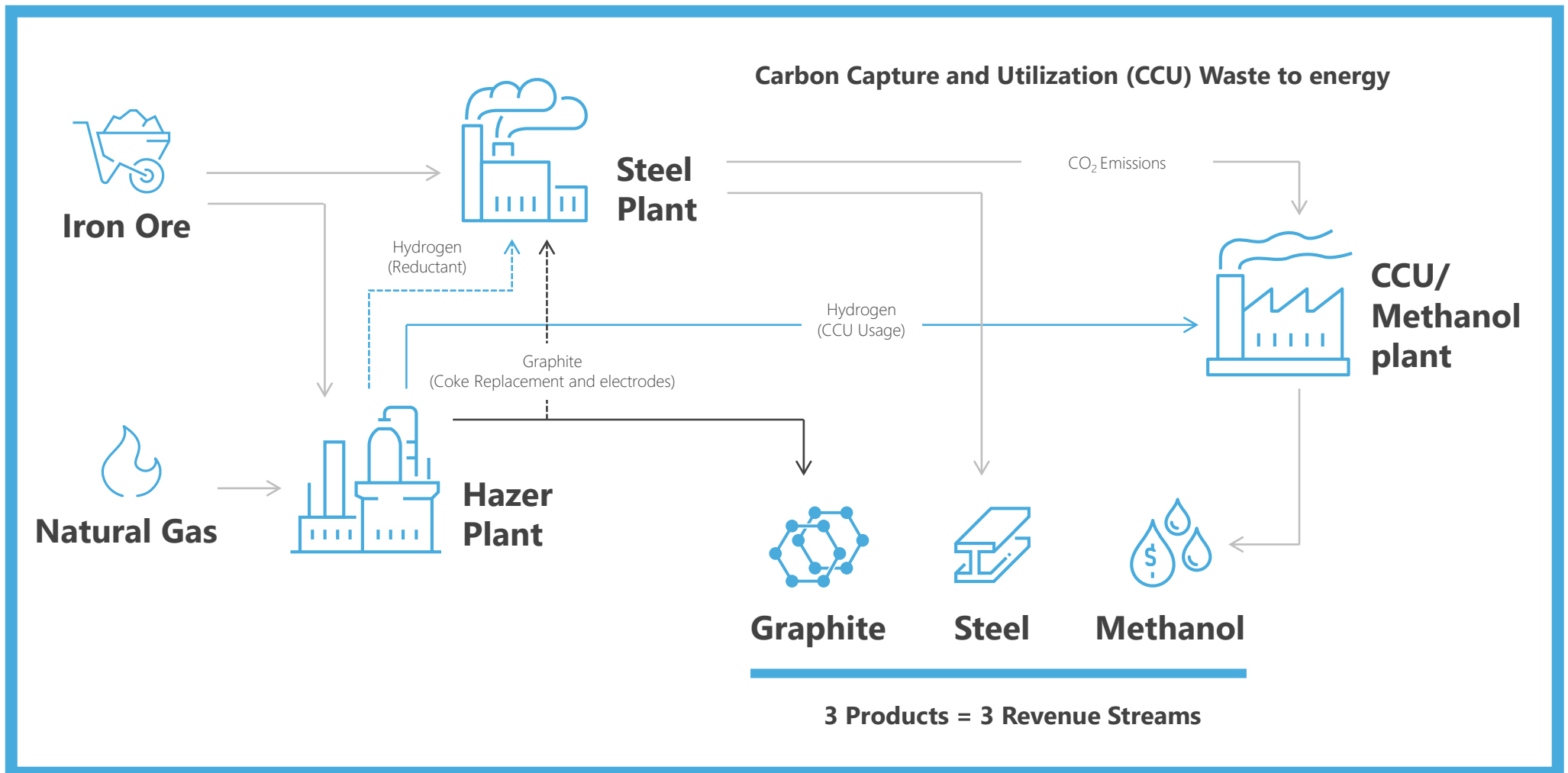
An alternative to CCS (Carbon Capture and Storage), where CO<sub>2</sub> emissions can be captured and used as feedstock for other chemical products.

These include methanol and liquid fuel (diesel).

Low cost, low emission hydrogen will be in demand as a key additional feedstock.

# INDUSTRIAL HYDROGEN MARKETS TRANSITIONING TO LOW CARBON HYDROGEN

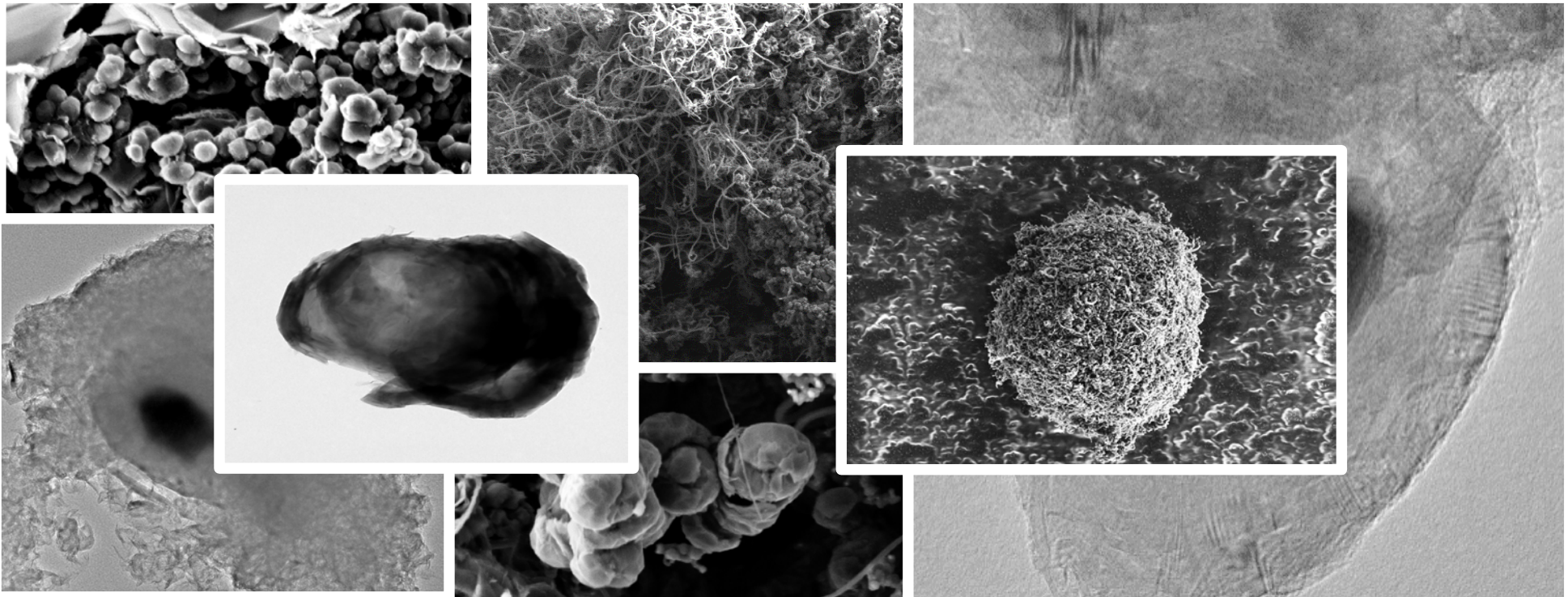
Conceptual Hazer plant integration into steel production with CCU



# HAZER GRAPHITE

## Versatile properties – many opportunities

- Current graphite market value in excess of US\$ 14 Billion per annum<sup>^</sup>
- Hazer graphite structure and properties can be altered to potentially suit different market by changing the process conditions
- Graphite purity ex reactor can range between 80-95%wt, and can be purified to 99.9%<sup>></sup> with standard purification techniques
- Promising preliminary results in using Hazer Graphite in Li-ion batteries

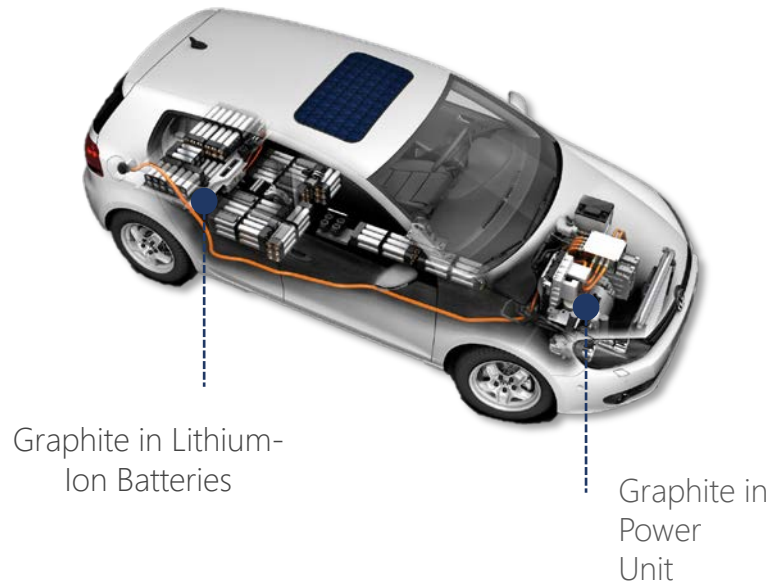


<sup>^</sup> "Global Market Study of Graphite Market", Persistence Market Report, pg 14

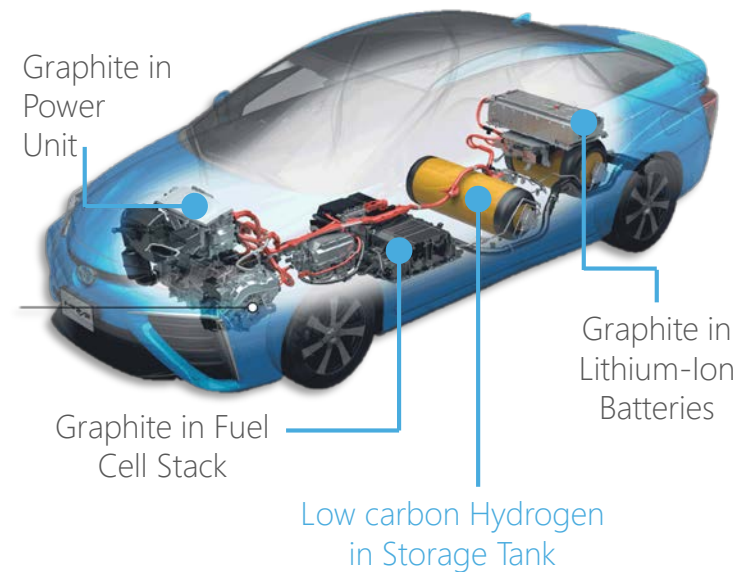
# HYDROGEN & GRAPHITE SYNERGY

Potential to be a major part of the revolution in future mobility

## Electric Vehicle

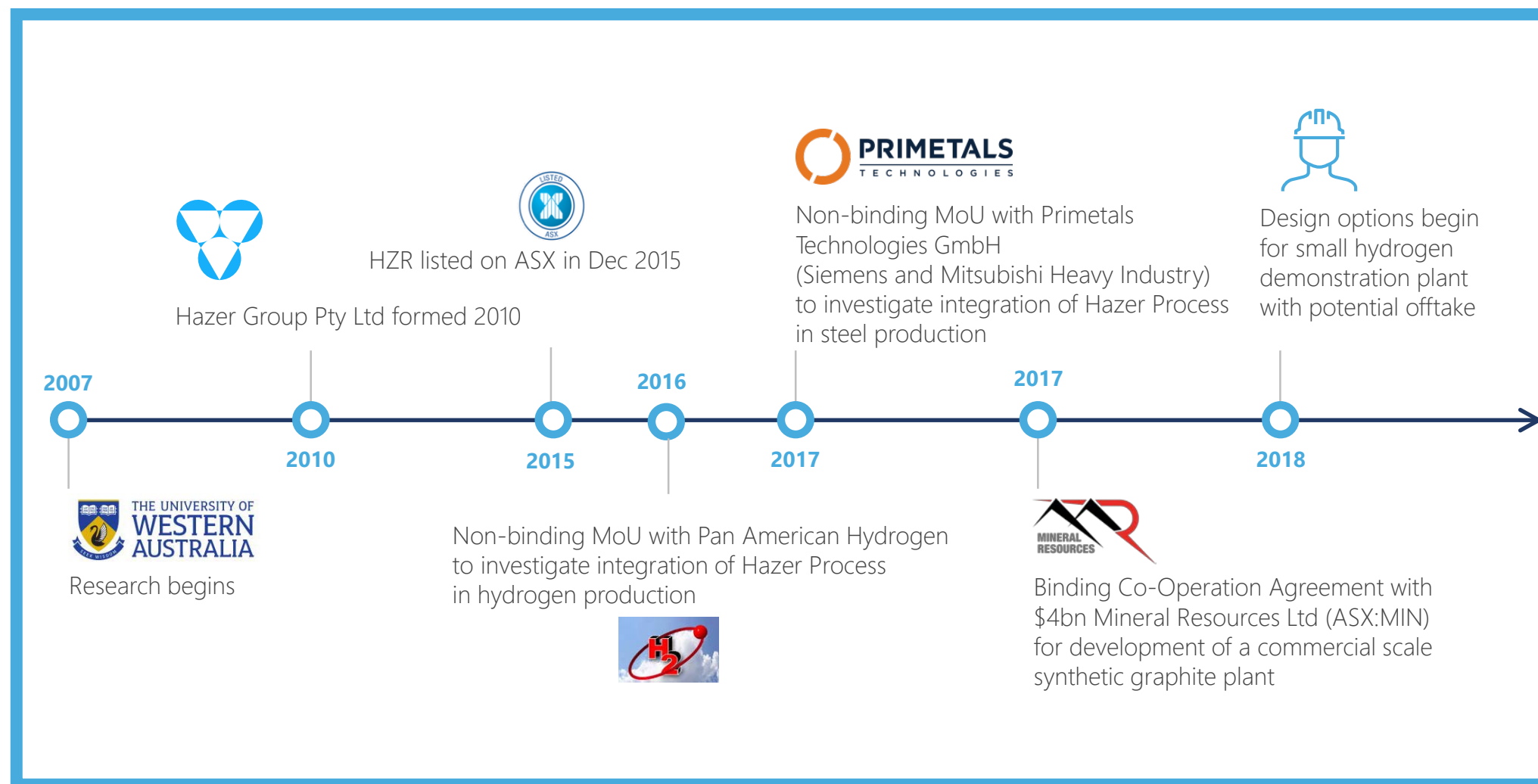


## Fuel Cell Vehicle



# STRONG COMMERCIAL PROGRESS SINCE IPO

## Milestones





# COLLABORATION WITH ASX:MIN

## Investment and Commercial Partner



March 2017 MIN made a A\$5M strategic placement and significantly increased their stake in Hazer to 14%.

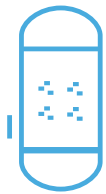
December 2017 binding agreement for the potential development of a commercial scale synthetic graphite facility;

- MIN to fund the commercial development.
- Hazer to obtain royalties from graphite sales.
- Stage 1 pilot plant first graphite expected Q4 2018.
- Stage 3 target production of 10,000tpa.



# MULTIPLE REACTOR OPTIONS

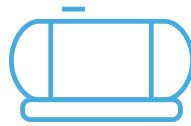
## Using Hazer Process



Hazer Reactor

### **Fluidised Bed Reactor FBR**

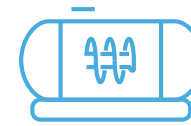
Reactor flexibility allowing for a range of graphite purity options and high hydrogen production with best productivity for reactor size.



External Reactor

### **Rotary Tube Reactor RTR**

Alternative off the shelf reactor design identified for a range of graphite purity options, medium hydrogen production but lower productivity for reactor size.

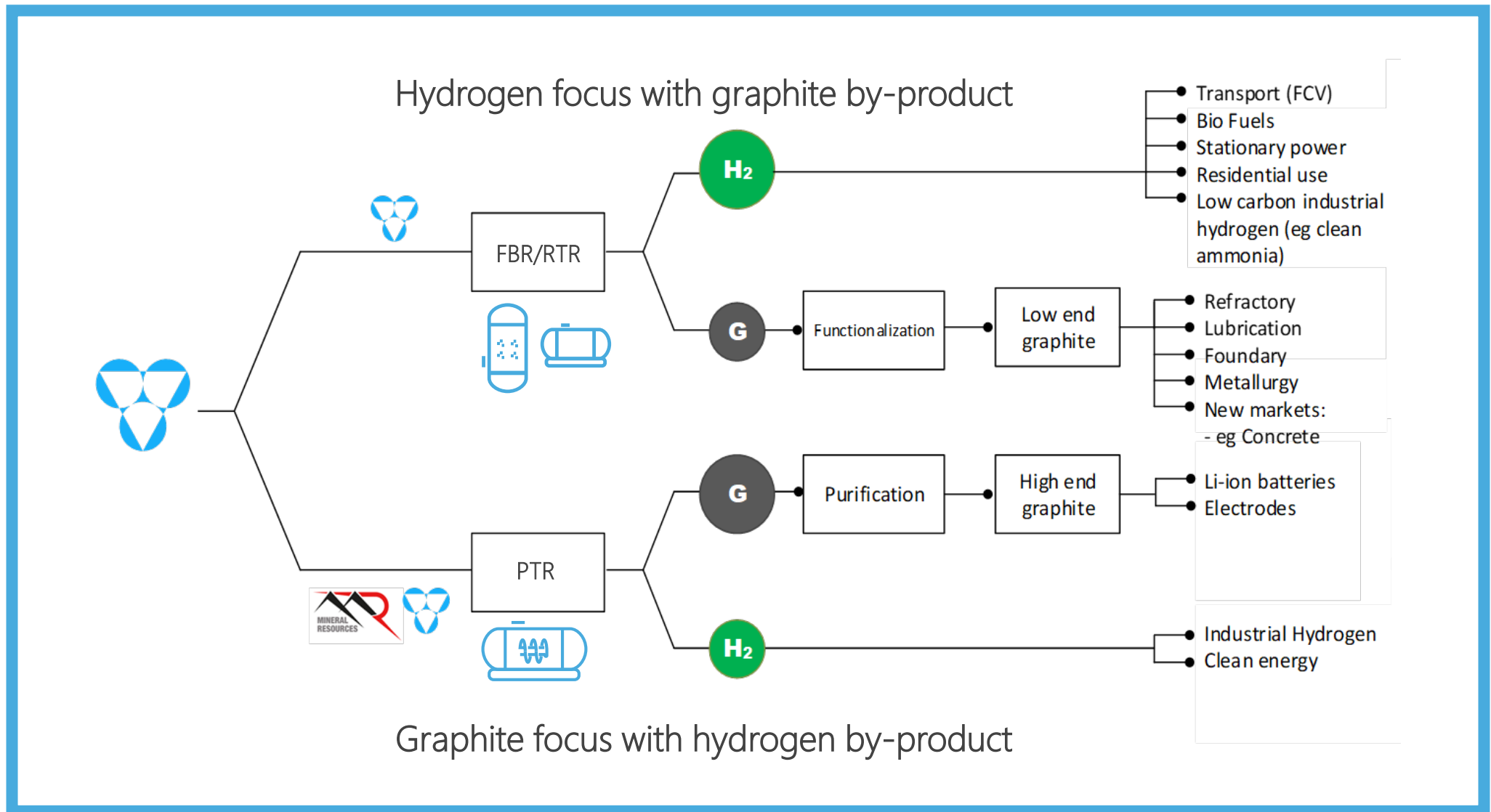


MRL/HZR Reactor

### **Paddle Tube Reactor PTR**

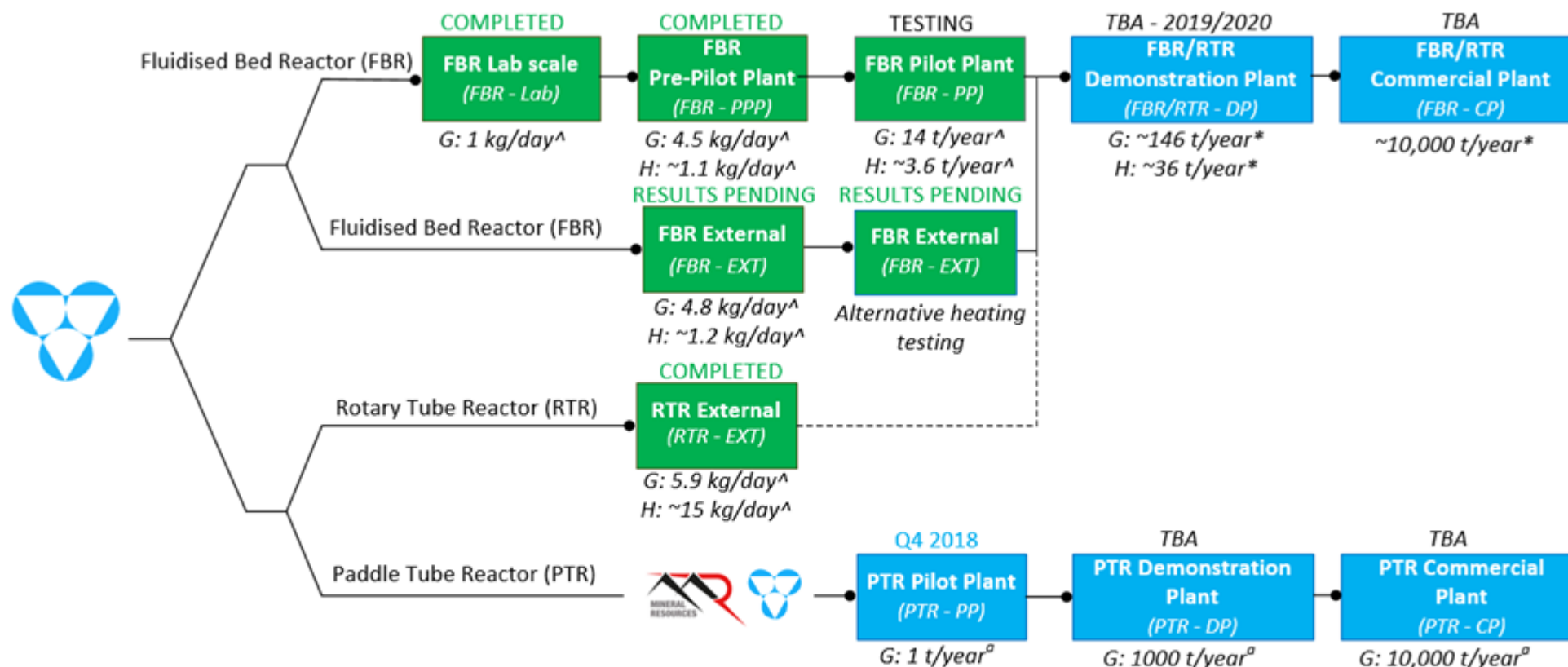
Reactor tailored towards production of high purity graphite for battery applications with good hydrogen potential.

## PROPOSED PATHWAY & POTENTIAL MARKETS





# PATH TO COMMERCIAL DEVELOPMENT



<sup>^</sup> Actual equivalent product capacity rate achieved (unpurified)

\* Nominal product target capacity (unpurified)

<sup>a</sup> Nominal graphite target capacity (purified)

G: Graphite nominal capacity

H: Hydrogen nominal capacity

# MULTIPLE COMMERCIAL OPTIONS

Using Hazer Process



## **License**

License IP to 3rd parties and generate high margin royalty



## **Partnership**

Share capital & operating costs with hydrogen or graphite partners



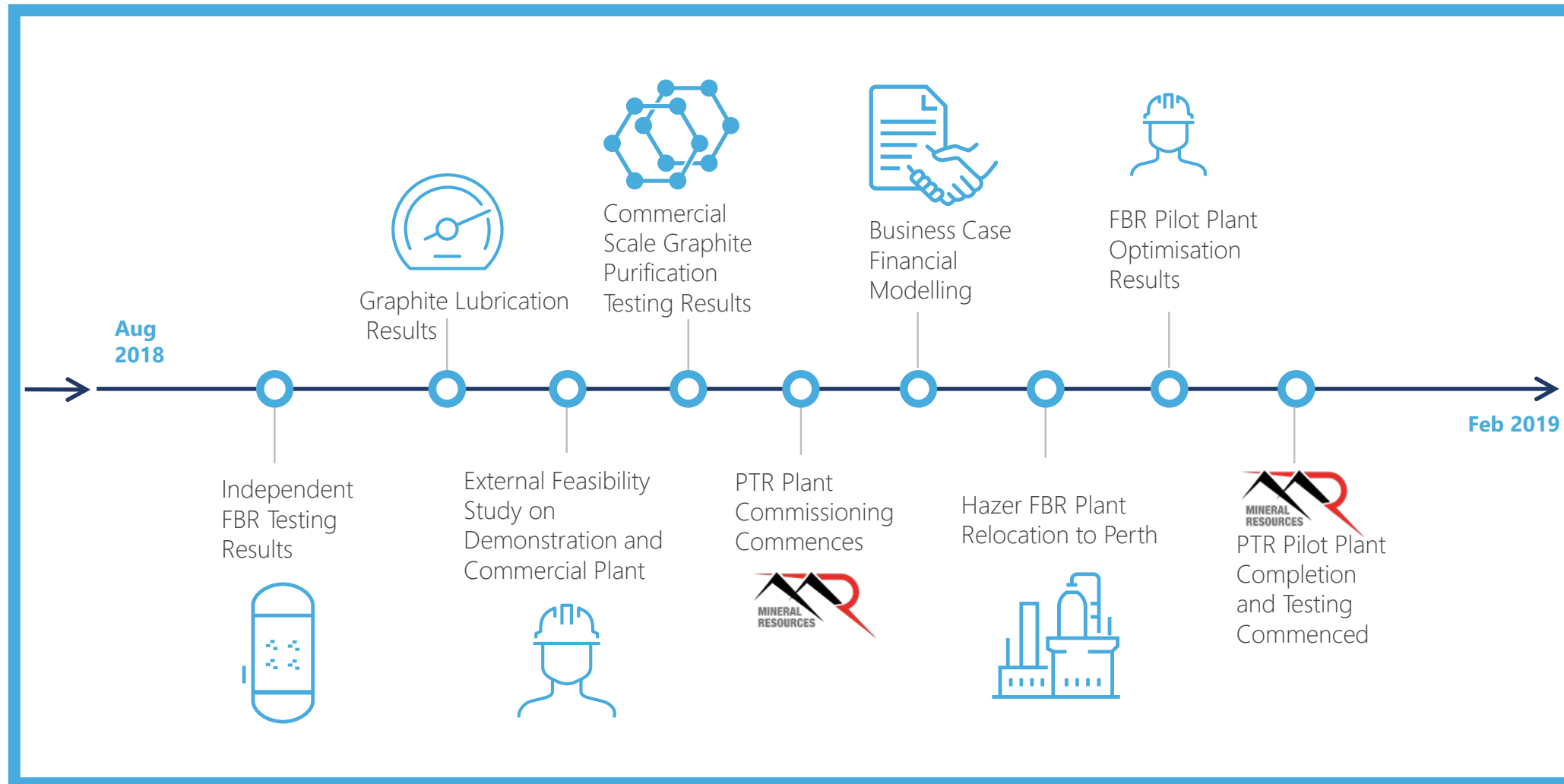
## **Build, Own & Operate**

Hazer can construct own and operate plants and sell products

**Currently investigating multiple options across different business models**

# NEWSFLOW

## Aspirational Milestones\*



\* Indicative timetable only August 2018 to February 2019

# STRONG LEADERSHIP

Commercial, Technical, Contract & Regulatory expertise



Mr Tim Goldsmith  
**Chairman**

- Over 20 years as Partner with global professional services group PwC
- Leader of PwC's Mining Group, and National China Desk leader at PwC
- Over 30 years corporate and commercial experience across international mining and industrial business operations



Mr Simon Rushton  
**NED**

- Executive General Manager - Corporate Development at Mineral Resources Limited
- 18 years global corporate experience in financial, advisory and legal roles
- Corporate contracts including M&A expertise within the mining sector



Ms Danielle Lee  
**NED**

- Corporate lawyer with more than 23 years' experience shared between private law firms and the ASX
- Main practice areas are corporate advisory, governance and equity capital markets; regularly advises on issues relating to the Corporations Act and ASX Listing Rules



Dr Andrew Harris  
**NED**

- Lead Director of the Engineering Excellence Group, Laing O'Rourke
- Professor of Chemical and Biomolecular Engineering at the University of Sydney
- Previously the CTO of Zenogen, a hydrogen production technology company, and a co-founder of Oak Nano, a start-up commercialising novel carbon nanotube technology

# PROJECT EXECUTION EXPERIENCE

Engineering, Technical, Marketing & Corporate expertise



Mr Mark Edwards  
**Acting CEO**

- Mechanical engineer with 25 years experience in project management, site maintenance and operation
- Former AUA Regional Director for Light Metals division at Hatch Pty Ltd
- Technical specialist with focus on delivery of complex technical projects



Dr Andrew Cornejo  
**Co-Founder and Chief Technical Officer**

- PhD and inventor of the Hazer Process
- 15 years technical engineering experience in R&D, advisory and resource development roles
- Bachelor of mechanical engineering and commerce, Graduate Cert in research commercialisation



Ms Emma Waldon  
**CFO and Company Secretary**

- 20 years experience in finance and corporate advisory roles including ASX listed companies
- Specialist in risk management
- Member of the Australian Institute of Chartered Accountants, a Fellow of the Financial Services Institute of Australasia and a Certificated Member of the Governance Institute of Australia



Mr Thomas Murrell  
**Chief Marketing Officer**

- 35 years experience in media, marketing and management
- Director of ASX-listed emerging graphite developer Walkabout Resources
- Chairman of Hong Boa Media, a Singapore and Malaysia-based media services company
- MBA in marketing

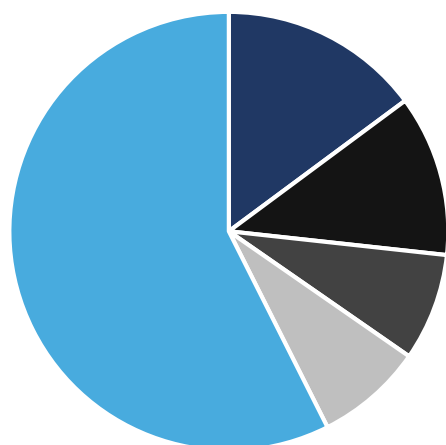
# TIGHTLY HELD REGISTER

Top 20 own 42%

## Capital Structure

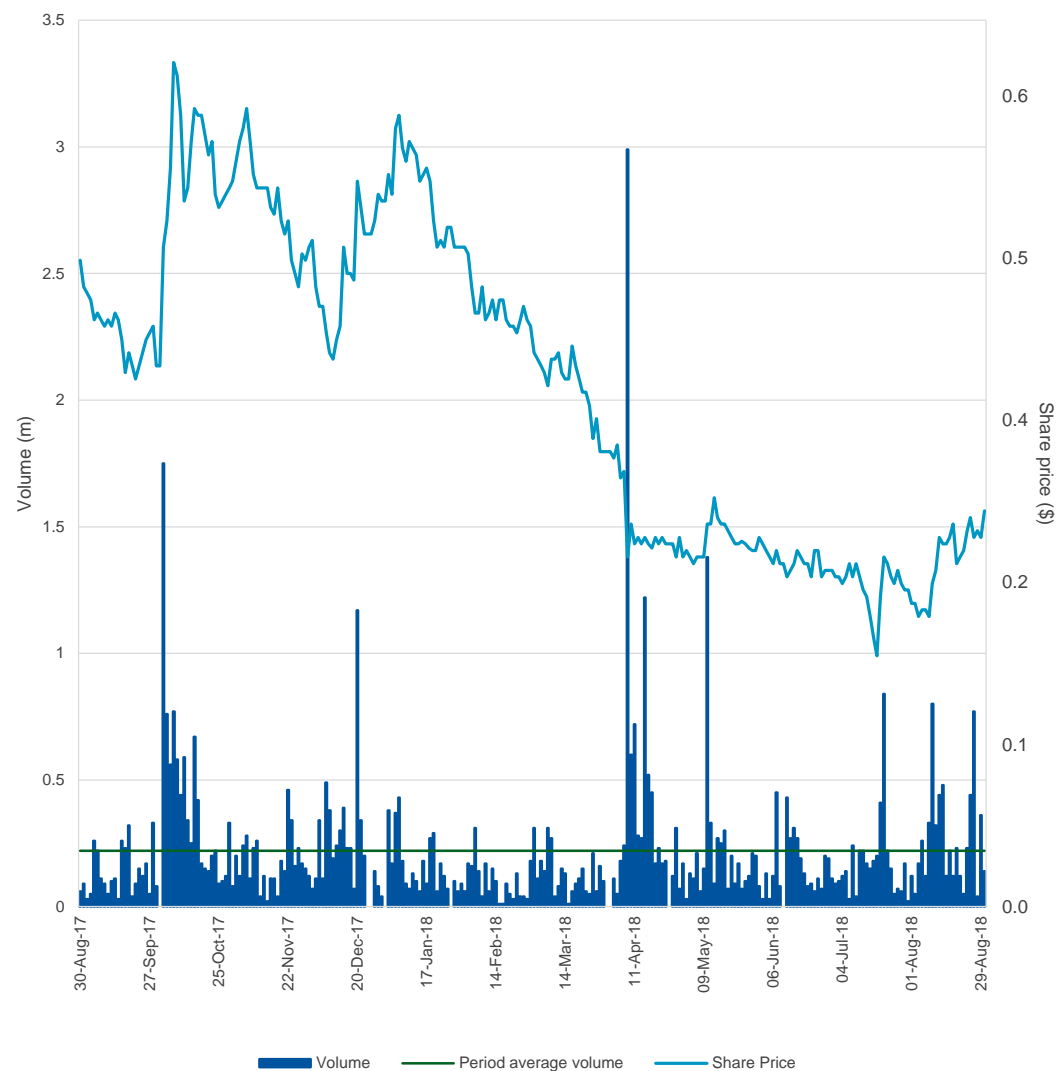
Current Shares on Issue	88.3m
Market Capitalisation @\$0.265	\$23.4m
Cash @ 30 June 2018	\$6.185m
Total Options	68.4m
\$0.25 and \$0.30 Options Exercise Dec 2018	30.2m
Diluted Market Cap \$0.25 and \$0.30 Options	\$31.4m
Total Cash From \$0.25 and \$0.30 Options Exercise Dec 2018	\$8.8m
Total Cash From all options	\$33.6m

## Substantial Shareholders



- Top 20 ex substantial shareholders holding >5%
- Mineral Resources Ltd
- Geoff Pocock Entities
- Andrew Cornejo
- Other

## Share Price & Volume



# WHY INVEST?



**Disruptive, global and scalable low cost, low emission solution to a decarbonised hydrogen future.**



**Technical development successfully progressed to enable transitioning into commercial phase with a strong focus on additional partnerships and offtake.**



**Multiple potential revenue streams.**

# DISCLAIMER

## Important Information

This presentation has been prepared by Hazer Group Limited ("Hazer" or "the Company")

This presentation is not a financial product or investment advice or recommendation, offer or invitation by any person or to any person to sell or purchase securities in Hazer in any jurisdiction. This presentation contains general information only and does not consider the investment objectives, financial situation and needs of individual investors. Investors should make their own independent assessment of the information in this presentation and obtain their own independent advice from a qualified financial adviser having regard to their personal objectives, financial situation and needs before taking any action.

No representation or warranty, express or implied, is made as to the accuracy, completeness, reliability or adequacy of any statements, estimates, opinions or other information, or the reasonableness of any assumption or other statement, contained in this presentation. Nor is any representation or warranty (express or implied) given as to the accuracy, completeness, likelihood of achievement or reasonableness of any forecasts, prospective statements or returns contained in this presentation. Such forecasts, prospective statements or returns are by their nature subject to significant uncertainties and contingencies, many of which are outside the control of Hazer.

To the maximum extent permitted by law, Hazer and its related bodies corporate, directors, officers, employees, advisers and agents disclaim all liability and responsibility (including without limitation any liability arising from fault or negligence) for any direct or indirect loss or damage which may arise or be suffered through use or reliance on anything contained in, or omitted from, this presentation. An investment in Hazer securities should be considered speculative and is subject to investment and other known and unknown risks, some of which are beyond the control of Hazer. Hazer does not guarantee any rate of return or the absolute or relative investment performance of Hazer securities. The distribution of this presentation including in jurisdictions outside Australia, may be restricted by law. Any person who receives this presentation must seek advice on and observe any such restrictions.



# HAZER GRAPHITE SHOWS PROMISE IN LI-ION BATTERIES



Preliminary testing of Hazer graphite in coin cell Li-ion batteries show equivalent performance to commercial synthetic spherical graphite.

