

# Hazer Group Ltd (HZR)

## Path to commercialising technology in place

Hazer Group Limited (ASX:HZR) has made significant progress over the past quarter towards commercialising their proprietary Hazer Process – the conversion, at moderate temperature and pressure, of natural gas into hydrogen and graphite, using iron ore as a process catalyst. In October 2017, HZR signed a non-binding Heads of Agreement with Mineral Resources (ASX:MIN) and separately, a non-binding Memorandum of Understanding with Primetals Technologies, a global engineering company.

The two agreements illustrate the adaptability of the technology. MinRes is looking for a low-cost method of producing ultra-high purity synthetic graphite; Primetals is looking for low CO<sub>2</sub> emission methods of producing hydrogen for carbon capture via methanol production, and reducing (primarily) steel plant operating costs.

The MinRes technology sharing agreement is likely to be the “first cab off the rank”. The targeted ramp-up schedule is for production of 10,000tpa of high-value ultra-high purity graphite by FY22E. At a forecast price of US\$10,000/t, this would equate to annual revenues of ~A\$130m, and an estimated royalty stream to HZR of ~A\$16m (pre-tax) per annum. The timing and quantum of any technology sharing arrangements with Primetals is unknown, but we calculate that royalties for a single 1Mtpa steel plant / 500ktpa methanol plant could be in the range of US\$15mpa.

### SOTP target price: A\$1.00

Our estimated SOTP equity value for HZR is A\$133m (A\$1.00 per fully diluted share). It is comprised of 1) a risk-weighted NPV<sub>10</sub> of A\$40m (A\$0.30 per fully diluted share) from royalties stemming from potential technology licensing arrangements (TLAs) with MinRes, 2) a risk-weighted NPV<sub>10</sub> of A\$89m (A\$0.66 per fully diluted share) from royalties stemming from potential TLAs with Primetals Technologies and, 3) FY18E net cash of A\$5m (A\$0.04 per fully diluted share).

At current share price levels of A\$0.54, we calculate that HZR offers some 88% upside potential. **We initiate coverage with a Speculative Buy (Higher Risk) recommendation**

### Key Financials

Year-end June	FY17A	FY18E	FY19E	FY20E	FY21E
Graphite sales (tonnes)	na	-	-	1,000	5,000
Graphite price (US\$/t)	na	10,000	10,000	10,000	10,200
Graphite revenue (US\$m)	na	-	-	10.0	51.0
Hydrogen sales (tonnes)	na	-	-	-	-
Revenue: MIN JV (A\$m)	na	-	-	12.5	63.8
EBITDA: MIN JV (A\$m)	na	(2.0)	(2.0)	8.4	51.1
% royalty to HZR	na	15%	15%	15%	15%
Royalty to HZR (A\$m)	na	-	-	1.3	7.7
Normalised NPAT (A\$m)	(3.9)	(4.8)	(5.1)	(4.1)	2.0
EPS Reported (A\$c)	(2.9)	(3.6)	(3.8)	(3.1)	1.5
EPS Normalised (A\$c)	(2.9)	(3.6)	(3.8)	(3.1)	1.5
DPS (A\$c)	-	-	-	-	-
PER (x)	na	na	na	na	35.2
Net cash/(debt) (A\$m)	8.1	4.9	5.5	5.4	11.1
Capex (A\$m)	(1.1)	(0.25)	(0.26)	(0.28)	(0.29)

Source: IRESS, Company Data, State One Stockbroking. Share price: \$ 0.530 Nov 17, 2017

17 November 2017

Share Price: A\$0.53

Target Price: A\$1.00

Recommendation  
**Speculative Buy**

Risk Assessment  
**Higher**

### Chemicals

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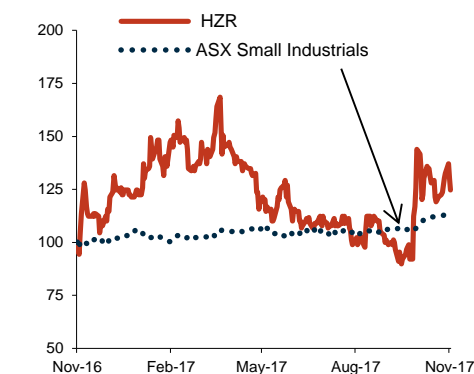
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### Hazer Group Ltd

ASX Code	HZR
52 week range (A\$cps)	A\$0.40-A\$0.77
Fully diluted Market Cap (A\$m)	71
Fully diluted no. of shares (m)	134
Av Daily Turnover (shares)	262k
ASX All Ordinaries	6.037
FY18E BV per share (A\$c)	A\$4.4c
FY18E EPS (A\$c)	-A\$3.6c
FY18E Net (Debt)/Cash (A\$m)	4.9

### Relative price performance



Source: Iress

## Financial Statements

### HazerGroup Limited

Year ending June

Profit & Loss Statement (A\$M)	FY17A	FY18E	FY19E	FY20E	FY21E
Revenue	0.3	0.0	0.0	0.0	0.0
Gas feedstocks costs	0.0	0.0	0.0	0.0	0.0
Iron ore catalyst/conversion costs	0.0	0.0	0.0	0.0	0.0
Corporate/Other costs	(4.2)	(5.0)	(5.3)	(5.5)	(5.8)
<b>EBITDA</b>	<b>(3.9)</b>	<b>(5.0)</b>	<b>(5.3)</b>	<b>(5.5)</b>	<b>(5.8)</b>
Depreciation & Amortisation	0.0	0.0	0.0	0.0	0.0
<b>Operating profit</b>	<b>(3.9)</b>	<b>(5.0)</b>	<b>(5.3)</b>	<b>(5.5)</b>	<b>(5.8)</b>
Royalty income	0.0	0.0	0.0	1.3	7.7
<b>EBIT</b>	<b>(3.9)</b>	<b>(5.0)</b>	<b>(5.3)</b>	<b>(4.3)</b>	<b>1.9</b>
Interest income	0.1	0.2	0.1	0.1	0.1
Interest expense	(0.0)	0.0	0.0	0.0	0.0
Tax expense	0.0	0.0	0.0	0.0	0.0
<b>Reported NPAT</b>	<b>(3.9)</b>	<b>(4.8)</b>	<b>(5.1)</b>	<b>(4.1)</b>	<b>2.0</b>
<b>Normalised NPAT</b>	<b>(3.9)</b>	<b>(4.8)</b>	<b>(5.1)</b>	<b>(4.1)</b>	<b>2.0</b>
EBITDA Margin (%)	na	na	na	na	na
Operating profit margin (%)	na	na	na	na	na
EPS Reported (A\$)	(2.9)	(3.6)	(3.8)	(3.1)	1.5
<b>EPS Normalised (A\$)</b>	<b>(2.9)</b>	<b>(3.6)</b>	<b>(3.8)</b>	<b>(3.1)</b>	<b>1.5</b>
EPS growth (%)	na	na	na	na	na
DPS - Declared (A\$)	0.0	0.0	0.0	0.0	0.0
YE no. shares (m)	77	84	105	112	122
YE no. of fully-diluted shares (m)	134	134	134	134	134

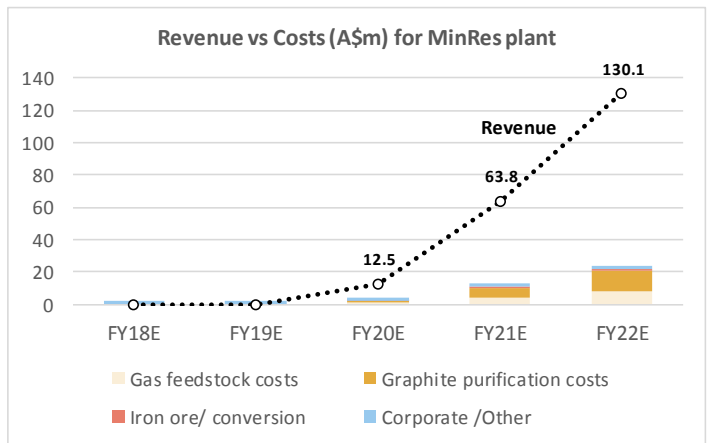
Cash Flow Statement (A\$M)	FY17A	FY18E	FY19E	FY20E	FY21E
EBITDA	(3.9)	(5.0)	(5.3)	(5.5)	(5.8)
Investment in working capital	0.1	0.0	0.0	0.0	0.0
Tax expense	0.0	0.0	0.0	0.0	0.0
<b>Operating Cash Flow</b>	<b>(3.8)</b>	<b>(5.0)</b>	<b>(5.3)</b>	<b>(5.5)</b>	<b>(5.8)</b>
Capex	(1.1)	(0.3)	(0.3)	(0.3)	(0.3)
Other investments	0.0	0.0	0.0	0.0	0.0
<b>Investing Cash Flow</b>	<b>(1.1)</b>	<b>(0.3)</b>	<b>(0.3)</b>	<b>(0.3)</b>	<b>(0.3)</b>
Net interest received / (paid)	0.1	0.2	0.1	0.1	0.1
Debt draw down / (repayment)	0.0	0.0	0.0	0.0	0.0
Dividends paid	0.0	0.0	0.0	0.0	0.0
Equity raised / (repaid)	8.3	1.8	6.1	4.3	4.0
<b>Financing Cash Flow</b>	<b>8.4</b>	<b>2.0</b>	<b>6.2</b>	<b>4.4</b>	<b>4.1</b>
Royalty income	0.0	0.0	0.0	1.3	7.7
<b>Inc(Dec) in Cash</b>	<b>3.5</b>	<b>(3.3)</b>	<b>0.7</b>	<b>(0.1)</b>	<b>5.7</b>

Balance Sheet (A\$M)	FY17A	FY18E	FY19E	FY20E	FY21E
Cash & Equivalents	8.1	4.9	5.5	5.4	11.1
Receivables	0.0	0.0	0.0	0.0	0.0
Inventories	0.0	0.0	0.0	0.0	0.0
Other Current Assets	0.1	0.1	0.1	0.1	0.1
PPE	1.1	1.3	1.6	1.9	2.2
Deferred tax asset	0.0	0.0	0.0	0.0	0.0
Other Non Current Assets	0.0	0.0	0.0	0.0	0.0
<b>Total Assets</b>	<b>9.3</b>	<b>6.3</b>	<b>7.2</b>	<b>7.3</b>	<b>13.4</b>
Payables and other current Liabilities	0.4	0.4	0.4	0.4	0.4
Short Term Debt	0.0	0.0	0.0	0.0	0.0
Long Term Debt	0.0	0.0	0.0	0.0	0.0
Other Non Current Liabilities	0.0	0.0	0.0	0.0	0.0
<b>Total Liabilities</b>	<b>0.4</b>	<b>0.4</b>	<b>0.4</b>	<b>0.4</b>	<b>0.4</b>
<b>Total Equity</b>	<b>8.9</b>	<b>5.8</b>	<b>6.8</b>	<b>6.9</b>	<b>12.9</b>
Net Cash/(Debt)	8.1	4.9	5.5	5.4	11.1

Substantial Shareholders	%	Date
Mineral Resources Limited	13.5	
OOFY Prosser Pty Ltd	4.8	Aug-17
Point at Infinity Pty Ltd	4.6	

Source: Company, IRESS, State One Stockbroking forecasts

Royalty income assumptions	FY17A	FY18E	FY19E	FY20E	FY21E
Graphite production (94%) (tonnes)	na	-	-	1,250	6,250
Graphite sales (99.9%) (tonnes)	na	-	-	1,000	5,000
Graphite price (US\$/t)	na	10,000	10,000	10,000	10,200
<b>Graphite revenue (US\$m)</b>	<b>na</b>	<b>-</b>	<b>-</b>	<b>10.0</b>	<b>51.0</b>
Hydrogen sales (tonnes)	na	-	-	-	-
Hydrogen price (US\$/t)	na	2,500	2,500	2,500	2,550
Hydrogen revenue (US\$m)	na	-	-	-	-
<b>Revenue (total) (A\$m)</b>	<b>na</b>	<b>-</b>	<b>-</b>	<b>10.0</b>	<b>51.0</b>
AUD:USD exchange rate	na	0.8	0.8	0.8	0.8
<b>Revenue (total) (A\$m)</b>	<b>na</b>	<b>-</b>	<b>-</b>	<b>12.5</b>	<b>63.8</b>
Natural gas price (A\$/GJ)	na	8	8	8	8
Gas feedstock required (tonnes)	na	-	-	1,812	9,058
<b>Gas input costs (A\$m)</b>	<b>na</b>	<b>-</b>	<b>-</b>	<b>(0.8)</b>	<b>(3.9)</b>
<b>Other costs (A\$m)</b>	<b>na</b>	<b>(2.0)</b>	<b>(2.0)</b>	<b>(3.4)</b>	<b>(8.8)</b>
Total costs (A\$m)	na	(2.0)	(2.0)	(4.1)	(12.7)
EBITDA (A\$m)	na	(2.0)	(2.0)	8.4	51.1
Royalty rate to HZR (%)	na	15%	15%	15%	15%
<b>Royalty to HZR (A\$m)</b>	<b>na</b>	<b>-</b>	<b>-</b>	<b>1.3</b>	<b>7.7</b>



Leverage	FY17A	FY18E	FY19E	FY20E	FY21E
Net Debt/Equity	cash	cash	cash	cash	cash
Gearing (ND/ND+E)	cash	cash	cash	cash	cash
Interest Cover (x)	na	na	na	na	na

Valuation Ratios (x)	FY17A	FY18E	FY19E	FY20E	FY21E
Normalised P/E	na	na	na	na	35.2
Price/OP Cash Flow	-18	-14	-13.5	-12.9	-12.3
Book value per share (A\$)	6.6	4.4	5.1	5.2	9.6
EV/EBITDA	-7	-6	-6	-5.6	-4.3
ROE (%)	-44%	-82%	-76%	-60%	16%

Risk-Weighted Target Price	(A\$m)	(A\$ps)
NPV of technology sharing agreement (TSA) with MinRes	57	0.42
<b>Risk weighting attached to MinRes TSA</b>	<b>70%</b>	
Risk-weighted MinRes TSA NPV	40	0.30
NPV of 500ktpa methanol plant contract with Primetals Tech	89	0.66
.....potential number of steel plant contracts (x)	10x	
Royalty value attached to Primetals Tech contracts (unrisked)	888	6.63
<b>Risk weighting attached to Primetals Tech contracts</b>	<b>10%</b>	
Risk-weighted valuation attached to contracts with Primetals Tech	89	0.66
Net cash / (debt)	5	0.04
<b>Risk weighted valuation</b>	<b>133</b>	<b>1.00</b>
Current share price		0.53
% upside / (downside)		88%

Note: Per share target price based on 134m fully-diluted shares in issue

## Valuation

### Sum-of-the parts (SOTP) valuation

Our estimated SOTP equity value for HZR is A\$133m (A\$1.00 per fully diluted share). It is comprised of:

- A risk-weighted NPV<sub>10</sub> of A\$40m (A\$0.30 per fully diluted share) from royalties stemming from potential technology licensing arrangements (TLA) with Mineral Resources (MinRes)
- A risk-weighted NPV<sub>10</sub> of A\$89m (A\$0.66 per fully diluted share) from royalties stemming from potential technology licensing arrangements (TLA) with Primetals Technologies,
- FY18E net cash of A\$5m (A\$0.04 per fully diluted share),

**Target price:**  
**A\$1.00ps**

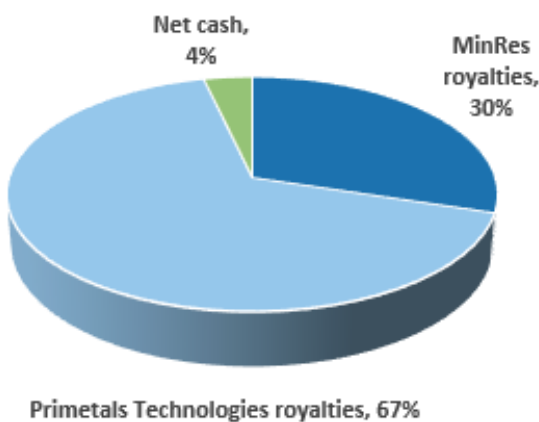
**Figure 1: SOTP valuation**

	(A\$m)	(A\$ps)
NPV of technology licencing arrangements (TLA) with MIN (10ktpa G)	57	0.42
<i>Risk weighting</i>	<i>70%</i>	
Risk-weighted NPV of TLA with Mineral Resources (ASX:MIN)	40	0.30
NPV of TLA with Primetals Technologies (for 1X 500ktpa methanol plant)	89	0.66
.....potential number of steel plant / methanol plant contracts		10x
Total NPV of TLA with Primetals Technologies (unrisked)	888	6.63
<i>Risk weighting</i>	<i>10%</i>	
Risk-weighted NPV of TLA with Primetals Technologies	89	0.66
Net cash / (debt)	5	0.04
<b>Risk-weighted group valuation</b>	<b>133</b>	<b>1.00</b>
<i>Current share price</i>		<i>0.53</i>
<i>% upside / (downside)</i>		<i>88%</i>

Source: State One Stockbroking forecasts

Note: Per share valuations based on 134m fully diluted shares.

### Group valuation composition



Estimated royalties from technology licensing arrangements with **Primetals Technologies** account for 67% of our group valuation.

Estimated royalties from technology licensing arrangements with **Minerals Resources (ASX:MIN)** account for 30% of our group valuation.

**Net cash (FY18E)** of A\$5m accounts for the balance (4%) of our group valuation.

## Recommendation and risks

At current share price levels, we calculate that HZR offers some 88% upside potential to our A\$1.00ps valuation. **We initiate coverage on HZR with a Speculative Buy (Higher risk) recommendation.**

Risks to our earnings profile and target price include, but are not limited to:

- **Timing – MinRes:** Some 30% of our group valuation is based on the estimated NPV of royalties associated with technology licencing arrangements with Mineral Resources (ASX: MIN). While MinRes is a significant shareholder in HZR (at 13.5%), the arrangement at this point is (only) in the form of a non-binding Heads of Agreement. The precise nature of the licencing arrangements – including royalty rates to HZR - will have to be confirmed in a legally-binding HoA.
- **Timing – Primetals Technologies:** Some 67% of our group valuation is based on the estimated NPV of royalties associated with technology licencing arrangements with Primetals Technologies. At this juncture, the arrangement is (only) in the form of a non-binding Memorandum of Understanding. The timeframe associated with progressing this beyond the MOU stage is not known. The precise nature of licencing arrangements – including royalty rates to HZR - will have to be firmed up to a legally-binding HoA.
- **Operational/Technical:** The Hazer Process – converting natural gas to hydrogen and graphite using an iron ore catalyst - has been successfully demonstrated in laboratory-scale apparatus and at a pre-pilot plant level. Under the MoA with MinRes, initial commissioning of a 1tpa ultra-high purity graphite pilot plant is scheduled for mid-2018. Success here will largely determine the timeline associated with scaling up production to 10,000tpa.
- **Natural gas costs:** The only input cost of significance in the Hazer Process is the cost of natural gas feedstock. We calculate that in the proposed modified process for MinRes (which will produce graphite only, not hydrogen and graphite), some 18,000t (960,000GJ) of natural gas is required to produce 10,000t of ultra-high purity graphite. At our base-case natural gas price of A\$8/GJ (real), we calculate natural gas input costs will come to ~A\$8m. Natural gas prices significantly higher (or lower) than forecast will reduce/increase margins.
- **Graphite price:** Our NPV<sub>10</sub> for the MinRes royalty stream to HZR is particularly sensitive to realised prices for ultra-high purity graphite (99.9% C). Our base-case price assumption is US\$10,000/t (real); this compares to current synthetic graphite prices of ~US\$12,000-20,000/t and US\$7,000-10,000/t for spherical coated natural graphite prices. In a 50% lower graphite price environment (i.e., US\$5,000/t), our un-risked NPV for the MinRes royalty stream falls by 60% to A\$22m from A\$57m and our SOTP valuation for HZR falls by 19% to A\$0.81ps from A\$1.00ps.
- **Currency:** A stronger/weaker AUD:USD exchange rate relative to our base-case of US\$0.80 will reduce earnings/increase earnings respectively.
- **Other:** Increased competition from new and existing methane cracking technologies. Regulatory risks. Dependence upon key personnel.

Recommendation:

Speculative Buy  
(Higher risk)

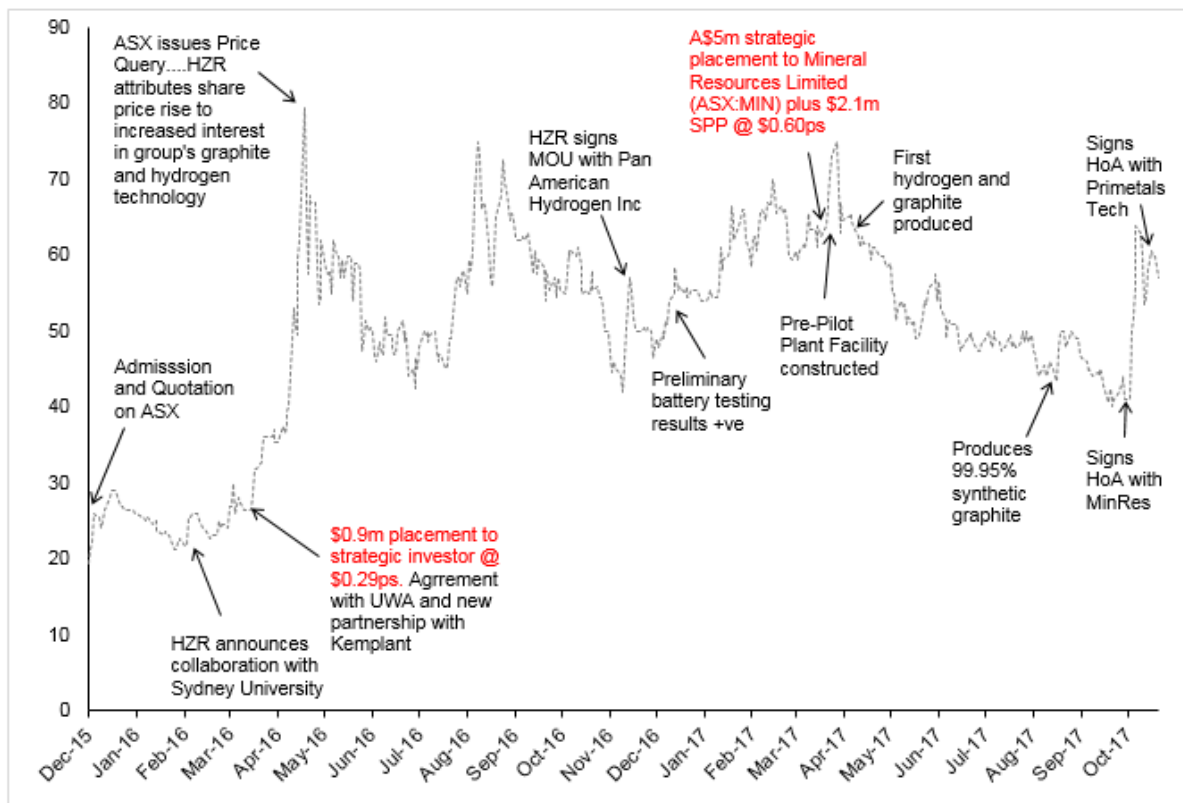
## Background

In December 2015 Hazer Group (HZR) listed on the ASX; A\$5m of capital raised (at A\$0.20 per share) was targeted to develop the group's core technology – the proprietary Hazer Process. The Hazer Process - originally developed at the University of Western Australia - allows for the production of hydrogen and graphite from methane (natural gas) in a low CO<sub>2</sub> emission process using iron ore as a process catalyst. Over the past two years the group has made significant progress towards the commercialisation of the Hazer Process including:

- A MoU with Pan American Hydrogen Inc, a Texas-based global supplier of hydrogen systems.
- The commissioning of a Pre-Pilot Plant (in St Marys Western Sydney) demonstrating the potential operation of the process beyond laboratory based equipment.
- First hydrogen and graphite produced from the Pre-Pilot Plant.
- A A\$5m Strategic Placement in Hazer by Mineral Resources (ASX;MIN) and a subsequent HoA with MIN for the development of commercial-scale synthetic graphite facilities.
- A MoU with Primetals Technologies Austria GmbH (a JV between Mitsubishi Heavy Industries and Siemens), to jointly investigate the commercial and technical viability of utilising the Hazer technology in the steel industry.

## Hazer Process – HZR's core technology

**Figure 2: Share price history and key company events**



Source: IRESS, State One Stockbroking

## Business Model

HZR has a number of routes towards commercialising their technology:

- Build-own-operate plant(s) to produce graphite and/or hydrogen,
- JV partnerships to build-own-operate plant(s) to produce graphite and/or hydrogen,
- Licencing technology /receiving royalty payments from third party operators.

At this juncture, our base-case valuation for HZR is based on the NPV of estimated royalty streams from (separate) technology licencing arrangements with Mineral Resources (MIN) and Primetals Technologies.

### Mineral Resources

On 3 October 2017, HZR announced that it had signed a Heads of Agreement (HoA) with Mineral Resources (ASX:MIN) for the potential development of commercial synthetic graphite facilities. Under the terms of the agreement, MIN and HZR will work to jointly develop a large-scale commercial synthetic graphite facility, initially targeted towards the production of at least 1,000tpa of ultra-high purity graphite and capable of modular expansion to a nominal 10,000tpa. MIN will fund the entire project across all required stages of scale-up and development, with HZR providing technical assistance and obtaining royalties from revenue generated by the sale of graphite from the commercial facilities. Initial commissioning of a 1tpa ultra-high purity graphite plant is targeted for the middle of 2018. Once satisfied with the design and performance of the pilot plant, MIN intends to design and construct a 1,000tpa commercial facility, capable of modular expansion to 10,000tpa (and beyond). The terms of the agreement also allow HZR to continue pursuing hydrogen production opportunities, with MIN being granted primary off-take partner for any co-product graphite produced (for beneficiation).

### Revenue forecast

Predicated on an ultra-high purity (99.9%) graphite price of US\$10,000/t (real), and an exchange rate of US\$0.80, we calculate that a proposed 10,000tpa graphite plant could generate revenue of ~A\$130m per annum by FY22/23E.

Forecast annual revenues of A\$130m

Figure 3: Forecast revenue profile to FY23E

Revenue	FY18E	FY19E	FY20E	FY21E	FY22E	FY23E
Graphite production (92-94% C) (toni	-	-	1,250	6,250	12,500	12,500
Graphite sales (99.9% C) (tonnes)	-	-	1,000	5,000	10,000	10,000
Hydrogen sales (tonnes)	-	-	-	-	-	-
Graphite price (US\$/t)	10,000	10,000	10,000	10,200	10,404	10,612
Hydrogen price (US\$/t)	2,500	2,500	2,500	2,550	2,601	2,653
Graphite revenue (US\$m)	-	-	10.0	51.0	104.0	106.1
Hydrogen revenue (US\$m)	-	-	-	-	-	-
Revenue (US\$m)	-	-	10.0	51.0	104.0	106.1
AUD:USD exchange rate	0.80	0.80	0.80	0.80	0.80	0.80
Revenue (A\$)	-	-	12.5	63.8	130.1	132.7

Revenue Assumptions	FY18E	FY19E	FY20E	FY21E	FY22E	FY23E
Graphite price (92-94% C) (US\$/t)	750	750	750	765	780	796
Graphite price (99.9% C) (US\$/t)	10,000	10,000	10,000	10,200	10,404	10,612
Hydrogen price (US\$/t)	2,500	2,500	2,500	2,550	2,601	2,653
AUD:USD exchange rate	0.80	0.80	0.80	0.80	0.80	0.80

Source: State One Stockbroking forecasts

## Profit forecast

Predicated on key input costs of A\$8/GJ natural gas, a 70% conversion efficiency, and graphite purification costs of A\$1,000/t, we calculate that a 10,000tpa ultra-high purity graphite plant can generate healthy annual EBITDA of ~A\$107m (equivalent to an EBITDA margin of 81%).

Forecast annual  
EBITDA of  
A\$108m

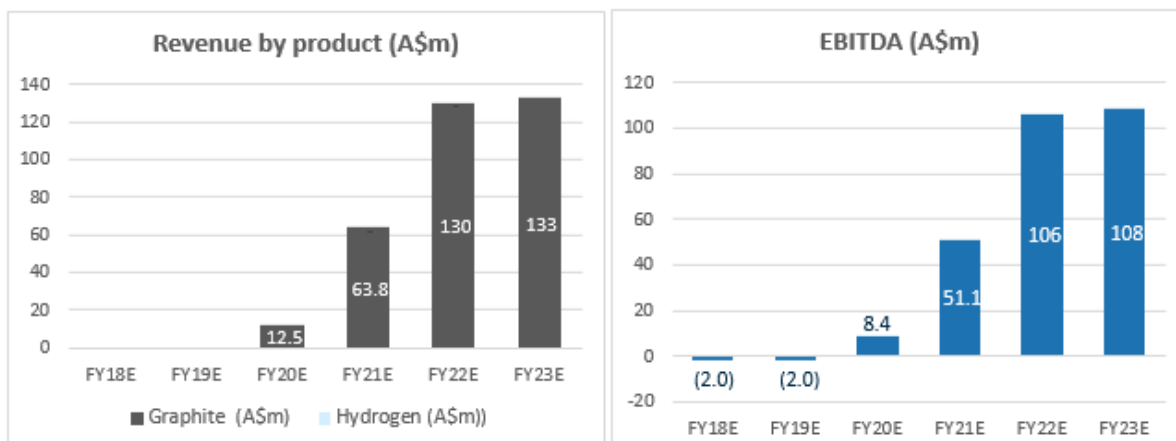
Figure 4: Forecast profit profile to FY23E

Operating Profit (A\$m)	FY18E	FY19E	FY20E	FY21E	FY22E	FY23E
Graphite	-	-	12.5	63.8	130.1	132.7
Hydrogen	-	-	-	-	-	-
<b>Revenue</b>	<b>-</b>	<b>-</b>	<b>12.5</b>	<b>63.8</b>	<b>130.1</b>	<b>132.7</b>
<i>Gas feedstock costs</i>	-	-	(0.8)	(3.9)	(8.0)	(8.2)
<i>Iron ore catalyst costs</i>	-	-	(0.0)	(0.7)	(0.14)	(0.14)
<i>Conversion costs</i>	-	-	(0.04)	(0.18)	(0.38)	(0.38)
Graphite purification costs	-	-	(1.25)	(6.38)	(13.01)	(13.27)
<i>MinRes admin costs/Other</i>	(2.0)	(2.0)	(2.1)	(2.1)	(2.2)	(2.2)
<b>Total Costs</b>	<b>(2.0)</b>	<b>(2.0)</b>	<b>(4.1)</b>	<b>(12.7)</b>	<b>(23.7)</b>	<b>(24.2)</b>
EBITDA	(2.0)	(2.0)	8.4	51.1	106.4	108.5
Depreciation	-	-	(0.5)	(1.0)	(2.0)	(2.0)
<b>Operating profit / (loss)</b>	<b>(2.0)</b>	<b>(2.0)</b>	<b>7.9</b>	<b>50.1</b>	<b>104.4</b>	<b>106.5</b>

Cost Assumptions	FY18E	FY19E	FY20E	FY21E	FY22E	FY23E
% impurities in natural gas feedstock	1%	1%	1%	1%	1%	1%
Conversion efficiency	70%	70%	70%	70%	70%	70%
= Gas feedstock required (tonnes)	-	-	1,812	9,058	18,116	18,116
= Gas feedstock required (GJ)	-	-	96,014	480,072	960,145	960,145
Gas price (A\$/GJ)	8.0	8.0	8.0	8.2	8.3	8.5
Iron ore catalyst as % gas feedstock	10%	10%	10%	10%	10%	10%
= Iron ore catalyst required (tonnes)	-	-	181	906	1,812	1,812
Iron ore price (US\$/t)	60	60	60	61	62	64
Conversion costs (A\$/tonne gas)	20	20	20	20	21	21
Graphite purification costs (A\$/t grap)	1,000	1,000	1,000	1,020	1,040	1,061
Corporate / Other (A\$m)	2.0	2.0	2.1	2.1	2.2	2.2
EBITDA margin	na	na	67%	80%	82%	82%
Operating profit margin	na	na	63%	79%	80%	80%

Source: State One Stockbroking forecasts

Note: MIN is only interested in the graphite output of the Hazer Process. As a result we assume no hydrogen is produced, with lower revenue offset by a modified process that effectively decreases gas consumption – reflected in higher conversion efficiency to 70% from 60%.



## NPV of royalty stream

Predicated on a royalty rate of 15% of EBITDA (equivalent to a royalty rate of 12% of revenue), we calculate the NPV<sub>10</sub> of royalty streams to HZR at A\$57m.

Figure 5: Forecast NPV of royalty streams to HZR

NPV (A\$m)	FY18E	FY19E	FY20E	FY21E	Year 1	Year 2	Year 3-Year 10	Total
					FY22E	FY23E	Additional 8 years	
Graphite (99.9% C) revenue	-	-	12.5	63.8	130.1	132.7	1,161	1,500
Hydrogen revenue	-	-	-	-	-	-	-	-
Revenue (total)	-	-	12.5	63.8	130.1	132.7	1,161	1,500
<i>Gas feedstock costs</i>	-	-	(10.8)	(13.9)	(18.0)	(18.2)	(171)	(192)
<i>Iron ore catalyst costs</i>	-	-	(10.0)	(10.1)	(10.1)	(10.1)	(11)	(2)
<i>Conversion costs</i>	-	-	(10.0)	(10.2)	(10.4)	(10.4)	(3)	(4)
<i>Graphite purification costs</i>	-	-	(1.3)	(6.4)	(13.0)	(13.3)	(116)	(150)
<i>MinFes admin costs (Other)</i>	(2.0)	(2.0)	(2.1)	(2.1)	(2.2)	(2.2)	(19)	(32)
Total Costs	(2.0)	(2.0)	(4.1)	(12.7)	(23.7)	(24.2)	(211)	(280)
<b>EBITDA</b>	<b>(2.0)</b>	<b>(2.0)</b>	<b>8.4</b>	<b>51.1</b>	<b>106.4</b>	<b>108.5</b>	<b>950</b>	<b>1,220</b>
<b>Royalty rate to HZR (%)</b>	<b>15%</b>	<b>15%</b>	<b>15%</b>	<b>15%</b>	<b>15%</b>	<b>15%</b>		
<b>Royalty to HZR</b>	-	-	<b>1.3</b>	<b>7.7</b>	<b>16.0</b>	<b>16.3</b>	<b>142</b>	<b>184</b>
Tax	-	-	-	-	(4.8)	(4.9)	(43)	(52)
<b>Royalty after tax</b>	-	-	<b>1.3</b>	<b>7.7</b>	<b>11.2</b>	<b>11.4</b>	<b>100</b>	<b>131</b>
Discount rate (%)	10%							
<b>PV of cash flow (A\$m)</b>	<b>57</b>							

Source: State One Stockbroking forecasts

Key assumptions: A 10-year plant life at 10ktpa ultra high-purity graphite, high-purity graphite sales maintained at 10ktpa over plant lifespan, costs escalated at 2% per annum (equivalent to forecast long-term/normalised inflation), a royalty rate on EBITDA of 15% and, an Australian corporate tax maintained at 30%. Cash flows are discounted at 10%. Note: our assumed 15% royalty rate is, we believe, typical of royalty rates in the industrial technology sector.

## Primetals Technologies

On 6 October 2017, HZR announced that it had signed a non-binding Memorandum of Understanding (MoU) with Primetals Technologies Austria GmbH (Primetals), a JV between Mitsubishi Heavy Industries and Siemens, to jointly investigate the commercial and technical viability of utilising the Hazer technology in the steel industry. Under the terms of the MoU, HZR and Primetals will jointly develop a roadmap to investigate the viability for the Hazer Process to increase the energy efficiency and reduce the environmental impact of steel production - a project called "Hazer, Steel, Carbon Capture and Methanol Project" or "HSCCM Project". Both parties will work towards identifying opportunities for commercialising the Hazer technology within the steel industry. The initial focus is on three core opportunities:

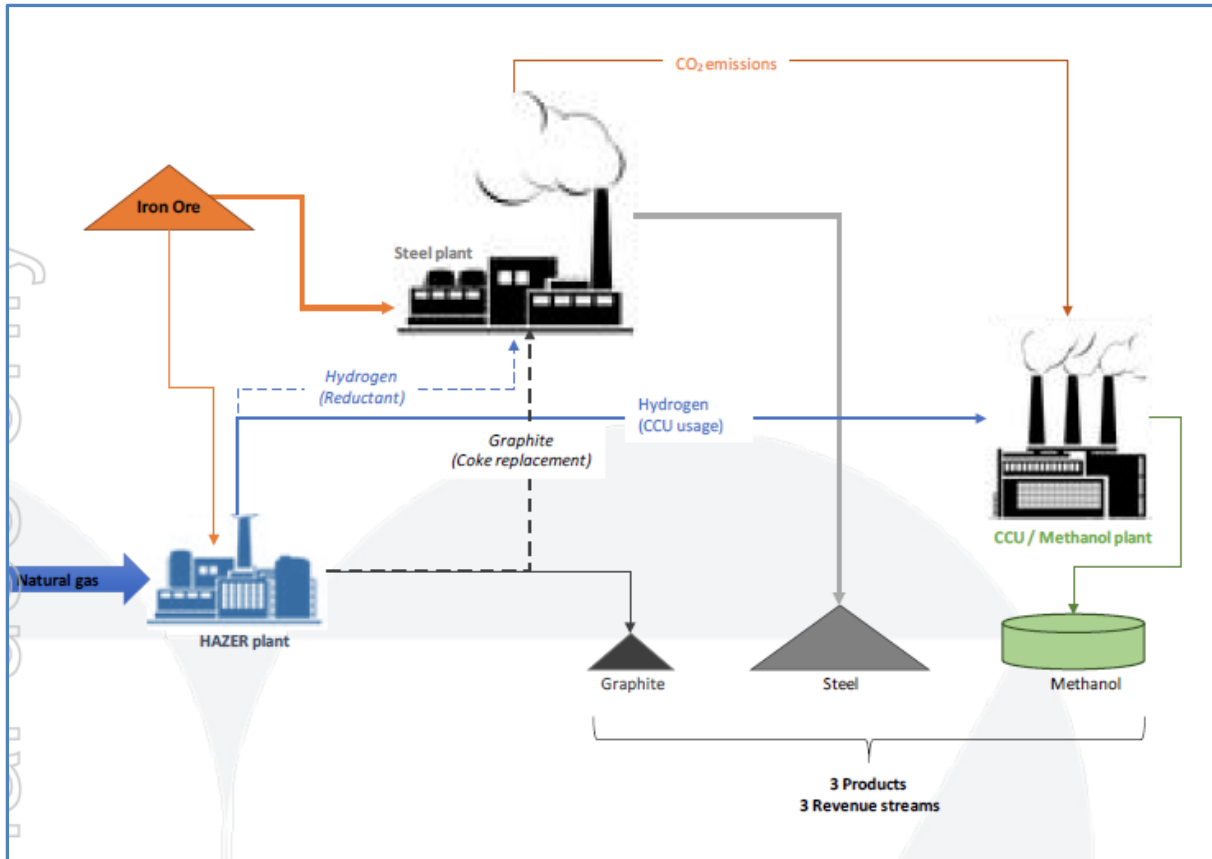
- **Carbon capture via production of methanol.** Methanol is a favoured target product for Carbon Capture and Utilisation (CCU) with methanol production from CO<sub>2</sub> and hydrogen (syngas process) the predominant production method globally.
- **Hydrogen as an alternative reductant of iron ore.** Low-cost hydrogen is a low CO<sub>2</sub> emission alternative to carbon-based reducing agents (i.e. coke/coking coal).
- **Potential for graphite as an alternative to coke/ coking coal in the steel making process.** The Hazer process can make raw graphite at purity ranging from 80 to 95%, with the principal impurity being the iron ore residue from the iron ore used as a catalyst.

Identifying opportunities within the steel industry



A possible flowsheet for a Hazer plant integrated into steel production, using Hazer to supply hydrogen for CCU via methanol production, hydrogen for direct reduction, or graphite as an alternative reductant is shown below.

**Figure 6: Indicative flowsheet of Hazer plant integrated into steel production**



Source: Company

### NPV of royalty stream

Predicated on a typical-sized methanol plant of 500ktpa, and a royalty based on 5% of revenue, we calculate royalty payments to HZR at A\$13m (after-tax) per annum, and a NPV<sub>10</sub> of a 10-year royalty stream at A\$89m.

We assume revenues stemming from 1) sales of methanol, 2) sales of graphite as a substitute for coking coal and, 3) CO<sub>2</sub> credits.

### Determination of Hazer plant size:

- The size of the methanol plant determines the tonnage of CO<sub>2</sub> required for methanol production as per the formula: 1.46t of CO<sub>2</sub> required per t of methanol.
- In turn, the tonnage of CO<sub>2</sub> required for methanol production determines the tonnage of hydrogen required as per the formula: 0.136t H<sub>2</sub> per t of CO<sub>2</sub>.
- The tonnage of H<sub>2</sub> required determines the size of the Hazer plant, with hydrogen being the primary product and graphite (at 3x H<sub>2</sub> tonnage) the secondary product.
- We calculate that a 500ktpa methanol plant will require a Hazer plant producing ~100ktpa of H<sub>2</sub> (and ~300ktpa of graphite by-product).

**Figure 7: Estimated NPV of revenues from 500,000tpa methanol plant**

<b>Methanol plant (tpa)</b>	<b>500,000</b>		
=> CO <sub>2</sub> required (tpa)	730,000		
=> H <sub>2</sub> required (tpa)	99,280	<b>Hazer plant</b>	
Implied graphite "byproduct" (tpa)	297,840	<b>size</b>	
Steel plant (tpa)	1,000,000		
CO <sub>2</sub> produced (tpa)	1,900,000	<b>Assumptions</b>	
Coking coal demand (tpa)	750,000	CO <sub>2</sub> demand (t CO <sub>2</sub> / t methanol)	1.46
% of CO <sub>2</sub> captured by methanol plant	38%	H <sub>2</sub> demand (t H <sub>2</sub> / t CO <sub>2</sub> )	0.136
% of coking coal replaced by graphite	40%	CO <sub>2</sub> intensity (t CO <sub>2</sub> / t steel)	1.9
		Coking coal demand (t coal / t steel)	0.75
<b>Revenue (US\$m)</b>		Methanol price (US\$/t)	500
Methanol	250	Coking coal price (US\$/t)	175
Coking coal	52	CO <sub>2</sub> emission credit (EUR/t)	5
CO <sub>2</sub> emission credits	4	EUR/USD exchange rate	1.18
<b>Total</b>	<b>306</b>	USD/AUD exchange rate	0.80
% revenue royalty to HZR	5%		
Royalty to HZR (US\$m)	15		
<b>After tax royalty (A\$m)</b>	<b>13</b>	<b>NPV<sub>10</sub> of 10-Year Project (A\$m)</b>	<b>89</b>

Source: State One Stockbroking forecasts

### **Methanol (CH<sub>3</sub>OH)**

**Methanol, also known as methyl alcohol, is the simplest alcohol (composed of four parts hydrogen, one-part oxygen, and one-part carbon) , and is a light volatile, colourless, flammable liquid. Methanol is most commonly produced on an industrial scale using natural gas as the principal feedstock in catalytic process directly from CO, CO<sub>2</sub> and hydrogen. However, using a variety of gasification technologies, synthesis gas can be produced from organic matter including biomass, agricultural and timber waste, and municipal solid waste. Synthesis gas can also be produced by combining waste CO<sub>2</sub> from manufacturing operations or power plants with hydrogen produced from the electrolysis of water using renewable energy. The Hazer Process which produces graphite as a by-product, is particularly attractive to steel companies where it can be used as a (partial) replacement for coking coal in the iron making process.**

**Methanol is primarily used as a feedstock for the manufacture of chemicals, automobile fuel, and as a common de-naturing agent for ethanol (drinking alcohol) to methylated spirits.**

**About 40% of methanol is converted to formaldehyde, and from there into products as diverse as plastics, plywood, paints, explosives etc.**

**Methanol is used as a fuel for a variety of off-road and dirt track vehicles. The European Fuel Quality Directive allows for up to 3% methanol with an equal amount of co-solvent to be blended with petrol. In the US, the "Open Fuel Standard Act of 2011" was introduced to encourage car manufacturers to build cars capable of using methanol, gasoline (petrol/diesel), or ethanol fuels.**

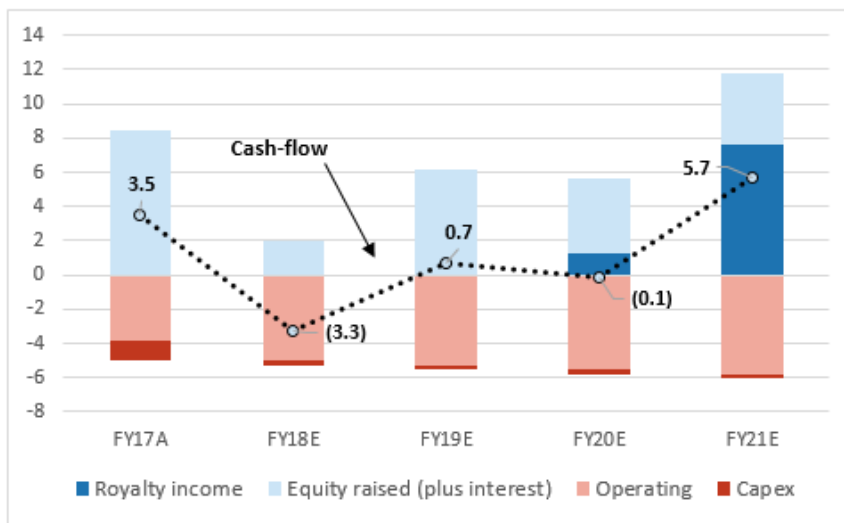
**Business consultants HIS Markit estimate global methanol demand reached 70Mt in 2015 (97 billion litres) driven in large part by emerging energy applications; China currently uses 3Mtpa of methanol as a transportation fuel in low level blends for conventional vehicles.**

### Cash flows

We forecast a maiden MinRes royalty payment of A\$1.3m in FY20E, with royalties increasing to a significant A\$7.7m in FY21E. With the Primetals Tech MoU at a relatively early stage, we think it unlikely that HZR will be in a position to receive technology sharing royalties from this source within five years. Despite the lack of near-term income (with ongoing corporate/admin and R&D expenses), we believe that HZR will be cash flow positive between FY18-21E; we calculate that equity inflows from current options on issue, plus FY20/21E royalties, should offset corporate / admin / R&D expenses over the next four years. We assume some A\$16m in new equity between FY18E-FY21E from options with exercise prices ranging between 25c-70c.

Cash inflow from options to offset corporate and admin costs

**Figure 8: Forecast cash flows (FY17E-FY21E) (A\$m)**



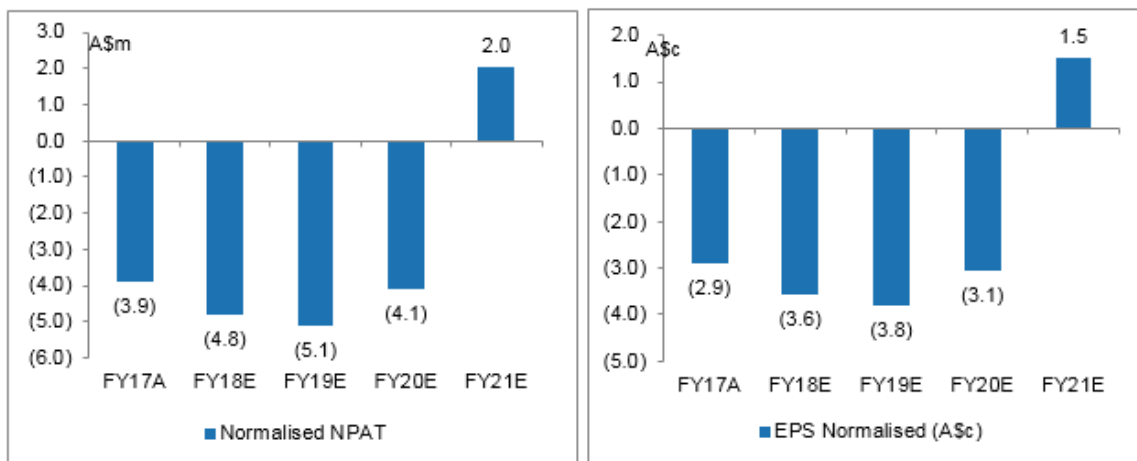
Source: Company, State One Stockbroking forecasts

Positive earnings from FY21E

### NPAT and EPS profile

Predicated on our forecast MinRes ramp-up profile of 1,000t high-purity graphite sales in FY20E and 5,000t in FY21E, we forecast that HZR will only achieve positive net profits and EPS in FY21E.

**Figure 9: Forecast NPAT (A\$m) and EPS (A\$c)**



Source: Company, State One Stockbroking forecasts

## Board of Directors (Source: Company)

### **Tim Goldsmith, Non-Executive Chairman (Independent Director)**

Director since July 2017. Previously partner at global professional services firm PWC for over 20 years. BCom and Member of Chartered Accountants Australia and New Zealand. Other current directorships: N/A

### **Geoff Pocock, Managing Director**

- Founder, HazerGroup Ltd
- Over 15 years experience in commercialisation, corporate finance and strategy
- Ex Managing Partner mid tier strategy consulting business
- Tertiary qualifications in Chemistry, Law and Applied Finance



### **Danielle Lee, Director**

- Corporate lawyer with more than 20 years' experience with approximately 9 years as legal counsel at ASX Sydney and Assistant Manager at ASX Perth.
- 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, Non-Executive Director**

- Lead Director of the Engineering Excellence Group within 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.



### **Terry Walsh, Non-Executive Director**

- A former commercial lawyer and manager with more than 20 years' experience in project development and general commercial law.
- Previously the General Counsel of Hancock Prospecting Pty Ltd and Corporate Counsel with Rio Tinto Ltd.



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