One to Watch

Hazer Group

CDP: Full steam ahead

12th August 2024

Venn Brown sat down with Glenn Corrie, CEO of Hazer Group, to discuss the progress of the commercialisation demonstration plant, customers, lower estimated levelized cost of hydrogen, revenue outlook and key milestones.

Commercialisation Demonstration Plant (CDP): Hazer has just announced that its CDP has completed a continuous 240-hour stable operating campaign, a 30% step up from the 182-hour operation completed in May. The plant is operating as designed with almost 98% uptime, and only a few minor issues arising from peripheral systems. Results from the CDP continue to allow Hazer to refine its modelling, with the group confirming the process requires significantly lower energy than expected: 8-10kWh rather than 10-13kWh per kilogram of hydrogen. Management expects to declare commercial readiness by the end of 2024

Customer progress: Hazer continues to advance its existing commercial projects, which are part of more than 30 commercial discussions currently underway.

- **FortisBC:** Signed binding agreement for a commercial scale, 2.5kt/yr plant. Hazer will start generating revenue for development costs plus margin for work completed as part of the plant planning. The final investment decision (FID) is expected in 2025.
- **POSCO:** After two years of due diligence, POSCO and Hazer have signed a MOU. Hazer sees a 10-year path to scale POSCO plants from 2.5kt/yr to over 100kt/yr. Management expects a licencing framework to be signed in CY25.
- **Mitsui:** Continues to develop a market for Hazer graphite. Hazer's models assume a price of ~US$400/t, but sees a price point emerging in the range US$600-$1,000/t based on feedback from prospective customers.

Reduction in Levelised Cost of Hydrogen: Process optimisations, improved energy efficiency, higher graphite price expectations and lower operating expenditure have lowered Hazer's expected LCOH expectations.

Revenue outlook: The 240-hour operation unlocks the next round of ARENA funding, with cash expected in January 2025. Hazer also expects to start receiving FortisBC project revenue over the next six months, as well as additional State and Federal government grants.

Hazer Group

ASX:HZR

Sector	Process Industries
Date	9th August 2024
Share price	$0.33
52-week range	$0.29 / $0.72
Market cap	$75.9m
Free float	89.9%
Dividend (FY23)	-
Yield	-

Year-end 30 June	FY20	FY21	FY22	FY23
Revenue	-	-	-	-
EBITDA	-$4.6m	-$8.6m	-$7.4m	-$14.3m
EBIT	-$4.7m	-$8.6m	-$7.5m	-$14.4m
Net profit	-$3.2m	-$11.7m	-$16.4m	-$12.2m
Earnings per share	-$0.03	-$0.08	-$0.10	-$0.07
Operating cash flow	-$2.5m	$5.1m	-$5.2m	-$1.3m
Free cash flow	-$3.5m	-$1.5m	-$21.3m	-$5.8m
Cash & equiv	$17.2m	$24.6m	$18.0m	$9.3m
Net debt	-$17.2m	-$21.9m	-$14.2m	-$9.0m
Net debt / EBITDA	3.7	2.6	1.9	0.6

3-year Price Chart

Analysts

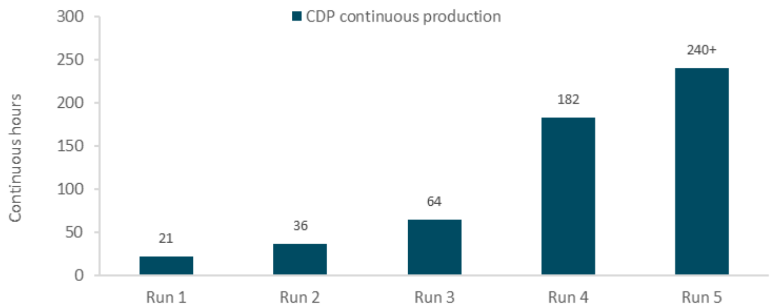
Andrew Wilkinson awilkinson@vennbrown.com

Commercialisation Demonstration Plant

Hazer provided an update on the operation and performance of the group's commercial demonstration plant (CDP).

- The CDP is undertaking its fifth campaign, operating continuously for over 240 hours, achieving uptimes of 98%, vastly improved hydrogen conversion rates and graphite production under continuous catalyst injection, in line with its design parameters. The facility continues to operate in steady state.
- The plant is performing as expected, proving the system:
  - operates at commercial scale
  - operates on a continuous basis; and
  - achieving conversion and graphite purity targets approaching design limits.
- This operational milestone also represents a key performance milestone that releases the next tranche of ARENA[1] funding which is expected in January 2025.

Figure 1: CDP operating times have been steadily lengthened since opening in November 2023



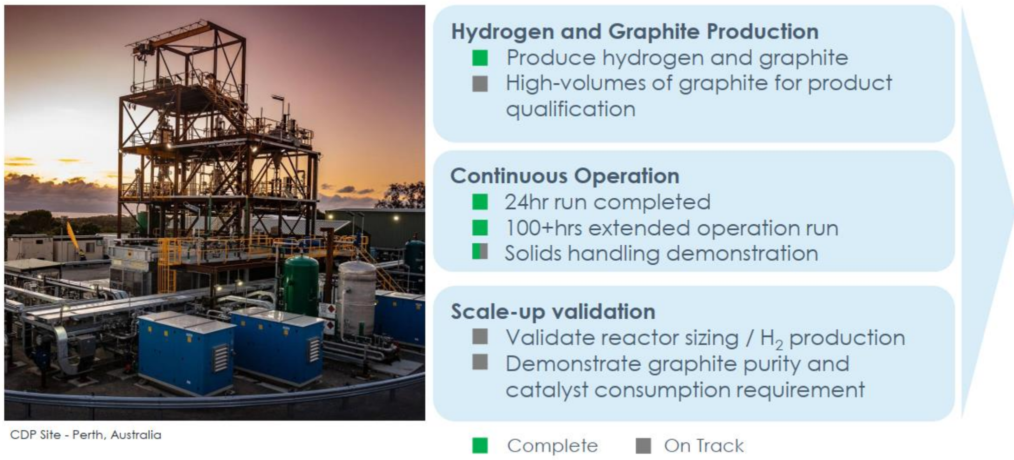
Source: Hazer Group

- The operation is demonstrating that conversion can occur more efficiently, requiring less energy, thereby lowering the hydrogen production cost.
- The CDP performance confirms the reliability of the process and confidence that production plants will achieve uptimes of above 95%.
- The reactor and core technology have operated without any major issues. Some minor operational issues have been experienced related to auxiliary and peripheral systems (condenser, water accumulation in feed gas) not core to the technology and can be remedied during the design of commercial facilities.
- The team continues to work on optimising the system, focusing on ensuring the produced graphite[2] flows out of the system and doesn't accumulate.
- Next steps:
  - Further optimisation
  - Declare ready for commercialisation by the end of CY24

[1] ARENA = Australian Renewable Energy Agency. In the May 2024 Federal Budget, the Australian Government announced investment in Round 2 of the "Hydrogen Headstart" program. The Program will provide up to $2 billion of revenue support to support large-scale renewable hydrogen production projects.

[2] For every kilogram of hydrogen produced, the pyrolysis produces four kilograms of graphite.

Figure 2: Hazer remains on track for commercial deployment by the end of CY24



Source: Hazer Group

Customer update

The ongoing successful CDP demonstrations help advance four existing commercial projects with POSCO, ENGIE, Chubu Electric / Chiyoda Corporation, and FortisBC, as well as new customer projects and strategic partnership opportunities. Hazer reports that it's engaged in commercial conversations with more than 30 large global industrial corporations, including potential clients and strategic partners and investors.

Interest in the technology primarily comes from hard-to-abate industries, including oil refining, ammonia production and power generation, as well as strategic partners, such as global engineering firms that want to market the technology to their customers.

Hazer aims to have five to six project agreements (final investment decision - FID) signed by the end of 2030.

Figure 3: Hazer continues to attract interest from major industrial players

Source: Hazer Group

- **Fortis (mkt cap - US$21.0 billion)**
  - After completing 18 months of front-end engineering and design (FEED) work with Fortis, Hazer has signed a binding agreement for a commercial-scale plant able to produce 2,500t of hydrogen a year, 25 times the size of the CDP.
  - Commencing over the next six months, Hazer will be reimbursed for its FEED costs on a costs-plus-margin basis.
  - The FID for the plant is expected in 2025.

    - As per Hazer's revenue model, FortisBC will own the project and will license the technology, paying ongoing licensing fees. Hazer will have no capital costs or exposure.
    - Hazer can use learnings from its implementation to feed into new projects with other customers.
- **Japan - Chubu Electric Power (US$91 billion) and Chiyoda Corporation (US$0.5 billion)**
    - During the first half of the year, Hazer completed the feasibility study and has now entered the pre-FEED stage, which is expected to be completed by around the end of the year.
    - In early 2025, management expects to sign a licensing framework followed by one year of FEED work and two years of construction.
    - The work already completed for Fortis feeds directly into the Japanese project, effectively giving it a two-year head start.
    - The Japanese plant is expected to be commissioned in ~2028.
- **POSCO (mkt cap - US$18.3 billion)**
    - Korean-based POSCO is the world's 6th largest steel maker. Steelmaking is responsible for between 7% and 11%[3] of CO_2 emissions.
    - After two years of due diligence, Hazer and POSCO have signed an MOU for the integration of Hazer technology into a low-carbon steel process.
    - POSCO is also interested in Hazer's graphite, which is more than pure enough for use in steel production.
    - Hazer sees a path towards a 10-year project scaling reactors from 2.5kt/yr to over 100kt/yr.
- **Mitsui (mkt cap - US$58 billion)**
    - Hazer is continuing its nearly 18-month relationship with industrial conglomerate Mitsui, which is focused on using and marketing Hazer graphite.
    - Mitsui has tested the graphite for various uses, including:
        - Steelmaking
        - Water purification
        - Electrode manufacture
        - Chemicals
    - All tests returned positive, and the next step is to undertake phase two testing on larger (>100kg) quantity samples from the CDP.
- **Interest from Australian industrial players**
    - Hazer reports that it is getting interest from Australian companies, which is driven by:
        - The Federal Government identified gas as a critical energy source supporting the shift to renewables
        - Hazer's processes offer a near-total decarbonisation of gas, using gas as a feedstock and making it near zero emissions
        - Reduction of levelized cost of hydrogen (see below), lifting affordability and reducing switching costs

[3] Source: Carbon Brief, Our World in Data

Reduction of Levelised Cost of Hydrogen (LCOH)

Results from the CDP have provided more accurate performance data, allowing Hazer to model reactor performance and costs more accurately. Cost improvements are largely a result of learnings from the CDP and include:

- Lower capex and opex estimates
- Energy efficiency improvements, from the original 10-13kWh per 1kg of hydrogen down to 8-10kWh.
- Improved conversion rates
- Further improvements are expected from 2nd and 3rd generation reactors, which are under development
- Lifting graphite price estimates from $200 per ton to $400 per ton. Hazer reports that prices could range from $600 - $1,000 per ton.

Scalability

Hazer is continuing to advance its reactor design. One of the unique aspects of Hazer's process is the use of a fluidised bed reactor (FBR) which has been adopted and re-purposed from the refining and metallurgical industry. FBR's have proven scalability and this is a key enabler and competitive advantage for Hazer's commercialisation strategy. The current reactor designs can potentially produce up to 40kt of hydrogen a year.

By increasing the reactor capacity and adding more reactors to a plant, Hazer has a path to grow hydrogen production to over 200kt per year over the next ten years. Hazer reports that some potential customers has indicated a demand for 200kt per year.

Other reactor designs are currently in development that will substantially increase single train capacity thereby enabling large industrial scales.

Hazer's "capital light" licensing model means that the limiting factor of the speed of the group's growth is primarily the number of customers Hazer can attract and the size of plants they want. The pyrolysis plant packages are highly transferrable between projects with construction and commissioning the responsibility of the customer or engineering partner.

Revenue outlook

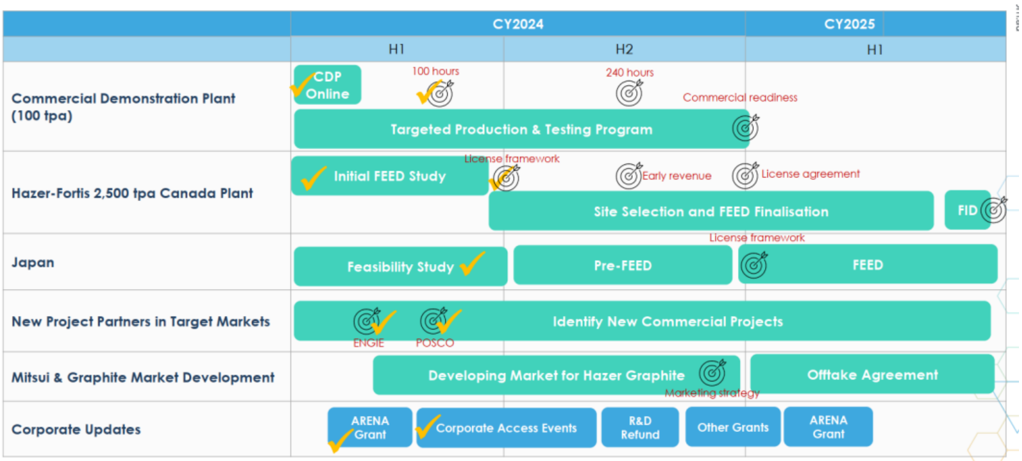
- **Government funding:**
  - Hazer is confident that it will continue receiving government funding from both state and federal budgets, supported in part by the $7 billion in federal funding allocated to hydrogen projects. While not confirmed, the group expects to receive some funding over the next 12 months.
    - R&D tax refund (2H24[4])
    - ARENA grant triggered by the successful 240-hour CDP run (1H25)
    - Other domestic and international grant opportunities
- **Fortis**
  - By early CY25, Hazer will start receiving cost plus margin recovery of pre-FEED and then FEED expenses related to its work on the commercial plant.

[4] Unless specified, dates refer to calendar years.

Key milestones

- **CDP**
  - 2H24 – 240 hours of continuous operation
  - End CY24 declare commercial readiness
- **Fortis**
  - End CY24 – licence agreement
  - Early CY25 – first revenue
  - End 1H25 – Final Investment Decision (FID)
- **Japan**
  - 2H24 – Pre-FEED completed
  - Early 1H25 – licence framework and FEED work commence
- **Mitsui**
  - End 2H24 – complete graphite marketing strategy

Figure 4: Hazer expects to reach Fortis's final investment decision by mid-25



Source: Hazer Group

Graphite Market

- The Hazer Process produces approximately 4kg of graphite for every 1kg of hydrogen.
- Hazer has been working with Mitsui on a graphite marketing and uptake strategy, which they expect to complete by the end of CY24.
- Management is negotiating with its partners over the ownership of the graphite but is confident they will receive at least a 50% share of any offtake agreement.
- Graphite produced by the Hazer Process is highly pure, with graphite produced by the CDP reaching around 95% purity.
- Graphite can be purified to battery grade quality (99%). While this is insufficient for lithium-ion batteries it far exceeds requirements for most other industrial applications.
- Aside from demand, graphite prices vary based on purity and other metrics, but Hazer believes the quality of the graphite from its process could achieve prices as high as $600 - $1,000 per ton.

Monolith's plasma torch versus Hazer Process

- Plasma torch pyrolysis is a high-temperature process that uses a plasma torch to decompose organic materials or gases into simpler substances. This process involves generating a plasma, a state of matter consisting of highly energised ions and electrons, to achieve extremely high temperatures.
- A temperature of around 2,000C is required to separate methane into hydrogen and carbon black[5] using a plasma torch, which compares to the 800-900C required using the Hazer Process.
- In addition to the high operating costs caused by the higher temperature requirements, the high operating temperatures also mean plasma torches must be replaced every 3-4 months.
- US-based Monolith Inc. continues progressing its plasma torch pyrolysis technology. Hazer believes Monolith is 12 months further along the commercialisation path than itself.
- Since launching, Monolith has raised a total of US$651 million, with its last funding round of $300 million in July 2022 pushed the company's valuation in excess of US$1 billion.
- In late 2023 Monolith announced it had received a US$1 billion, 20-year loan from the US Department of Energy to help expand its hydrogen and carbon black production facilities. Market reports suggest that securing the loan has pushed the group's valuation beyond US$2 billion.

About Hazer

The Hazer Group is a technology development company commercialising a new low-energy, low-cost, low-carbon hydrogen generation process. Called the Hazer Process, Hazer has developed a proprietary process that uses iron ore as a catalyst in methane pyrolysis, enabling low-temperature conversion of methane and similar feedstocks into hydrogen and high-quality graphite.

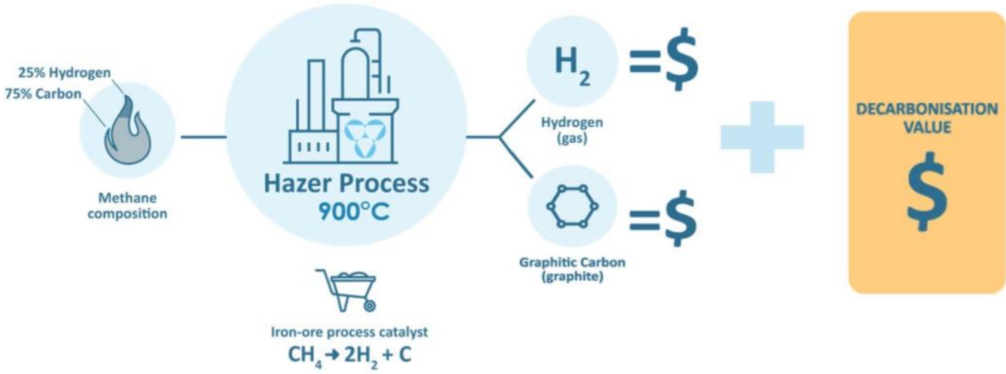
Unlike other forms of hydrogen generation, the Hazer process uses less energy for conversion and has only hydrogen and near-pure graphite as outputs. The benefits for customers are:

1. lower operating costs;
2. lower carbon footprint;
3. no demand for water;
4. carbon credits; and
5. revenue-generating graphite by-product.

While methane pyrolysis isn't new (it's been around since the 1930s), it never took off because oil and gas became the main fuel sources. By using its patented iron ore catalyst process, Hazer has significantly reduced the energy required for pyrolysis, essentially using one technology to serve three highly valuable markets – hydrogen, graphite and decarbonisation.

[5] Carbon black is a fine black carbon powder with a different molecular structure than graphite giving it different properties. Carbon black is primarily used as a pigment and reinforcing agent. Carbon black is orders of magnitude less expensive than graphite costing between US$1.50 - $2.00 per ton.

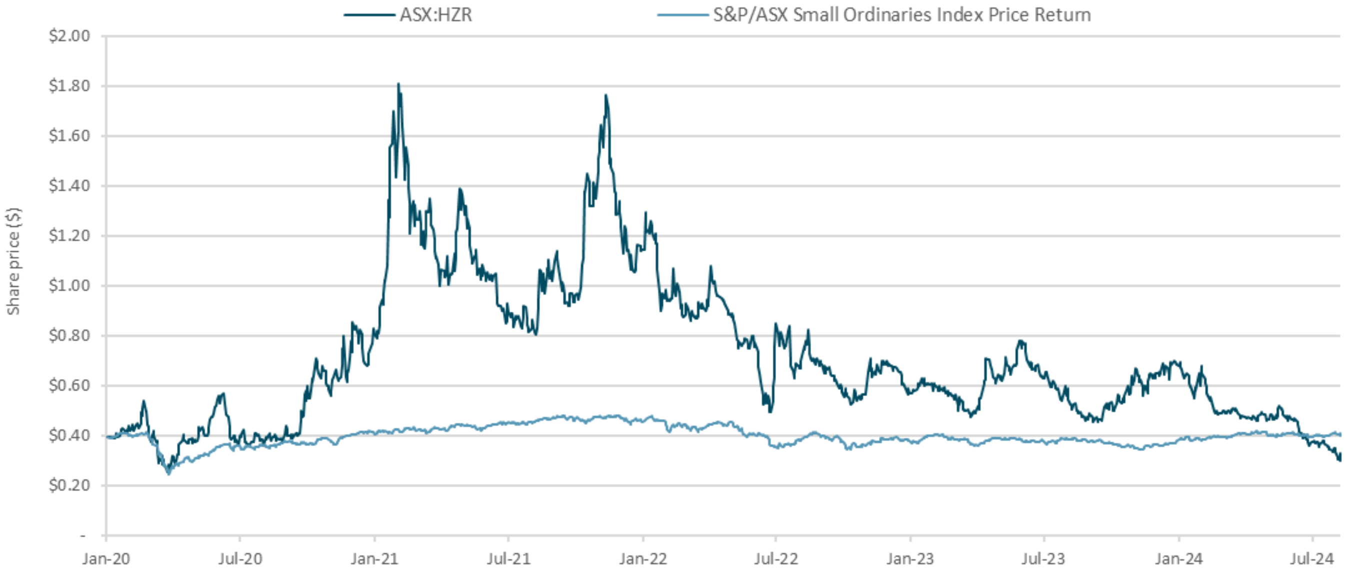
Figure 5: The Hazer Process requires less energy, no water & produces no CO^2



Source: Hazer Group

Read more about Hazer in our January 2024 One to Watch interview with Glenn Corrie.

Share price performance



Source: S&P Global

Disclaimers

Disclaimer

Venn Brown Pty Ltd (“Venn Brown” ABN 24 665 561 900, AFS Representative No. 001305730) is a Corporate Authorised Representative of True Oak Investments Ltd (ABN 81 002558 956, AFSL 238184). The information, opinions and commentary provided by Venn Brown (“Content”) is prepared by Venn Brown. Any person receiving the Content represents, warrants and confirms that it accepts the qualifications, limitations and disclaimers set out in this Disclaimer.

All Content is only available for distribution within Australia.

All Content is intended to reflect a summary of the matters described with respect to a particular company that is covered by the Content (Investment) at a specific point in time. The Content is general only and is not intended to constitute an opinion or recommendation with respect to the Investment. Anyone viewing the Content must obtain and rely upon their own independent advice and inquiries.

Past performance is not a reliable indicator of future performance. Any reference to past performance is intended to be for general illustrative purposes only.

The Content does not purport to be complete, accurate or contain all of the information that a person may reasonably require to make an informed assessment with respect to a particular Investment. The Content may contain forward looking statements in relation to future matters which are subject to known and unknown risks, uncertainties and other important factors that could cause the actual results, performance or achievements of the Investment to be materially different from those expressed or implied by the Content.

The Content has been prepared based on information available to Venn Brown at the date the Content is published. All information is believed to be reliable. However, none of Venn Brown or its related entities (as defined in the Corporations Act 2001 (Cth)) nor any of their respective directors, officers, employees, advisers or representatives (together “Beneficiaries”) make any express or implied representation or warranty as to the fairness, accuracy, completeness or correctness of the information in the Content (including, but not limited to, the accuracy, likelihood of achievement or reasonableness of any forecast milestones, returns, yields, future income or other statements in relation to future matters). Nothing contained in the Content can be relied upon as a promise or representation by any Beneficiary.

The Content does not constitute an invitation, recommendation or offer by any Beneficiary in relation to the Investment. The Content is not a prospectus, product disclosure statement or other disclosure document (as each of those terms are defined in the Corporations Act 2001 (Cth)) and does not contain all of the information that would be contained in a prospectus or other disclosure document prepared under the Corporations Act 2001 (Cth).

To the maximum extent permitted by law, the Beneficiaries will have no liability for any loss or liability of any kind: (i) arising in respect of information contained or not contained in the Content; or (ii) arising from a person relying on any information or statement contained herein.

General Advice Warning

The Content may contain general advice, which is prepared without taking your personal objectives, financial situation or needs into account. Before acting on any general advice, you should consider the appropriateness of it having regard to your personal objectives, financial situation and needs. You should obtain and read any prospectus, product disclosure statement or other disclosure document (as each of those terms are defined in the Corporations Act 2001 (Cth)) before making any decision to acquire a financial product referred to in the Content. We suggest you seek independent professional advice if in doubt. Please refer to our Financial Services Guide (available at www.vennbrown.com/disclaimer) for contact information and information about remuneration and associations with product issuers.

Investing in small and medium-cap companies carries inherent risks, with companies being affected by events that may be unforeseeable and out of management’s control. As an investor, you are solely responsible for your investment decisions.

Financial products are complex and involve a risk of loss, may rise and fall, and are subject to a range of market and economic factors. It is recommended that you seek professional advice to ensure that trading or investing in such products is suitable for your specific circumstances and that you obtain, read and understand any applicable prospectus, product disclosure statement or other disclosure document (as each of those terms are defined in the Corporations Act 2001 (Cth)).

Disclosures

Venn Brown may be engaged and compensated by the companies featured in its Content for ongoing research coverage. In such instances, Venn Brown receives fees from the company mentioned in the Content for research services and other financial services or advice it may provide to that company. Venn Brown does not receive commissions or other performance based-fees from companies. Please refer to our Financial Services Guide for information about remuneration we may receive in relation to our services. The company has facilitated communication with senior management and provided information on the company and industry. As part of our due diligence, we have independently and critically reviewed the assistance and information provided by the company to form the opinions expressed in the report. Diligent care has been taken by the analyst to maintain an honest and fair objectivity in authoring this report and making any recommendations.

Beneficiaries may, from time to time, hold interests, transact or hold directorships in, or perform paid services for companies mentioned herein. Beneficiaries may hold securities in the companies mentioned herein and may trade in those securities as principal, potentially contrary to recommendations mentioned in the Content.

Privacy Policy

Venn Brown takes your privacy seriously. This Privacy Policy outlines the types of personal information we collect, how we use it, and how we protect your privacy.

We collect personal information such as your name and email address when you subscribe to our financial research service. We may also collect information about your browsing behaviour and IP address when you visit our website.

We use the personal information we collect to provide you with financial research and market analysis that we believe will be of interest to you. We do not share your personal information with any third parties. We may use your email address to send you updates about our services and promotional offers.

We take appropriate technical and organisational measures to protect your personal information from unauthorised access, disclosure, alteration, or destruction. We limit access to your personal information to authorised personnel who need to know the information in order to provide our services to you. You have the right to access, correct, or delete your personal information at any time. You may also object to the processing of your personal information or request that we restrict the processing of your personal information. To exercise any of these rights, please contact us.

We may update this Privacy Policy from time to time to reflect changes in our practices or for other operational, legal, or regulatory reasons. We will notify you of any material changes to this Privacy Policy by posting the revised policy on our website.

Terms of Service

By using our website and services, you agree to the following terms and conditions. Venn Brown provides issuer sponsored Content on an as is basis. This Content is intended for informational purposes only and should not be considered as a recommendation or advice to invest. The research provided by Venn Brown should be read in conjunction with our Disclaimers and Privacy Policy.

You are solely responsible for any investment decisions you make based on the information provided by Venn Brown. All content provided by Venn Brown is the property of Venn Brown and may not be reproduced or distributed without our permission. Venn Brown may modify or update these terms and conditions at any time without notice.