



Keep on (hydrogen) trucking

Pure Hydrogen (ASX: PH2) was formed in early 2021 out of the merger of two small listed gas project developers, Real Energy and Strata-X Energy. The merged company took the name Pure Hydrogen because, while it retained the three main gas projects of the merging companies, and ultimately hopes to develop all three, its primary focus is now to become a major player in Australia in the emerging field of hydrogen. In late 2021 Pure Hydrogen is evolving into a portfolio of unique offerings in hydrogen fuel cell vehicles, hydrogen supply, and a hydrogen delivery system.

Several hydrogen projects currently underway

Pure Hydrogen's main focus today is demonstrating that the hydrogen ecosystem - including trucks buses and power generating devices - can work and save companies money. Pure Hydrogen is now looking to build plants to make hydrogen, where the medium-term goal is to be producing at below A\$4 per kilogram. At that price, hydrogen becomes highly cost effective as a transport fuel in Australia when compared to petrol and diesel, and could induce trucking firms to start switching their fleets over to hydrogen. At the same time as it is developing hydrogen production capability, Pure Hydrogen hopes to build ventures in hydrogen distribution, in hydrogen refuelling stations and hydrogen fuel cell vehicles.

A big believer in hydrogen fuel cell trucks

A variety of established truck makers, including Cummins, Daimler, General Motors, Hino, Hyundai, Toyota and Volvo, as well as newer companies such as Nikola and Hyzon Motors, have bet on hydrogen as a better electric-vehicle option for heavy, long-range vehicles than batteries. Pure Hydrogen wants to be the first company to put the infrastructure in place to support hydrogen fuel cell trucks as well as buses and other large vehicles. The company's recent investment in a startup called H2X makes Pure Hydrogen another player in the hydrogen vehicle space.

Valuation range tweaked, with 2021's progress justifying the bull case

We revise our valuation range for PH2 to A\$0.56 per share base case and A\$0.81 per share bull case (\$0.60-0.83 previously) using a sum-of-the-parts approach. We think the company's achievements on the hydrogen front in 2021 can justify a market capitalisation in the higher end of the range. The key risks include 1) execution risk and 2) funding risk.

Share Price: A\$0.465

ASX: PH2

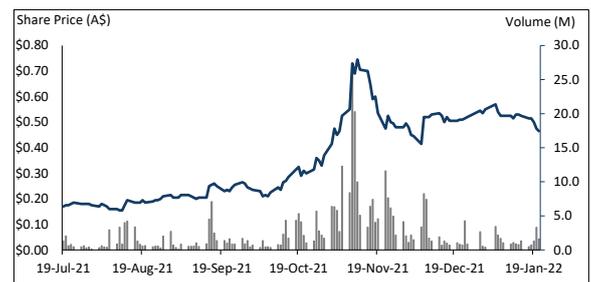
Sector: Energy

24 January 2022

Market Cap. (A\$ m)	159.0
# shares outstanding (m)	341.9
# shares fully diluted	382.1
Market Cap Ful. Dil. (A\$ m)	177.7
Free Float	100.00%
52-week high/low (A\$)	\$0.83 - \$0.12
Avg. 12M daily volume (m)	2.2
Website	purehydrogen.com.au

Source: Company, Pitt Street Research

Share price (A\$) and avg. daily volume (m, r.h.s.)



Source: CommSec, Pitt Street Research

Valuation	
Sum-of-the-Parts Valuation (A\$ per share)	0.56 – 0.81

Source: Pitt Street Research

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Pure Hydrogen offers hydrogen fuel cell vehicles, and now ‘Emerald’ hydrogen

Pure Hydrogen – The story so far. Pure Hydrogen was formed in early 2021 out of the merger of two small listed gas project developers, Real Energy and Strata-X Energy. The merged company took the name Pure Hydrogen because, while it retained the three main gas projects of the merging companies, and ultimately hopes to develop all three, its primary focus is now to become a major player in Australia in the emerging field of hydrogen. In late 2021 Pure Hydrogen is evolving into a portfolio of unique offerings in hydrogen fuel cell vehicles, hydrogen supply, and a hydrogen delivery system.

Pure Hydrogen has become involved in a variety of hydrogen projects, which we describe in Appendix I below. The main focus is demonstrating that the hydrogen ecosystem - including trucks buses and power generating devices - can work and save companies money. Pure Hydrogen is now looking to build plants to make hydrogen, where the medium-term goal is to be producing at below A\$4 per kilogram. At that price, hydrogen becomes highly cost effective as a transport fuel in Australia when compared to petrol and diesel, and could induce trucking firms to start switching their fleets over to hydrogen. At the same time as it is developing hydrogen production capability, Pure Hydrogen hopes to be build ventures in hydrogen distribution, in hydrogen refuelling stations and hydrogen fuel cell vehicles. A key focus of all this effort is the trucking sector, which Pure Hydrogen believes will find the economics of hydrogen fuel cells compelling and switch over to hydrogen fuel cells en masse.

Hydrogen fuel cell trucks will start to show up in Australia soon.

Pure Hydrogen believes hydrogen fuel cell trucks will start to show up in Australia soon. A variety of established truck makers, including Cummins, Daimler, General Motors, Hino, Hyundai, Toyota and Volvo, as well as newer companies such as Nikola and Hyzon Motors, have bet on hydrogen as a better electric-vehicle option for heavy, long-range vehicles than batteries. Basically, hydrogen fuel cells refuel faster, and are lighter, than lithium-ion batteries and similar battery modalities, so while battery approaches are gaining traction thanks to the success of Tesla in cars, truck makers are betting on both technologies. Pure Hydrogen wants to be the first company to put the infrastructure in place to support hydrogen fuel cell trucks as well as buses and other large vehicles. The company’s recent investment in a startup called H2X, which we profile below, makes Pure Hydrogen another player in the hydrogen vehicle space.

Until now Pure Hydrogen’s hydrogen generation focus has been ‘Turquoise’ and ‘Green’ hydrogen, that is, hydrogen made from natural gas using a process called methane pyrolysis or Plasma Arc. Green hydrogen is hydrogen manufactured from running electricity through water. We describe the various ‘colours’ of hydrogen in Appendix II below. Pure Hydrogen currently has five major hydrogen projects in the early stages of development, and another that would allow smaller-scale Turquoise hydrogen production modules to be built. Pure Hydrogen is building a demonstration plant in 2022 for the Turquoise hydrogen.

With CAC-H2, Pure Hydrogen has now become a player in ‘Emerald’ hydrogen, which is hydrogen produced from waste that would otherwise go to landfill. The company announced on 9 November 2021 that it had formed a collaboration with a Singapore-based company called CAC-H2 to build Emerald hydrogen plants in Sydney, Brisbane and Melbourne. The Singapore company will fund, build and operate the plants, and Pure Hydrogen will fund the associated storage and load-out facilities in these plants. CAC-H2 has



The CAC-H2 plants are expected to grow markedly in output

specialised technology that allows the conversion of waste wood biomass into hydrogen, and it has the capital to build hydrogen plants. However, as a technology company, CAC-H2 does not want to be involved in downstream hydrogen distribution. Pure Hydrogen will take care of that part of CAC-H2 collaboration.

The CAC-H2 collaboration has potential to be ‘capital light’ Pure Hydrogen expects to be able to buy hydrogen and wholesale from CAC-H2, and sell at an appropriate markup. The primary requirement is for Pure Hydrogen to have the hydrogen loadout facilities in place, and deploy the trucks to ship it to customers. In a follow-up announcement on 11 November 2021, Pure Hydrogen indicated that the typical hydrogen supply contract will be six years, and that CAC-H2’s plants will be supplying at least 1,000 kg of hydrogen a day with the Brisbane plant expected to start at 5,000 kg per day of Hydrogen with a gradual increase to 30,000 kg per day expected.

It's early days for hydrogen in Australia. At the moment there is no established market for hydrogen. This provides a great opportunity for Pure Hydrogen and its collaborators to make the hydrogen available and at the same time set the initial price, using technology approaches that are well understood. Obviously hydrogen prices will go down as producers optimise the efficiency of their plants, but this in turn is likely to induce more investment in hydrogen by potential users. Pure Hydrogen believes it can benefit as hydrogen becomes commonplace with transport companies in Australia. The upside is a low price is likely to encourage major adoption of hydrogen fuel technology which will in turn increase the demand for Hydrogen.

Valuation reiterated

As PH2 has two distinct energy businesses, we think that the sum-of-the-parts approach is the best way to frame valuation. We have derived A\$78-128M for PH2’s gas business and A\$103-140M for its hydrogen business, representing a 43:57 divisional split (Figure 2). After adding them together and adjusting for net cash and shares, we have obtained a fair valuation range of A\$0.56-0.81 per share for the PH2 group (Figure 1).

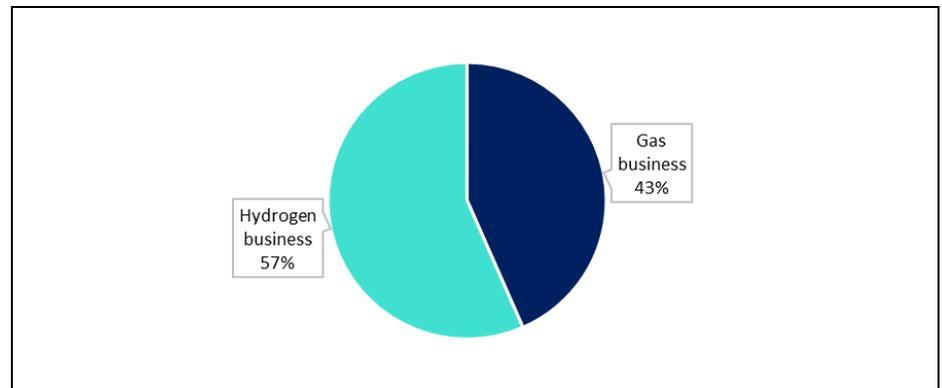
Figure 1: Sum-of-the-Parts valuation summary

Sum-of-the Parts Valuation for PH2 (AUDm unless specified otherwise)	Base Case	Bull Case
Implied EV for gas business	77.5	127.8
Implied EV for hydrogen business	103.0	140.0
Combined EV	180.5	267.8
Net cash	(9.5)	(9.5)
Equity Value	190.0	277.3
Shares outstanding	341.9	341.9
Implied Price (AUD)	0.56	0.81
Current Price (AUD)	0.47	0.47
Upside	19%	74%

Source: Pitt Street Research



Figure 2: PH2's valuation, split by business



Source: Pitt Street Research

We value PH2's Australian gas assets at A\$79-117M

Given that PH2's gas assets are still in the development phase, we don't think valuation through a DCF is appropriate as production and cashflows from gas sales aren't yet available. We think investors are rather trying to price the resources that PH2 currently has in its gas portfolio. Therefore, we have used an EV/Resource multiple-based approach to derive a fair valuation range for PH2's gas business.

Figure 3 shows some ASX-listed small energy businesses that we compiled. We view them as comparables for PH2 because they share some similarities 1) they are in the early exploration/development stage, 2) they have some exposures to unconventional gas sources such as coal seam gas and 3) all of them have proven contingent resources.

Figure 3: Selected ASX-listed small energy companies

Comparable comp	Ticker	EV (A\$M)	2P Reserves (PJ)	2C Contingent Resources (PJ)	EV/(2P+2C) (A\$/GJ)
Galilee Energy	GLL	110	0	2,508	0.04
Comet Ridge	COI	78	106	309	0.19
Blue Energy	BLU	66	71	1,166	0.05
State Gas	GAS	60	0	217	0.28
NuEnergy Gas	NGY	36	78	52	0.28
Peer avg		70	51	850	0.17

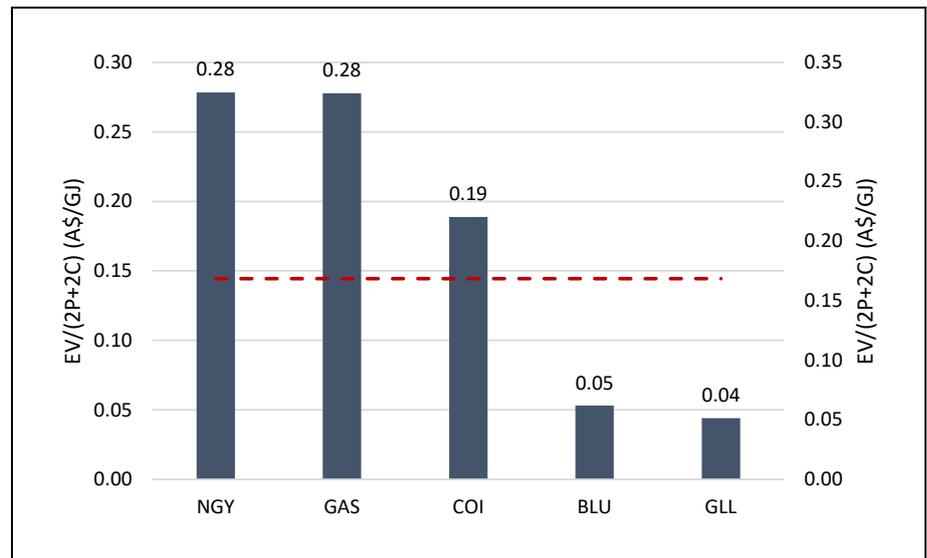
Source: S&P Capital IQ, Pitt Street Research estimates of company data

We see attributes in PH2 that support its re-rate towards peer average 1) PH2 is getting close on achieving 2C to 2P conversion for its Project Venus gas asset, 2) an optionality to use the gas to run its hydrogen assets, which de-risks its project proposition, in our view, and 3) similar to State Gas (ASX: GAS), PH2 is also aiming to capitalise on the expected East Coast supply shortage opportunity, and yet investors are paying twice for each GJ of GAS's resources versus PH2's. As an aside, we note that our 2C estimate for PH2 are derived based on its Australian gas assets only, which means that any country risks attached to developing markets, such as Botswana, should not be discounted into PH2's Australian gas assets.



Therefore, we set our base case EV/(2P+2C) multiple at peer average, whilst our bull case reflects the multiple that investors are currently paying for GAS because in our view both GAS and PH2 faces a similar market opportunity set and are yet to convert their 2C resources to 2P reserves. If we work off these metrics, we would derive A\$78M base case and A\$128M bull case (Figure 5).

Figure 4: Peer comparative - EV/(2P+2C) (A\$/GJ)



Source: S&P Capital IQ, Pitt Street Research estimates of company data

Figure 5: Relative valuation summary for PH2's gas business

BASE CASE		BULL CASE	
PH2's gas business valuation (AUDm unless specified otherwise)	EV/(2P+2C)	PH2's gas business valuation (AUDm unless specified otherwise)	EV/(2P+2C)
Target Resource Multiple (A\$/GJ)	0.17	Target Resource Multiple (A\$/GJ)	0.28
2P+2C Resource	460.0	2P+2C Resource	460.0
Implied EV	77.5	Implied EV	127.8

Source: Pitt Street Research

We value PH2's hydrogen assets at A\$103-140M

Given PH2 has only recently begun building its hydrogen business and there's no production and cashflows yet, we will stick with a comparable valuation approach. We have put together a set of domestic small hydrogen peers (Figure 6). We view this as a tentative comparable comp set for PH2, although we note that most of these peers differs regarding 1) the types of hydrogen they aim to generate, 2) their production technologies and 3) their development status.



Figure 6: Small hydrogen companies

Comparable Comp	Ticker	EV (A\$M)	Project	Type of Hydrogen	Est. Hydrogen Production	Development status
Province Resources	PRL	134.8	HyEnergy Zero Carbon Hydrogen Project	Green Hydrogen	Stage 1 (c.180kt/annum) Stage 2 (c.480kt/annum)	Feasibility studies to commence shortly
Hazer Group	HZR	171.2	Hazer Commercial Demonstration Project	Turquoise Hydrogen	100t/annum	Construction & installation works commenced
Hexagon Energy Materials	HXG	31.1	Pedirka Blue Hydrogen Project	Blue Hydrogen	na	Pre-feasibility study commenced
Pilot Energy	PGY	28.1	Blue Hydrogen Projects	Blue Hydrogen	na	Commencing feasibility studies
Lion Energy	LIO	11.8	Green Hydrogen Project	Green Hydrogen	na	Experts appointed to undertake further studies
QEM	QEM	15.0	Julia Creek Project	Green Hydrogen	na	Bench Scale Pilot plant under construction
Infinite Blue Energy (pre-IPO)	na	na	Arrowsmith Project	Green Hydrogen	25t/day	Expected to come online in 2022
Peer Average		65.3				

Source: Company websites & presentations, Pitt Street Research

Out of the whole basket of small hydrogen peers, we view Hazer Group (ASX: HZR) as the best comparable that could help us to form a view on PH2's valuation, due to the following three reasons:

- **Similar production technique** – Both PH2 and HZR are aiming to produce what we believe as “Turquoise Hydrogen” via a less well-known method called methane pyrolysis, which effectively produces both hydrogen and a high-value solid carbon by-product, as mentioned earlier.
- **Developed technology** – Both PH2 and HZR have a developed technology and process in place for their hydrogen production, albeit being proven at a pilot scale. Therefore, we view their technology propositions as less risky than peers who are yet to prove-up their concepts and products.
- **Pure hydrogen play** – Unlike some of its peers that also operate projects adjacent to their hydrogen assets, HZR is a pure hydrogen play. Therefore, we view HZR's EV as a better yardstick to gauge the valuation for PH2's standalone hydrogen business.

However, we also note that HZR appears to have a faster development status than PH2, as HZR expects to commence operations by the end of 2021, versus PH2's expected production in 2H 2022. This factor, when considered alone, could tip the valuation scale more favourably towards HZR. But we also note that PH2 appears to have a higher expected production volume (c.548tpa¹) versus HZR (c.100tpa), which should translate to higher expected sales and cashflows, in our view.

Overall, we conservatively set our base case valuation for PH2's hydrogen business at A\$103M, which is around the mid-point of HZR and peer average.

¹ Estimated based on a daily production rate of 1,500kg per plant.



Our bull case is set at A\$140M, reflecting a stronger view on the commonality between PH2 and HZR, as per our reasonings discussed above.

The CAC-H2 transaction provides significant validation for our hydrogen valuation

Pure Hydrogen has talked about a relatively low capital spend needed to be able to build a significant business from the CAC-H2 relationship. With the potential for the plants to grow from 5,000 kg per day to 30,000, we foresee the ability to generate strong NPVs from these projects once the company is able to talk publicly about pricing.

Valuation summary

In aggregate, we value PH2 at A\$0.56-0.81 per share (Figure 1) (\$0.60-0.83 previously), representing a 57:43 valuation split between its hydrogen and gas assets. We think the company's achievements on the hydrogen front in 2021 can justify a market capitalisation in the higher end of the range.



Risks

We see the following as key risks related to our investment thesis:

- **Environmental risk** – Although gas is a cleaner burning fuel than coal, it is still a fossil fuel and hence, releases emission to the atmosphere. As such, there is a risk that the Australian states and territories may move against the idea of opening up new gas fields. If this risk materialises, PH2 would encounter difficulty with its Australian unconventional gas development.
- **Market development risk** – Regarding the looming shortfall risk in the East Coast gas market, there are multiple avenues to mitigate this risk, one of which includes importing LNG from offshore suppliers. The LNG import terminal at Port Kembla is about four months into construction and is positioned for gas import by early 2023. More import terminals are currently being discussed and planned. This could potentially help to plug the supply gap and therefore, reduce the need for developing new gas fields, such as the ones currently being developed by PH2.
- **Execution risk for the gas business** – There is a risk that PH2 may not be able to prove and deliver commercial gas flows at its pilot well. This would hamper its ability to convert 2C Contingent Resources to 2P Reserves, which in turn could negatively impact on PH2's ability to secure gas sales agreements, in our view.
- **Execution risk for the hydrogen business** – Likewise, there is a risk that PH2 may not achieve successful commercial outcomes with its hydrogen technology business, due to various reasons such as 1) unable to lock in agreements with potential commercial users/buyers, 2) disruption in the supply of raw material from its gas fields and/or external parties, which could interrupt PH2's hydrogen production process and, 3) issues with the storage and transportation of hydrogen to customers' site.
- **Funding risk** – PH2 has c.\$10M in cash at FY21 year-end, which we think is sufficient for the completion of its initial hydrogen project. Our view is that PH2 will require additional funding to progress its four larger scale hydrogen plants. And there is the risk that PH2 may not be able to secure the funding needed for its expansion.



Appendix I - Pure Hydrogen's various hydrogen ventures

Pure Hydrogen currently has five basic hydrogen ventures in various stages of development:

- The major Turquoise hydrogen plant in 'Project Saturn'
- Major hydrogen plants on the ports
- The hydrogen transport venture
- The hydrogen vehicles venture

Venture No 1: The major Turquoise hydrogen projects. Pure Hydrogen's Project Saturn covers an intended larger-scale hydrogen plants. Project Saturn, 100% owned by Pure Hydrogen, is located near the town of Miles, in Queensland's Western Downs Region around 339 km northwest of Brisbane and may take its natural gas feedstock from Pure Hydrogen's Project Venus.

Venture No 2: Major hydrogen plants on the Ports. Pure Hydrogen is working on four hydrogen plants to be 60% owned by Pure Hydrogen, with a privately-held Australian company called Liberty Hydrogen holding the other 40%. These projects, being located at ports and will use green hydrogen for domestic and export markets.

- **Project Mars (60%),** at Mackay, Qld
- **Project Jupiter (60%),** at Gladstone, Qld
- **Project Liberty North (60%),** at Newcastle, NSW
- **Project Liberty South (60%),** at Port Anthony, Vic, a major oil service port in the Gippsland region of eastern Victoria.

Venture No 3: The hydrogen transport venture. Pure Hydrogen anticipates building a fleet of trailers that would take 1,000 kg of hydrogen at a time from the hydrogen plants, with those trailers being shipped to customer premises to allow, in effect, on-site hydrogen generation. The company announced in May 2021 that a Melbourne-based company called Pure Haul will provide the transportation services to move the hydrogen trailers.

Venture No. 4: The hydrogen vehicles venture. Pure Hydrogen announced in October 2021 that it would start to make hydrogen fuel cell trucks and buses. The first step in this direction was an investment in H2X Global, a Melbourne-based start-up that intends to make hydrogen fuel cell vehicles. Pure Hydrogen's initial stake in H2X Global is 24%, with an option to go to 48% together with establishing Pure X. Pure Hydrogen is thinking about making its own hydrogen fuel cell vehicles as well as selling hydrogen fuel cell vehicles made by H2X Global. In late November 2021 Pure Hydrogen announced its first order from a customer for hydrogen fuel cell vehicles.



Appendix II – The colours of hydrogen

When commentators talk about hydrogen as a fuel source, they often add a colour to the hydrogen, such as Green, Blue, Turquoise and so on. What they are referring to is the source of the feedstock to make the hydrogen:

Blue hydrogen means hydrogen sourced from natural gas, where the natural gas is split into hydrogen and CO₂ by one of two processes, SMR (Steam Methane Reforming) or ATR (Autothermal Reforming (ATR) where the CO₂ is captured and stored.

Brown hydrogen means hydrogen sourced from coal, with the carbon going into the atmosphere.

Emerald hydrogen means hydrogen sourced from biomass where the waste is heated up.

Green hydrogen means hydrogen sourced from water, produced by splitting water into hydrogen and oxygen molecules, with a process called electrolysis. Oxygen is vented into the atmosphere, typically as harmless water vapor. Hydrogen is green when the electrolyser is powered by renewable energy sources such as wind or solar power.

Grey hydrogen means hydrogen sourced from natural gas that emits carbon into the atmosphere.

Pink hydrogen means hydrogen sourced from water, as per Green hydrogen, but where the electrolyser is powered by nuclear energy.

Turquoise hydrogen, so called because turquoise sits between blue and green in the colour wheel, means hydrogen sourced from natural gas using pyrolysis, which involves splitting methane into hydrogen and solid carbon. The reason this approach is more 'green' than 'blue' is that the carbon, instead of being captured and stored, can then be used in various industrial applications such as in carbon black, graphite, carbon fibre, carbon nanotubes and so on.



Appendix III - Analyst qualifications

Stuart Roberts, lead analyst on this report, has been covering the Life Sciences sector since 2002.

- Stuart obtained a Master of Applied Finance and Investment from the Securities Institute of Australia in 2002. Previously, from the Securities Institute of Australia, he obtained a Certificate of Financial Markets (1994) and a Graduate Diploma in Finance and Investment (1999).
- Stuart joined Southern Cross Equities as an equities analyst in April 2001. From February 2002 to July 2013, his research specialty at Southern Cross Equities and its acquirer, Bell Potter Securities, was Healthcare and Biotechnology. During this time, he covered a variety of established healthcare companies such as CSL, Cochlear and Resmed, as well as numerous emerging companies. Stuart was a Healthcare and Biotechnology analyst at Baillieu Holst from October 2013 to January 2015.
- After 15 months in 2015 and 2016 doing Investor Relations for two ASX listed cancer drug developers, Stuart founded NDF Research in May 2016 to provide issuer-sponsored equity research on ASX-listed Life Science companies.
- In July 2016, with Marc Kennis, Stuart co-founded Pitt Street Research Pty Ltd, which provides issuer-sponsored research on ASX-listed companies across the entire market, including Life Science companies.

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