

Fastbrick Robotics Ltd (FBR)

Building on technology for exciting growth

19 January 2018

Fastbrick Robotics Limited (ASX: FBR) has made significant progress over the past half-year towards commercialising the group's 3D robotic bricklaying system – the Hadrian X. In July 2017, FBR signed a Memorandum of Understanding (MoU) with global construction and mining equipment manufacturer Caterpillar (NYSE: CAT) to explore opportunities regarding manufacturing and sales. In August 2017, FBR signed a non-binding MoU with the Kingdom of Saudi Arabia's Ministry of Housing for a potential 50,000 houses (equivalent to 100 Hadrian X robots).

FBR is targeting to have the first Hadrian X commercial prototype ready by mid-2018 and the first trial house built by the end of November 2018 (meeting the first Performance Milestone – construction of a 180m² house). Predicated on FBR timeously finalising a binding technology transfer/manufacturing agreement with an Original Equipment Manufacturer (OEM), we forecast first royalties from Hadrian X sales coming in from late 2020 (meeting the third Performance Milestone – sales of +A\$10m by November 2020).

Royalty calculation: Based on Hadrian X's forecast revenue generating potential, we estimate a potential sales price of US\$5m per robot. Assuming sales ramping up from 25 units in FY21E to a long-term or normalised level of 300 units by FY24E, and assuming a 20% technology royalty rate, **we forecast FBR's FY21E (pre-tax) royalties at A\$34m, increasing to A\$433m in FY24E.**

SOTP target price: A\$0.53

Our estimated SOTP equity value for FBR is A\$860m (A\$0.53 per fully diluted share). Our risk-weighted NPV₁₀ of A\$782m for Hadrian X royalties accounts for 86% of this valuation, with technology upside (i.e., applications outside of residential house construction) accounting for 9%, with net cash of A\$49m in FY18E accounting for the balance. Following a A\$35m equity placement in November 2017, FBR has effectively de-risked the balance sheet for the next 3-4 years i.e., until first sales in FY21E. At current share price levels of A\$0.195, we calculate that FBR offers significant upside potential to our A\$0.53ps target price. **We initiate coverage with a Speculative Buy (Higher Risk) recommendation**

Key Financials

Year-end June	FY17A	FY18E	FY19E	FY20E	FY21E
No. of units sold	na	-	-	-	25
Unit selling price (US\$m)	na	-	-	-	5
Revenue (US\$m)	na	-	-	-	128
Royalty rate to FBR	na	-	-	-	20%
Royalty to FBR (US\$m)	na	-	-	-	26
AUD:USD exchange rate	na	-	-	-	0.75
Royalty to FBR (A\$m)	na	-	-	-	34
Normalised NPAT (A\$m)	(1.4)	(3.5)	(5.7)	(4.5)	19.1
EPS Reported (A\$c)	(0.1)	(0.2)	(0.4)	(0.3)	1.2
EPS Normalised (A\$c)	(0.1)	(0.2)	(0.4)	(0.3)	1.2
DPS (A\$c)	-	-	-	-	0.6
PER (x)	na	na	na	na	16.6
Net (debt) / cash (A\$m)	8.7	49.3	39.3	30.9	39.0
Cash flow (A\$m)	4.8	40.7	(10.1)	(8.3)	8.1
Capex (A\$m)	(2.0)	(5.0)	(5.0)	(5.0)	(2.0)

Source: IRESS, Company Data, State One Stockbroking. Share price: \$ 0.195 Jan 17, 2018

Share Price: A\$0.195

Target Price: A\$0.53

Recommendation
Speculative Buy

Risk Assessment
Higher

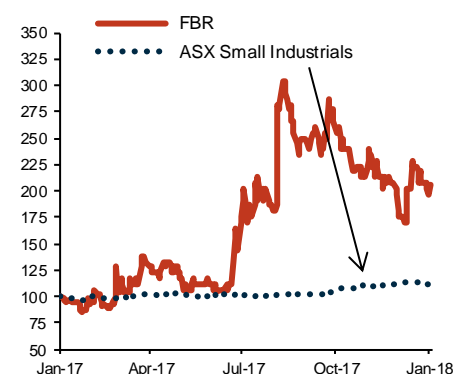
Construction Machinery/Technology

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Fastbrick Robotics Ltd

ASX Code	FBR
52 week range (A\$cps)	A\$0.08-A\$0.30
Fully diluted Market Cap (A\$m)	317
Fully diluted no. of shares (m)	1,625
Av Daily Turnover (shares)	7.4 million
ASX All Ordinaries	6,166
FY18E BV per share (A\$c)	A\$3.5c
FY18E EPS (A\$c)	-A\$0.2c
FY18E Net (Debt)/Cash (A\$m)	49

Relative price performance



Source: Iress

Financial Statements

Fastbrick Robotics Ltd

Year ending June

Profit & Loss Statement (A\$m)	FY17A	FY18E	FY19E	FY20E	FY21E
Revenue	1.4	0.0	0.0	0.0	0.0
Raw materials / rental / lease	0.0	0.0	0.0	0.0	0.0
Employee	(1.4)	(3.0)	(5.0)	(5.0)	(5.0)
Other	(0.6)	(1.2)	(1.5)	(2.0)	(2.0)
EBITDA	(0.6)	(4.2)	(6.5)	(7.0)	(7.0)
Depreciation & Amortisation	(0.0)	(0.5)	(0.5)	(0.5)	(0.5)
Operating profit	(0.6)	(4.7)	(7.0)	(7.5)	(7.5)
Royalties & Other	(0.8)	1.0	0.0	0.0	34
EBIT	(1.4)	(3.7)	(7.0)	(7.5)	27
Interest income	0.0	0.2	1.3	1.0	1
Interest expense	0.0	0.0	0.0	0.0	0
Tax expense	0.0	0.0	0.0	1.9	(8)
Reported NPAT	(1.4)	(3.5)	(5.7)	(4.5)	19
Normalised NPAT	(1.4)	(3.5)	(5.7)	(4.5)	19
EBITDA Margin (%)	-39%	na	na	na	na
Operating profit margin (%)	-43%	na	na	na	na
EPS Reported - Diluted (A\$c)	(0.1)	(0.2)	(0.4)	(0.3)	1.2
EPS Normalised - Diluted (A\$c)	(0.1)	(0.2)	(0.4)	(0.3)	1.2
EPS growth (%)	nm	nm	nm	nm	n/a
DPS - Declared (A\$c)	0.0	0.0	0.0	0.0	0.6
Avg. no. of shares (m)	719	938	1,165	1,353	1,540
YE no. of fully-diluted shares (m)	1,389	1,625	1,625	1,625	1,625

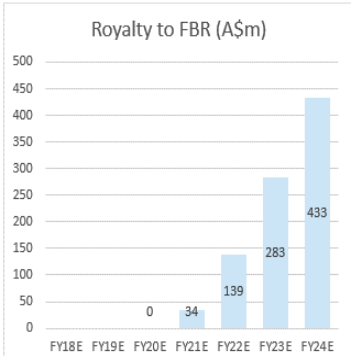
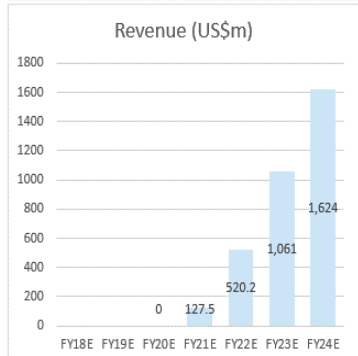
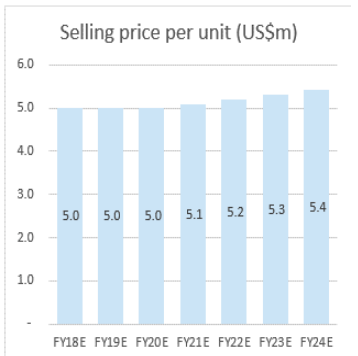
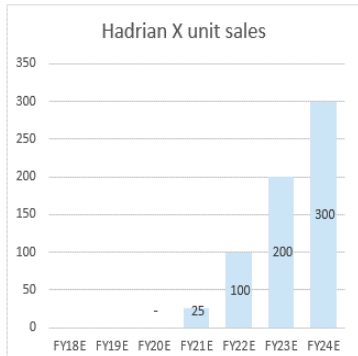
Cash Flow Statement (A\$m)	FY17A	FY18E	FY19E	FY20E	FY21E
EBITDA	(0.6)	(4.2)	(6.5)	(7.0)	(7.0)
Investment in working capital	(0.4)	0.3	0.0	0.0	0.0
Tax expense	0.0	0.0	0.0	1.9	(8.2)
Operating Cash Flow	(0.9)	(3.9)	(6.5)	(5.1)	(15.2)
Capex	(2.0)	(5.0)	(5.0)	(5.0)	(2.0)
Other investments	0.0	0.0	0.0	0.0	0.0
Investing Cash Flow	(2.0)	(5.0)	(5.0)	(5.0)	(2.0)
Net interest received / (paid)	0.0	0.2	1.3	1.0	0.8
Debt draw down / (repayment)	0.0	0.0	0.0	0.0	0.0
Dividends paid	0.0	0.0	0.0	0.0	(9.6)
Equity raised / (repaid)	9.2	48.4	0.1	0.7	0.0
Financing Cash Flow	9.2	48.7	1.4	1.7	(8.8)
Royalties & Other	(1.5)	1.0	0.0	0.0	34.0
Inc/(Dec) in Cash	4.8	40.7	(10.1)	(8.3)	8.1

Balance Sheet (A\$m)	FY17A	FY18E	FY19E	FY20E	FY21E
Cash & Equivalents	8.7	49.3	39.3	30.9	39.0
Receivables	0.8	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	2.7	7.2	11.7	16.2	17.7
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
Total Assets	12.3	56.7	51.1	47.3	56.8
Payables and other current Liabilities	0.6	0.1	0.1	0.1	0.1
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
Total Liabilities	0.7	0.2	0.2	0.2	0.2
Total Equity	11.6	56.5	50.9	47.1	56.7
Net Cash/(Debt)	8.7	49.3	39.3	30.9	39.0

Substantial Shareholders	%	Date
Fidelity International	9.8	
Mark Joseph Pivac	9.4	Dec-17
Regal Funds Management	7.4	

Source: Company, IRESS, State One Stockbroking forecasts

Hadrian X royalty f'cast (A\$m)	FY17A	FY18E	FY19E	FY20E	FY21E
No. of units sold	na	-	-	-	25
Selling price per unit (US\$m)	na	-	-	5.0	5.1
Revenue (US\$m)	na	-	-	-	127.5
Royalty rate to FBR	na	-	-	-	20%
Royalty to FBR (US\$m)	na	-	-	-	25.5
AUD:USD exchange rate	na	-	-	-	0.75
Royalty to FBR (A\$m)	na	-	-	-	34.0



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	16.6
Price/OP Cash Flow	na	na	na	na	na
Book value per share (A\$c)	0.8	3.5	3.1	2.9	3.5
EV/EBITDA	na	na	na	na	na
ROE (%)	-12%	-6%	-11%	-10%	34%

SOTP valuation	A\$m	A\$ps
Hadrian X NPV (unrisked)	1,043	0.64
<i>Risk weighting (timing, volumes, pricing, etc)</i>	25%	
Hadrian X NPV (risky)	782	0.48
Technology upside / new opportunities	78	0.05
Corporate/Admin costs	-49	-0.03
Enterprise value	811	0.50
Net cash / (debt) (FY18E)	49	0.03
Equity value	860	0.53

Current share price	0.20
% upside / (downside)	171%

Valuation

Sum-of-the parts (SOTP) valuation

Our estimated SOTP equity value for FBR is A\$860m (A\$0.53 per fully diluted share). It is comprised of:

- A risk-weighted NPV₁₀ of A\$782m (A\$0.48 per fully diluted share) from royalties stemming from sales of the Hadrian X robotic bricklaying system.
- A new technology/new application valuation of A\$78m (A\$0.05 per fully diluted share based on a nominal 10% of our Hadrian X valuation. After commercialising the Hadrian X, FBR will be looking to work with industry leaders to collaborate on new products based around the group's core Dynamic Stabilisation Technology (DST) applications (i.e., high rise construction, sub-sea, civil construction, oil & gas, mining).
- FY18E net cash of A\$49m (A\$0.03 per fully diluted share),

Target price:
A\$0.53ps

Figure 1: SOTP valuation

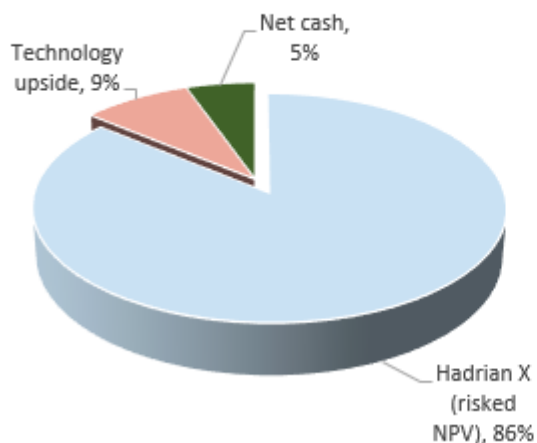
	A\$m	A\$ps
Hadrian X NPV (unrisked)	1,043	0.64
<i>Risk weighting (timing, volumes, pricing, royalty)</i>	<i>25%</i>	
Hadrian X NPV (risked)	782	0.48
Technology upside / new opportunities	78	0.05
Corporate/Admin costs	(49)	(0.03)
Enterprise value	811	0.50
Net cash / (debt) (FY18E)	49	0.03
Equity value	860	0.53
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Current share price		0.195
% upside / (downside)		171%

Source: State One Stockbroking forecasts

Note: Technology upside = 10% of our estimated risk-weighted Hadrian X NPV

Note: Per share valuations based on 1,625m fully diluted shares (assumes CAT exercises US\$10m investment option by June 2018)

Group valuation composition (excluding corporate/admin costs)



Our estimated NPV (risk-weighted) of A\$782m for the Hadrian X accounts for 86% of our group valuation. We attach a nominal 10% of the Hadrian X NPV valuation to new technology applications (high-rise building, mining etc etc). As a result Technology upside accounts for A\$78m or 9% of our group valuation. Net cash (A\$49m, FY18E) accounts for the balance (5%) of our group valuation.

Recommendation and risks

At current share price levels, we calculate that FBR offers significant upside potential to our A\$0.53ps valuation. **We initiate coverage on FBR with a Speculative Buy (Higher risk) recommendation.**

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

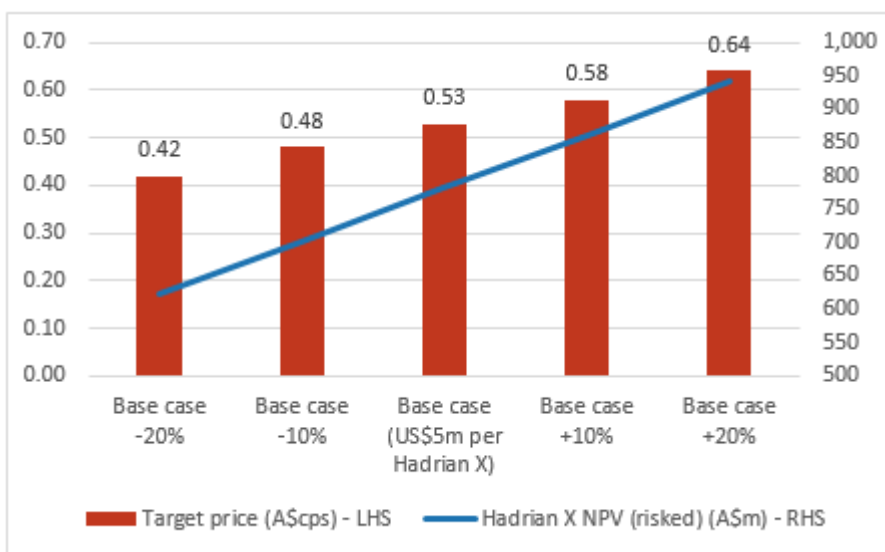
- **Technology/manufacturing agreement:** Some 86% of our group valuation is based on the estimated NPV of technology licensing royalties associated with the Hadrian X. Consequently, delays to or the failure to timeously secure a legally-binding technology transfer/manufacturing heads of agreement (HoA) with an OEM would have a significant negative impact on our group valuation. The timing of sales (maiden sales and subsequent ramp up profile), unit selling price, and royalty rate also impact our forecast NPV.
- **Currency:** A stronger/weaker AUD:USD exchange rate relative to our base-case of US\$0.75 will reduce earnings/increase earnings respectively.
- **Other:** Competition from new / alternative building technologies (i.e., prefabricated units) and/or alternative robotic bricklaying technologies. Regulatory / sovereign risks. Intellectual property risks (security). Dependence upon key personnel.

Sensitivity to Hadrian X NPV valuation drivers

Our base case valuation assumes a selling price of US\$5m per Hadrian X unit. A 20% lower/higher price (relative to our base case forecast), reduces/increases our target price by 21% respectively. Note: a 20% lower/higher volume sales profile has a similar impact on our target price.

Our base case valuation assumes a royalty rate (on Hadrian X sales revenue) of 20%. Reducing/increasing the royalty rate by 5 percentage points impacts our target price by 26%.

Figure 2: FBR target price sensitivity to Hadrian X selling price



Source: State One Stockbroking forecasts

Note: A 20% lower than base case selling price = US\$4m per Hadrian X, a 20% higher than base case selling price = US\$6m per Hadrian X

Recommendation:

Speculative Buy
(Higher risk)

20% change in Hadrian X selling price / volumes impacts target price by 21%

Note: Our forecast base-case sales volume is 300 units per annum from FY24E; we estimate that this is equivalent to 1% of the addressable market.

If FBR obtains 5% of the addressable market – equivalent to 1,500-unit sales per annum – **our target price increases to A\$2.31 per share.**

Background


Following a reverse takeover of DMY Capital Limited (ASX: DMY – delisted), and a A\$5.7m capital raise (at A\$0.02ps), Fastbrick Robotics Limited (ASX: FBR) listed on the ASX in mid-November 2015. FBR is a Perth-based robotic technology company developing and commercialising digital construction technology solutions. FBR’s Hadrian X - a globally patented 3D robotic bricklaying system - represents the first application of the company’s underlying intellectual property (IP) portfolio.

Figure 3: Illustration (computer simulation) of Hadrian X Construction Robot



Source: Company

Figure 4: Hadrian X – a “game changer” for the construction industry



- Hadrian X requires minimal human interaction and can work 24 x 7 in extreme conditions
- Design capability of up to 1,000 bricks per hour, truck mounted and self-powered
- Universal brick compatibility up to 500mm x 250mm x 250mm
- 30m robotic arm allows completion of all brickwork from a single position on site
- DST system using Omni-track laser alignment system and corrects dynamic interference and vibration to within 0.5mm accuracy of a computer-aided design (CAD)
- Hadrian X will maximize efficiency and affordability of brick construction with efficient software called The Architectural Designer (TAD)

Source: Company

Note: DST = Dynamic Stabilisation Technology, FBR’s core IP which allows the robotic bricklaying system to move from a controlled / internal environment to uncontrolled outdoor environments.

Hadrian X development status

In 2016, FBR achieved successful proof of concept with the Hadrian 105 technology demonstrator and commenced with plans for constructing the Hadrian X commercial prototype (effectively a truck-mounted version of Hadrian 105).

In April 2017, FBR moved its head office, R&D, construction, assembly and testing facilities to a purpose-built site in Perth. As part of the risk mitigation process, management decided in 3Q 2017 to adopt and apply the latest high technology best practice methods from the aeronautical and defence industries and to invest in a second Hadrian X prototype.

During the September 2017 quarter, orders for medium lead-time items were placed, including the latest generation laser tracking systems, servo drives, mechanical drive components, servo motors and hydraulic systems. Many of the bespoke machined components have already been manufactured and are currently being assembled. The two Hadrian X commercial prototypes are being assembled and tested in parallel with each other. This should allow the engineering team to de-risk the assembly and de-bugging process between each machine as they progress to completion, and ultimately to the demonstration and operation stages.

Our understanding is that management is targeting to have the first commercial prototype finished by mid-2018 and ready for factory testing in the September quarter of 2018 (with the second prototype ready for factory testing shortly after).

While the decision to construct two Hadrian X prototypes side-by-side has pushed out the dateline by at least six months (from an initially targeted delivery date of end-2017), and increased costs, the upside benefits are significant. The more robust development process now materially de-risks the assembly, build and physical world testing phases, adds significantly to the in-house technology component of the final product (which should stand to FBR's benefit in royalty discussions with manufacturers), and, importantly, should "fast-track" the customer adoption process as, with two machines, FBR will be able to carry out demonstrations in two different parts of the world.

As per the IPO Prospectus dated September 2015, the conversion of some 166.7m Class A Performance Shares to Ordinary Shares (worth a significant A\$32.5m at current share price levels) is dependent on FBR successfully meeting a Construction House milestone by November 2018. The Construction House milestone requires the successful demonstration of the company's robotic building technology to complete, within three days, the building (brickwork from slab to cap) of a three-bedroom, two-bathroom residential house with a minimum floorplan of 180m².

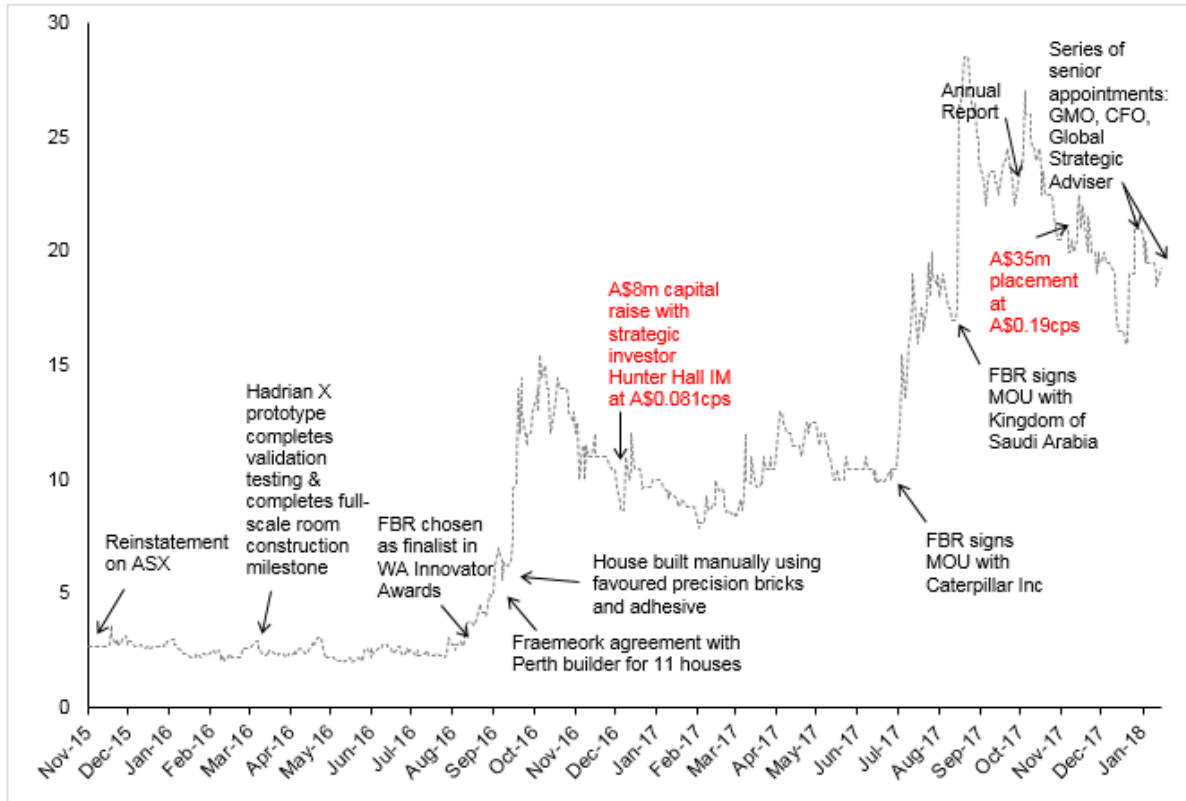
Thus, we forecast that, before the end of 2018, FBR's robotic building technology will be effectively commercialised, with FBR in a position to enter into a technology JV with a suitable manufacturer for production.

Commercial
prototype targeted
for mid-2018

Business Model

In July and August 2017, FBR announced two (2) separate Memorandum of Understandings (MOU); these announcements acted as significant share price catalysts, with the market viewing the agreements as important stepping stones towards the group successfully commercialising the Hadrian X Construction Robot.

Figure 5: Share price history (A\$) and key company events



Source: IRESS, State One Stockbroking

Global Partnering Strategy

A key strategic objective for the group was to create global scalability for the Hadrian X product, by partnering with a recognised brand and company that has the expertise and capability to manufacture, distribute, sell and service the machines globally. In July 2017, FBR announced that it had signed a Memorandum of Understanding (MOU) with global construction and mining equipment giant Caterpillar Inc. (NYSE: CAT), to discuss and develop a potential framework for collaboration regarding the development, manufacturing, sales, and services of FBR's robotic bricklaying technology, and how best to offer this technology to CAT's construction customers.

As part of the MOU, CAT invested US\$2m in FBR via a placement at an issue price of A\$0.10ps. In October 2017, FBR shareholders approved an option for CAT to invest a further US\$8m in FBR at A\$0.20ps (option expires on 30 June 2018).

Moving forward, the next key steps will be securing IP and Licensing agreements, and production/manufacturing solutions.

MOU with Caterpillar – world leader in construction and mining equipment

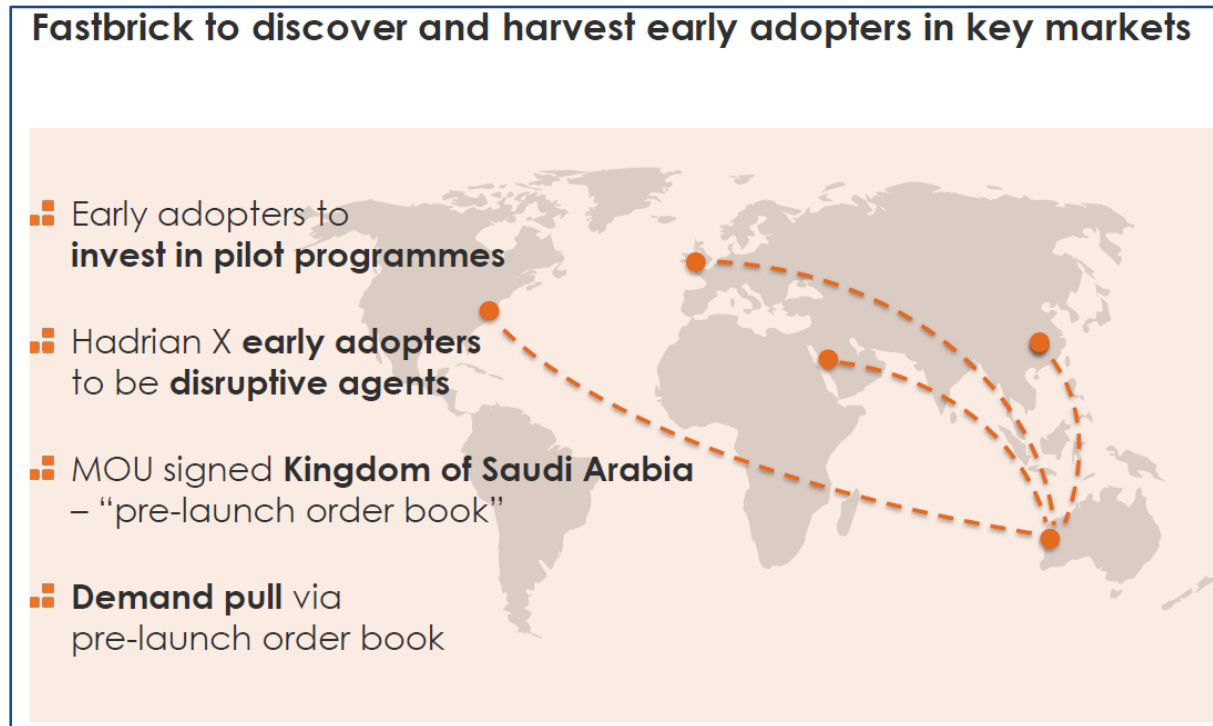
Customer Discovery Strategy

In August 2017, FBR announced that it had signed a non-binding Memorandum of Understanding (MOU) with the Kingdom of Saudi Arabia’s (KSA) Ministry of Housing. The MOU indicates an equivalent requirement for 100 Hadrian X robots to build a minimum of 50,000 new homes by 2022. The 50,000 target is part of a larger 500,000 new home target set by the KSA government to be completed by 2022, with a directive that all of these homes are to be constructed using innovative construction technologies (Innovative Construction Target). These 500,000 homes are, in turn, part of a broader target of 1.5 million new homes by 2022. KSA’s housing shortage is being fuelled by a high demand for housing, a growing population, and increasing labour costs.

MOU with Saudi Arabia’s Ministry of Housing

Through the group’s Customer Discovery Strategy – including industry consultation and meetings with a broad range of companies, interested parties and governments - FBR is targeting to grow its pre-launch order book, while simultaneously executing on its Caterpillar Global Partnering alliance.

Figure 6: Customer Discovery Strategy



Source: Company

It is anticipated that the MOUs with Saudi Arabia will be superseded by more definitive and binding legal agreements in due course.

While the 3D robotic bricklaying system is the first application of the company’s IP, the underlying Dynamic Stabilisation Technology (DST) can be applied outside the domestic residential construction sector. Management will be investing in new IP, securing patent rights, and looking to work with partners in sectors such as high-rise construction, mining, underwater construction etc.

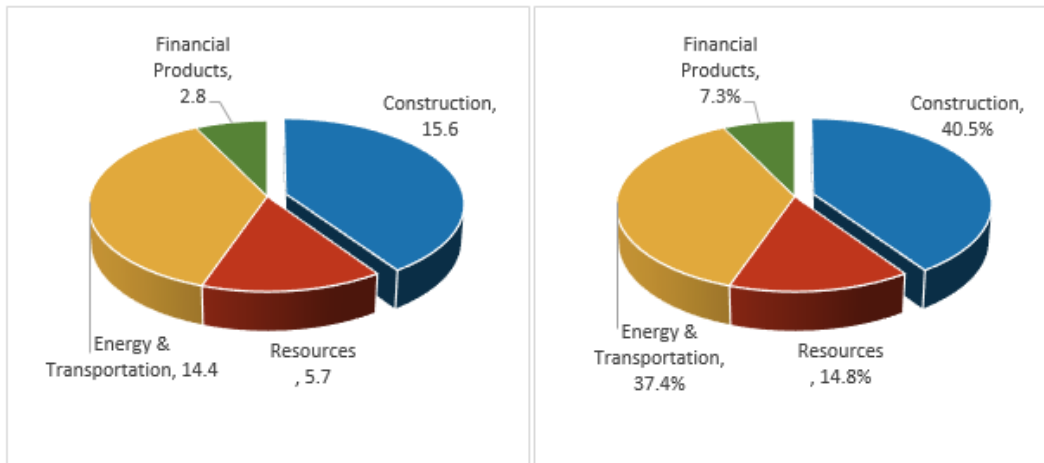
Revenue forecast

FBR’s targeted route to commercialising the Hadrian X is through a technology royalty agreement with a large, global manufacturer of heavy construction and mining machinery (and preferably one with distribution, servicing, and preferably financing capabilities). As such, Caterpillar - with which FBR has a MOU – is an ideal partner. Other potential partners (essentially competitors to Caterpillar) would include Komatsu (Japan), Hitachi (Japan), Liebherr (Germany), Volvo (Sweden), Terex (US), Deere & Co (US), J.C. Bamford (US), Doosan Infracore (South Korea) and LiuGong (China).

Commercialisation via technology JV with global machinery manufacturer

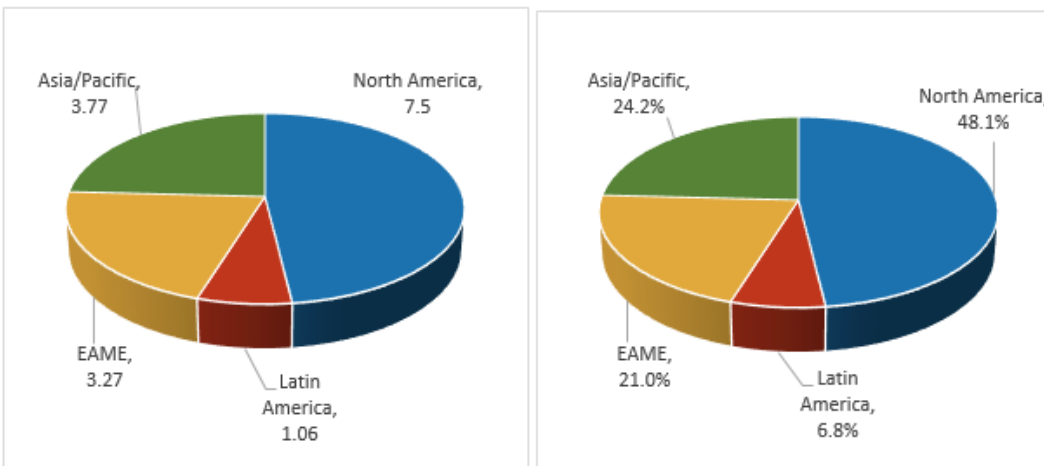
The construction industry is a key contributor to Caterpillar’s (CAT) group revenue, accounting for US\$15.6bn or 40.5% of group total revenue in 2016. North America accounted for 48% of Construction Industries revenue, with Asia/Pacific (24%), and EAME (21%) important contributors. The product portfolio for this segment includes backhoe loaders, wheel loaders, track-type tractors, skid steer loaders, excavators, track-type loaders, and motor graders. In our view, FBR’s Hadrian X is not a competitor to these products, but, adds a new and innovative product / service to the overall offering.

Figure 7: CAT revenue per business segment (US\$bn) (2016)



Source: Caterpillar 2016 annual report, compiled by State One Stockbroking

Figure 3: Location of CAT Construction Industries revenue (US\$bn) (2016)

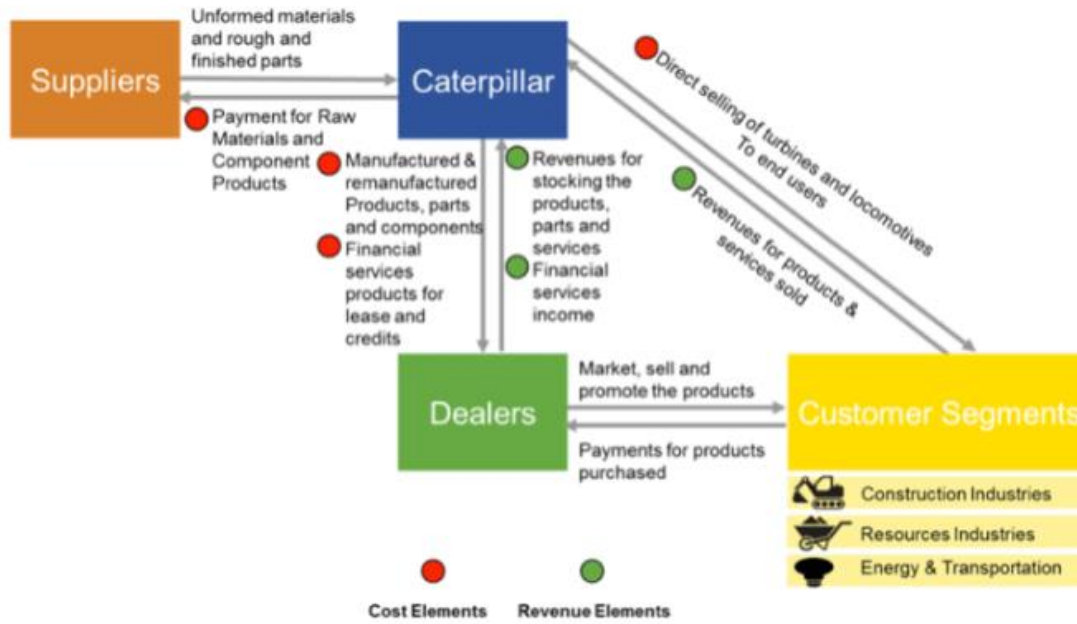


Source: Caterpillar 2016 annual report, compiled by State One Stockbroking

While CAT sells machines directly to end users, the group’s global network of independent dealers underpins the group’s business model. Dealers sell machines (to contactors or rental companies), but also offer parts, servicing, and financing to provide a total package “on the ground” to the end customer.

Figure 8: CAT business model

How Caterpillar Makes Money?



Source: ALVIS website

Revenue from total Machinery, Energy & Transportation fell 19% to US\$35.8bn from US\$44.2bn in 2015. However, in the nine months to September 2017, revenues have rebounded 13% to US\$30.5bn (from US\$26.9bn), with 3Q 2017 revenues up an impressive 27% YoY. CAT attribute the turnaround to increased end-user demand for both equipment and aftermarket parts, as well as favourable changes in dealer inventories.

Figure 9: CAT share price 2012-Present



Source: IRESS

Not surprisingly, the recovery in Caterpillar’s revenue in 2017 has caused CAT’s share price to recover strongly from a 5-year low of US\$60/share in early 2016, to current share price levels of US\$144.

Global construction outlook – a key driver of development

CAT is looking to maintain its position as the global leader in construction machinery in a world where population growth, urbanisation, and increasing wealth – specifically in emerging economies - is forecast to drive a significant increase in global infrastructure spend over the next decade. At the same time, more onerous safety and environment regulations, and rapid advances in automation, robotisation, and big data (Internet of Things (IoT)), is likely to change how traditional building and construction activities are carried out.

A recent report "*Global Construction 2030*", sponsored by professional services and accounting firm PwC forecasts that the **volume of construction work will grow by 85% to US\$15.5 trillion worldwide by 2030**, with three countries, China, US and India, leading the way and accounting for 57% of all global growth.

A recent study by Global Construction Perspectives and Oxford Economics, forecasts **average global construction growth of 3.9% pa to 2030, outpacing that of global GDP by over one percentage point**, driven by developed countries recovering from economic instability and emerging countries continuing to industrialize.

China construction growth in the residential sector is forecast to slow from the exceptionally high levels of urbanisation and industrialisation-led fixed investment seen between 2000-2015. However, the relatively recent abolition of China's one-child policy adds impetus to a generally positive outlook for the residential sector. In addition, the country's transition to a consumer and services driven economy provides opportunity for growth in new types of construction in healthcare, education and social infrastructure, as well as retail and other consumer end-markets.

The construction market in India is forecast to grow almost twice as fast as China to 2030, providing a new engine of global growth in emerging markets. **India's urban population is expected to grow by a staggering 165 million by 2030**, swelling Delhi by 10.4 million people to become the world's second largest city.

"Whilst there is an interesting relationship between the top three countries, it is important not to forget that we see significant weakness in Brazil and Russia, whilst we see extraordinary growth in Indonesia. In Latin America, we expect Mexico to overtake Brazil, whilst Indonesia will overtake Japan by 2030, says Jeremy Leonard, Director of Industry Services, Oxford Economics.

When it comes to Europe, whilst it won't recover to reach pre-crisis levels until 2025, the UK is a stand-out growth market, overtaking Germany to become the largest in Europe and the world's sixth largest construction market by 2030.

"Construction is likely to be one of the most dynamic industrial sectors in the next fifteen years and is utterly crucial to the evolution of prosperous societies around the world. The numbers within this report are huge and that translates as creating vast numbers of new jobs and creating significant wealth for certain countries across the globe", says Fernando A. González, Chief Executive of global building materials company CEMEX.

Global
construction:
forecast to grow
significantly over
the next 12 years
to 2030

Potential addressable market

The UN estimates that by 2030, the global population will reach 8.5 billion (from 7.6bn as in December 2017), with most of this growth occurring in less developed countries in Africa, Asia, the Middle East, and Latin America. The UN estimates that by 2030 ongoing urbanisation will see almost 60% of the global population living in towns and cities, putting (even more) pressure on housing financing and construction delivery systems - which are often informal or rely on the state. As it stands, the World Bank Group estimates that 1.2bn people live in substandard housing, and forecasts that **3bn people will need new housing and basic infrastructure by 2030.**

While developing countries have made progress in improving the framework for housing and housing finance, the World Bank indicates that a significant gap remains to access affordable housing. In many IDA countries, there is a need to develop mortgage solution, particularly for lower-income households who often work in the informal sector. India has taken the lead in addressing this problem, and has set a goal of achieving "[Housing for All by 2022](#)" - by housing up to 40 million households within the next 4-5 years via new lending initiatives, reform of property title legislation, and lower-cost building processes. While progress has been slow, the initiative (if successful) has potential to be adopted in Bangladesh, Indonesia, Philippines and many countries in Africa where reconciling informal incomes with formal lending is problematic.

Predicated on 3 billion people requiring housing between now and 2030, we calculate global standalone residential housing demand at 16 million units per annum. Hadrian X winning 1% of this market equates to some 160k houses.

Assuming two days (on average) to lay the house brickwork, we calculate that some 100 Hadrian X units would typically be required to build 50,000 houses within a three-year period (which we believe is a reasonable period to complete a 50,000 house "contract"). Thus, we calculate that building some 160,000 houses would require around 300 Hadrian X units.

If the Hadrian X technology wins 5% of the global house building market, we calculate that sales of the Hadrian X robotic bricklaying system could increase to over 1,500 units per annum

We forecast global housing demand at 16 million units per annum

Hadrian X securing 1% of this demand = 160,000 houses = 300 Hadrian Xs

Figure 10: Forecast addressable market for the Hadrian X

Global population requiring housing 2017-2030 (million people)	3,000				
Average population requiring housing per annum (million people)	250				
Average household size (people per unit)	8				
Housing units required per annum (million)	31				
% of housing not met or met via high-rise / apartments / other	50%				
Required number of standalone houses per annum (million)	16				
Hadrian X market share (%)	1%	2%	3%	4%	5%
Hadrian X market share (houses)	156,250	312,500	468,750	625,000	781,250
Estimated no of Hadrian X units required per 50,000 houses	100				
=> Number of Hadrian X units required (per annum)	313	625	938	1,250	1,563

Source: State One Stockbroking forecasts

Note: 100 Hadrian X units per 50,000 house "contract" assumes 2 days to lay brickwork per house, 90% machine uptime, and a 3-year contract time-frame.

Sales (volume) profile

We believe that FBR will successfully complete the first Performance Milestone - the building (brickwork) of a +180m² house - by November 2018.

The second Performance Milestone is predicated on FBR successfully completing- under a commercial arm’s length contract - ten (10) homes for Perth-based building contractor Archistruct Builders and Designers by November 2019.

The third Performance Milestone is predicated on FBR reporting annual operating revenue, in a financial year, attributable to robotic building technology (excluding grant receipts and R&D rebates from the ATO) of at least A\$10m by November 2020. Note: each Performance Milestones is associated with 166.7m Performance Shares worth ~A\$32.5m at current share price levels.

Bearing in mind the strong financial incentives, we believe the company will be intensively focused on meeting the above milestones.

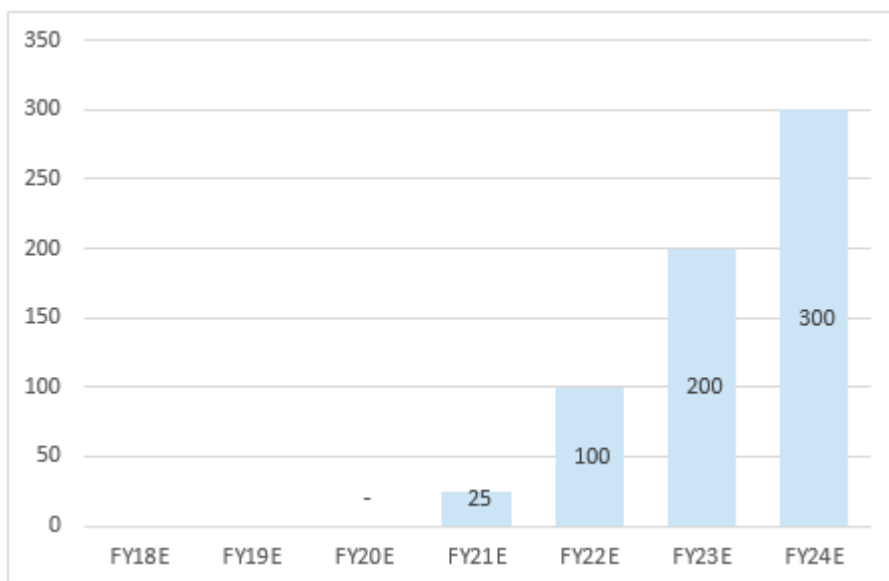
In addition, we believe that the extensive de-risking of the commercial prototype will allow for the technology JV partner (most likely Caterpillar) to “tool-up” relatively quickly to start commercial production.

Lastly, we understand that the Saudi Arabian government is eager to start the initial 50,000 housing order using the Hadrian X technology as soon as possible.

In summary, we believe that everything is pointing to FBR being in a position to achieve first commercial sales of the Hadrian X in late 2020 (i.e. late in 1H FY21).

We forecast maiden sales of 25 units in FY21E, ramping up to our forecast long-term or normalised sales level of 300 units per annum in FY24E (equivalent to servicing 1% of forecast global (standalone) housing demand or ~160,000 houses).

Figure 11: Forecast Hadrian X unit sales (volume)



Source: State One Stockbroking forecasts

500m performance shares worth \$82.5m - a big incentive!

We forecast maiden sales of 25 Hadrian X units in FY21E....

...ramping up to 300 units by FY24E

Hadrian X purchase price – we assume this will be determined by its revenue generating potential

FBR has not disclosed the targeted purchase price of the Hadrian X. In the absence of any unit revenue guidance, we have based the forecast purchase price on our estimated NPV of cash flows generated by the machine. We calculate that over a 10-year machine life, the Hadrian X can generate some ~US\$2.2m per annum in profits (for the operator), resulting in a NPV₁₀ of some US\$13m. After purchase/financing costs and corporate taxes, we suggest a possible purchase price of US\$5m per Hadrian X is not unreasonable - and is probably on the conservative side. Our estimated pre-tax annual cash flow of ~A\$2m (average) in years 1-3, implies a payback period on the US\$5m purchase price of 2.5 years.

We assume an upfront US\$5m purchase price for the Hadrian X. In reality, the purchase price is likely to be a combination of an upfront payment and work-based payments, with the split dependant on geographic location (Middle East skewed towards upfront, US skewed towards work-based).

Figure 12: Forecast NPV of Hadrian X

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
No. of bricks / brick equivalent per house	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000	18,000
Laying cost per brick (US\$)	1.00	1.02	1.04	1.06	1.08	1.10	1.13	1.15	1.17	1.20
Revenue per house (US\$)	18,000	18,360	18,727	19,102	19,484	19,873	20,271	20,676	21,090	21,512
Cost per house (US\$)	(6,000)	(6,120)	(6,242)	(6,367)	(6,495)	(6,624)	(6,757)	(6,892)	(7,030)	(7,171)
Profit per house (US\$)	12,000	12,240	12,485	12,734	12,989	13,249	13,514	13,784	14,060	14,341
No of houses per annum	165	165	165	165	165	165	165	165	165	165
Annual profits (pre-tax) (US\$)	1.98	2.02	2.06	2.10	2.14	2.19	2.23	2.27	2.32	2.37
Discount rate	10%									
NPV of cash flows (US\$m)	13.1									

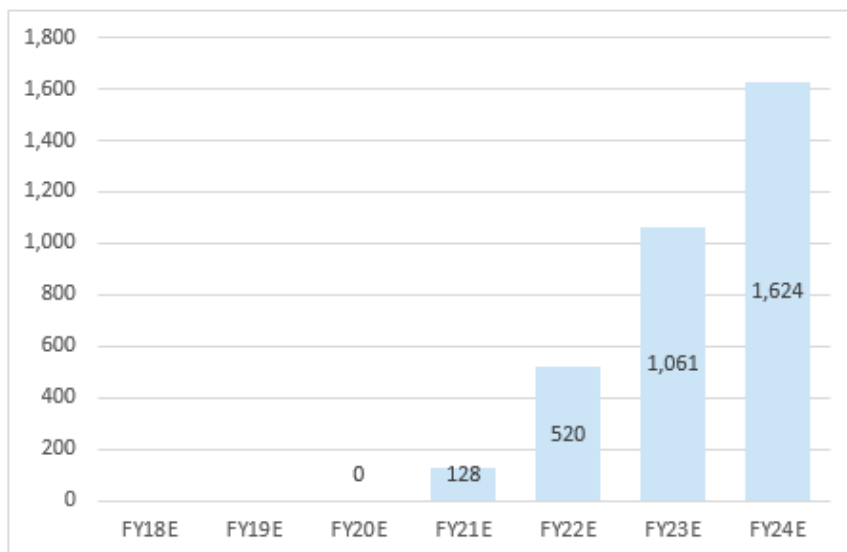
Source: State One Stockbroking forecasts

Note: Estimated revenue of US\$18,000 per house is equivalent to the estimated costs of traditional bricklaying i.e, 4-5 bricklayers taking 6-7 days to complete an average 180m² residential house. Estimated costs of US\$6,000 per house (one third traditional/ manual costs) account for a smaller work-crew (typically three), and a reduced number of days to complete the building (2 days versus 6-7 days). The number of house per annum assume 2 days per house and 90% machine uptime.

Revenue forecast

Predicated on our forecast unit sales and unit price, we calculate revenue from Hadrian X sales rising from US\$128m in FY21E to US\$1.6bn in FY24E.

Figure 13: Forecast Hadrian X revenue (US\$m)



Source: State One Stockbroking forecasts

Hadrian X - NPV to FBR

Assuming a 20% royalty rate to FBR from Caterpillar / CAT dealer sales to building contractors, we estimate post-tax royalties to FBR increasing from A\$24m in FY21E - the maiden year of sales - to ~A\$300m in FY24E. In effect, we estimate that each unit sale is equivalent to ~A1m in post-tax royalties to FBR.

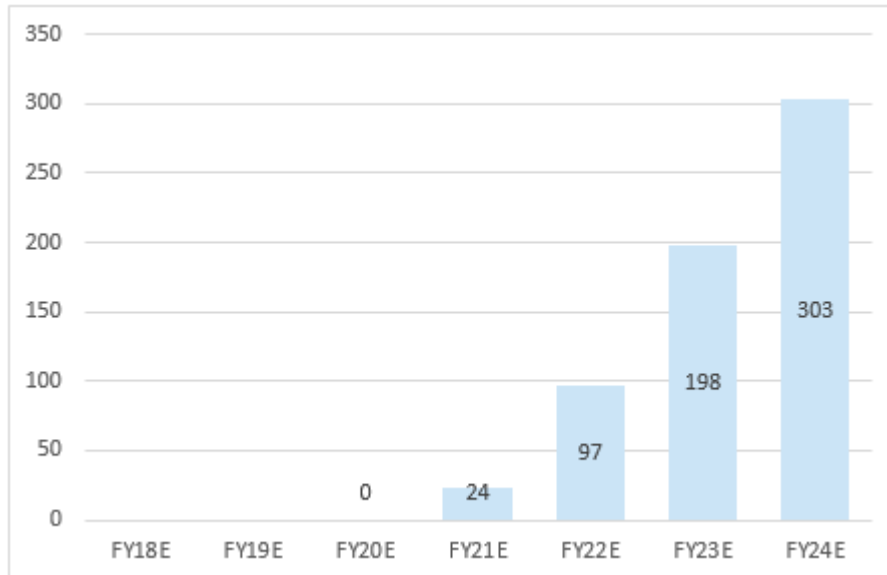
Our estimated NPV₁₀ value (post-tax) of 10-year royalty cash flows is A\$1,043m. See table below.

Figure 14: NPV of Hadrian X royalty stream to FBR (A\$m)

	FY18E	FY19E	FY20E	Year 1 FY21E	Year 2 FY22E	Year 3 FY23E	Year 4 FY24E	Year 5 FY25E	Year 6 FY26E	Year 7 FY27E	Year 8 FY28E	Year 9 FY29E	Year 10 FY30E
No. of units sold	-	-	-	25	100	200	300	300	300	300	300	300	300
Selling price per unit (US\$m)			5.00	5.10	5.20	5.31	5.41	5.52	5.63	5.74	5.86	5.98	6.09
Revenue (US\$m)	-	-	-	128	520	1,061	1,624	1,656	1,689	1,723	1,757	1,793	1,828
Royalty rate to FBR			20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Royalty to FBR (US\$m)	-	-	-	26	104	212	325	331	338	345	351	359	366
AUD:USD exchange rate	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Royalty to FBR (A\$m)	-	-	-	34	139	283	433	442	450	459	469	478	488
Tax (A\$m)	-	-	-	(10)	(42)	(85)	(130)	(132)	(135)	(138)	(141)	(143)	(146)
After-tax royalty (A\$m)	-	-	-	24	97	198	303	309	315	322	328	335	341
Development capex (A\$m)	(5)	(5)	(5)	(2)	(2)	(2)	(2)	(2)	(3)	(3)	(3)	(3)	(3)
Cash flow (A\$m)	(5)	(5)	(5)	22	95	196	301	307	313	319	325	332	338
Discount rate	10%												
NPV (A\$m)	1,043												

Source: State One Stockbroking forecasts

Figure 15: Forecast after-tax royalty stream to FBR (A\$m)



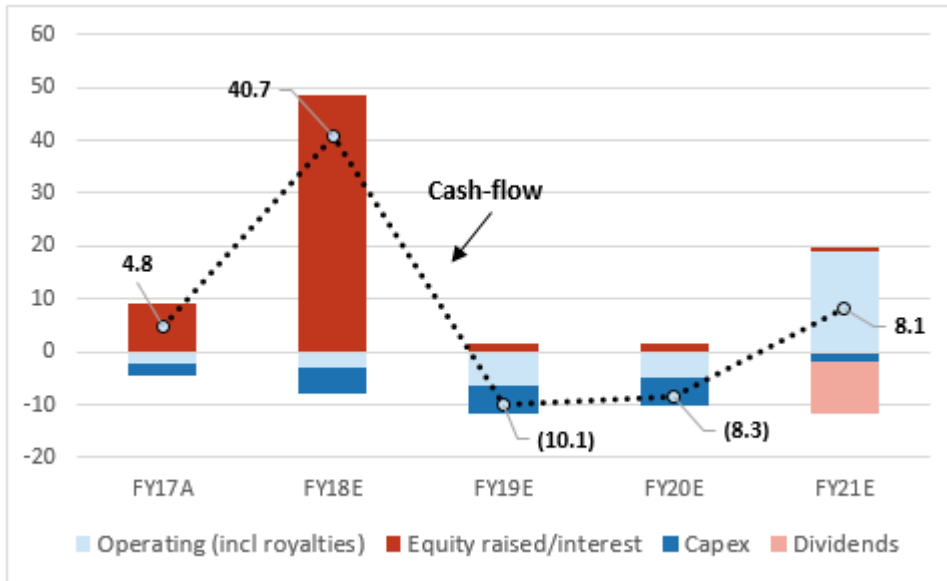
Source: State One Stockbroking forecasts

Cash flow

While we forecast maiden royalty income (only) in FY21E, we believe that the significant cash inflow in FY18E (US\$2m equity injection from Caterpillar in July 2017 with the option of an additional US\$8m investment by 30 June 2018, and a A\$35m placement completed in November 2017), should provide sufficient working capital to support the group’s overheads and development activities over the next 3½ years.

Cash inflow from equity injections in FY18E to fund FBR over next 3-4 years

Figure 16: Forecast cash flows (FY17E-FY21E) (A\$m)



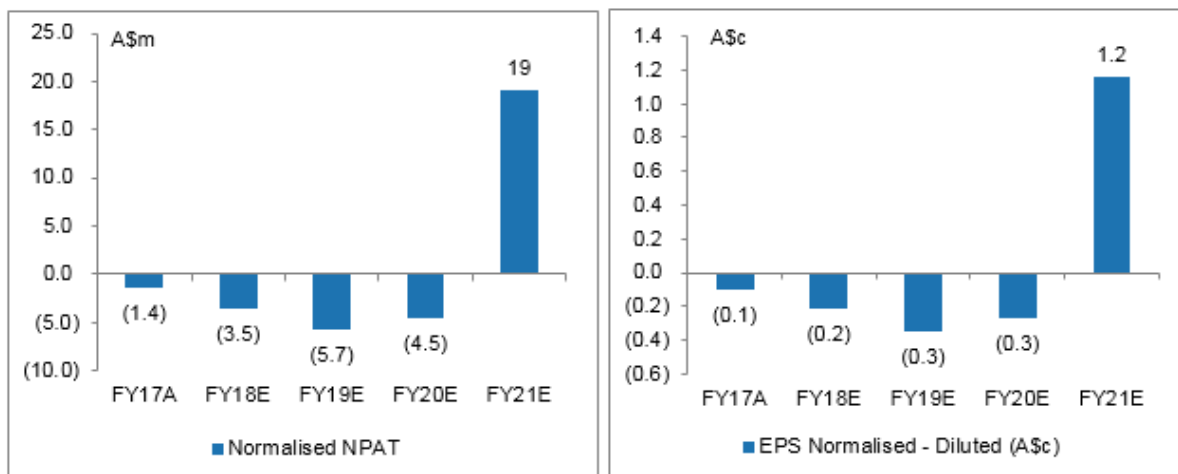
Source: Company, State One Stockbroking forecasts

Note: We forecast that FBR should be in a position to return dividends to shareholders in FY21E; we assume a payout ratio of 50% of net income.

In line with our forecast of maiden royalty income in FY21E, we forecast that FBR will only achieve positive net profits (A\$19m) and EPS (A\$1.2c) in FY21E.

Positive earnings from FY21E

Figure 17: Forecast NPAT (A\$m) and EPS (A\$c)



Source: Company, State One Stockbroking forecasts

Board of Directors (Source: Company)



Michael Pivac
Executive Director & Chief Executive Officer

Michael Pivac is a former airborne mission systems specialist with broad experience in night vision, infrared and radar detection systems and has been key to developing the technology and developing the Business Plan and Machine Development Strategy.



Mark Pivac
Executive Director & Chief Technology Officer

Mark Pivac is the primary inventor of Fastbrick's Dynamic Stabilisation technology. He is an aeronautical and mechanical engineer with over 25 years' experience working on the development of high technology equipment and 20 years' experience of pro/engineer 3D computer-aided design (CAD)



Marcus Gracey
Chief Operating Officer

Marcus is an experienced ASX company executive and director, a corporate and technology lawyer and a Chartered Company Secretary. Marcus has extensive international experience with specific expertise in the commercialisation of new technologies, technology transfer and licensing, the global protection and enforcement of intellectual property rights, the development and execution of international business strategy along with significant public company governance and compliance experience.



Gabriel Chiappini
Director

Gabriel is an experienced ASX director and has been active in the capital markets for 17 years. Gabriel has assisted in raising in excess of AUD\$450m in funding and has provided investment and divestment guidance to a number of companies. Gabriel specializes in Start-Up companies and assists companies with their growth and strategic direction and has been involved with 10 ASX IPO's in the last 12 years. Gabriel is a member of the Australian Institute of Company Directors and Chartered Accountants Australia & New Zealand.

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