MAC EQUITY PARTNERS

fyi Resources Limited

COMPANY STATEMENT	
GICS Industry Group	**Materials**
Location	**Australia**
Shares on issue	**365,867,589**
Share Price (ASX.FYI)	**A$0.38**
52 week high/low	**A$0.88/0.17**
Cash and Marketable Securities (12 October 2021)	**A$10,200,000**
Debt	**A$0**
Market Capitalisation (fully diluted)	**137,000,000**

MANAGEMENT	
Mr Edmund Babington	Non-Executive Chairman
Mr Roland Hill	Managing Director
Mr David Sargeant	Non-Executive Director
Mr Adrian Jessup	Non-Executive Director
Dr Sandy Chong	Non-Executive Director - ESG

MAJOR SHAREHOLDERS	
CITICORP NOMINEES PTY LIMITED	**11.45%**
BNP PARIBAS NOMINEES PTY LTD ACF CLEARSTREAM	**9.03%**
MR KENNETH JOSEPH HALL <HALL PARK A/C>	**2.69%**
Top 20	**45.17%**

CHART

EQUITY RESEARCH

FYI Resources (ASX.FYI | FRA.SDL)

Moving Towards Being The World Leading Green Producer of High Purity Alumina (HPA)

RESEARCH HIGHLIGHTS 2021

Innovative HPA Production with Improved Efficiency and ESG Benefits

- High Purity Alumina (HPA) is an essential and **irreplaceable input material** in several **rapidly growing industries**.
- FYI Resources (ASX.FYI) have developed an **innovative method** to produce HPA which results in **less raw material waste** and **reduced environmental impact**, whilst also **reducing operating costs**.
- This method will enable FYI to mine aluminous clay (kaolin) at its **100% owned Cadoux Kaolin Project**, 200km north-east of Perth and then process this kaolin just 256km at their processing facility in a Kwinana industrial area which is quickly becoming known as "battery valley." There is also the potential to use Alcoa sourced feedstock if it is found to be more effective.

Exclusive Joint Venture with Alcoa on HPA Project

- On October 1st 2021 FYI entered into an **exclusive joint venture** with a leading global aluminium producer and **US$8.8B listed company Alcoa Corp (NYSE.AA)**[1]
- This JV outlines a **3 phase path to mass HPA production** with Alcoa in line to bare the majority of the costs.
- The combined expertise of FYI and Alcoa should allow for the rapid advancement of FYI's HPA process with an eye towards securing off-take agreements as they move closer to production at scale.
- Alcoa are in line to contribute up to US$243m out of a total project cost of US$250m, therefore **FYI is effectively fully funded**.

High Project NPV With The Potential To Overachieve

- A definitive feasibility study, which utilised conservative forecasts for future HPA prices, gave this project a **net present value >US$1B**.[2] With the current trends in demand for HPA's far exceeding the growth in supply there is the potential the actual value could far exceed this.

Strong Balance Sheet and Tightly Held Registry

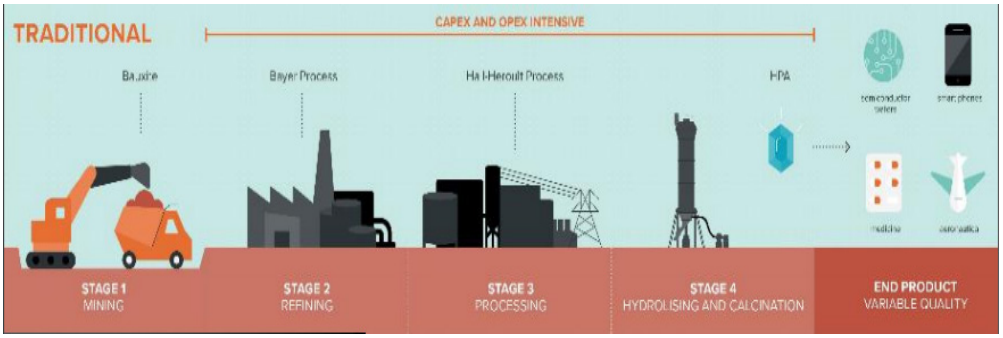
- **A$80m equity commitment funding** from Luxembourg-based private equity group GEM global yield LLC SCS, a US$3.4b long only fund.
- Cash at bank of ~A$10.2 million.
- FYI is quite tightly held with the top 20 holders accounting for 45.17% of shares.

MAC EQUITY PARTNERS PTY LTD
AFSL: 338731
ABN: 32 126 369 640

EXISTING METHOD:

The most common method of HPA production currently is the **hydrolysis of aluminium alkoxide**. In order to orchestrate this process bauxite which has been mined must first be converted into aluminium in metallic form by electrolysis, before it is then converted into aluminium alkoxide. Hydrated alumina is then synthesised through the hydrolysis of this aluminium alkoxide This process is **expensive** and **detrimental to the environment** due to the high processing requirements of the feedstock. Further to this the end product of hydrolysis of aluminium oxide is **largely inconsistent** and can contain **high levels of impurities**. This process has not substantially changed since the 1880's is long overdue for modernisation.

Figure 1: Visual representation of four staged conventional method

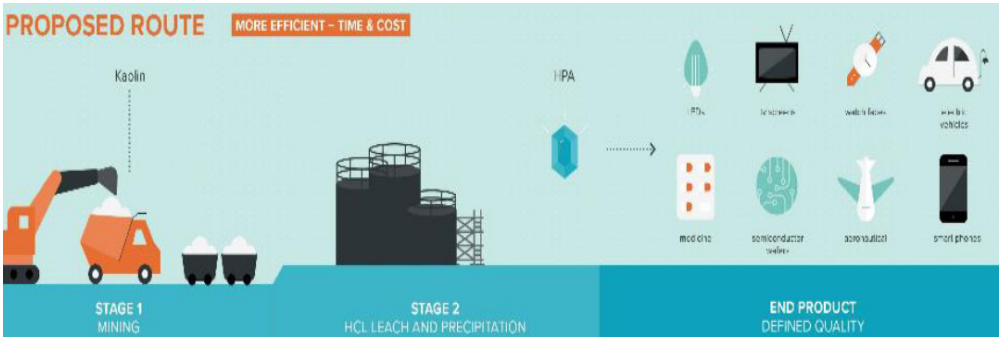


SOURCE FYI RESOURCES

FYI INNOVATION:

FYI has developed an **innovative flowsheet** predicated on hydrochloric acid leaching to filter impurities from the feedstock and refine to a high level of purity. Also unique is this feedstock; Kaolin clay sourced from FYI's wholly owned mine in Cadoux, Western Australia. Unlike traditional methods this feedstock can be directly inputted and does not have to undertake excessive, expensive and environmentally detrimental processing beforehand. FYI plans to process at a facility in Kwinana in the area developing into 'battery valley' providing the added benefit of **geographical proximity** as the kaolin feedstock will only need to be transported 256km for processing. There is also the possibility to use Alcoa feedstock in addition to, or instead of, FYI's Kaolin clay. This method provides **significant ESG benefits** resulting in 50% less energy consumed and 40% less green house gasses produced compared to conventional method[3].

Figure 2: Visual Comparison of FYI's proposed twe stage greener method.



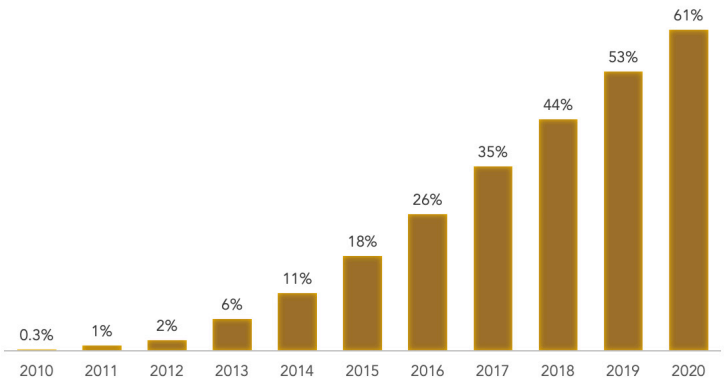
SOURCE FYI RESOURCES

EARNINGS POTENTIAL:

LED BULBS

HPA is essential in the production of Synthetic sapphire which, amongst other uses such as scratch resistant glass, is essential in the manufacture of substrates for LED lights. LED filament lamps primarily use sapphire substrates as opposed to nonrenewable aluminium and non-biodegradable plastic. The market is beginning to realise the benefits of filament LED's as opposed to the traditional method. Due to this the global filament LED bulb market is projected to reach **US$ 6621.39m in 2028** up from US$ 1433.19m in 2021 growing at a CAGR of 24.4%[4]. Much of this growth is in the Asia Pacific region attributed mainly to the rapid nature of India and China's property development. This is ideal for a company such as FYI to look to enter the market in an easily addressable region.

Figure 3: Estimated LED Penetration Rate

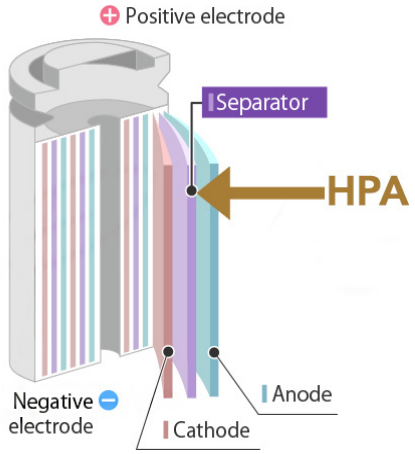


SOURCE STATISTA

EV BATTERIES

An emerging market for HPA is in the production for Li-ion batteries and particular those used in electric vehicles. HPA is used to coat the separator between the anode and the cathode of the battery which acts to increase the battery life cycle and reduce the self-discharge rate. The EV battery market is forecast to grow from US$450m (2016) to **US$35b (2025)**[5]. As more countries continue to implement policies shifting production towards electric vehicles the demand for batteries, and therefore battery inputs such as HPA, will continue to escalate strongly.

Figure 4 Diagram of the role of HPA in a Li-ion battery

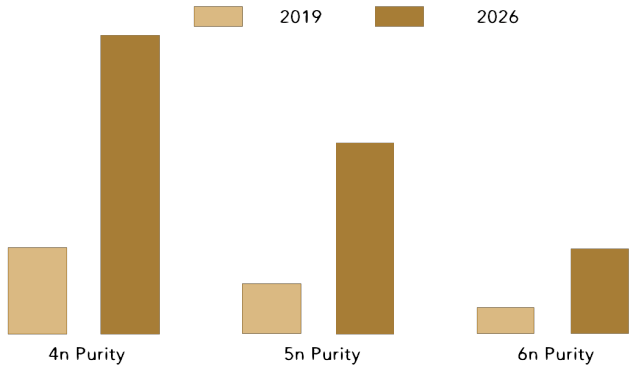


SOURCE TEIJIN LIMITED

OVERALL HPA DEMAND

The global HPA market was valued at US$1.3b in 2019, and is projected to reach **US$4.8b by 2026**[6], growing at a CAGR of 20.7%. HPA's are categorised by their purity, with 4n being >99.99% pure, 5n being >99.999% pure and 6n being >99.9999% pure. The 4N product fetches approximately US$25,000 per tonne, whilst the 5n product goes for roughly US$50,000 per tonne for 5n HPA[7]. The 4n market is the currently the largest already accounting for ~30ktpa demand per annum due to its use in LED substrate. The 5n market is quickly catching up however as the electric vehicle industry requires the higher purity product. FYI aims to address both the 4n and 5n market.

Figure 5: Forecast Demand for HPA's By Purity (2019 vs 2026)



SOURCE ALLIED MARKET RESEARCH

ALCOA JOINT VENTURE:

On the 1st of October FYI announced that the long awaited term sheet for an Alcoa joint venture had been signed. The agreement outlines a 3 phase pathway for FYI towards production of HPA's at a global scale. Under the agreement FYI would own 35% and Alcoa would own 65%. Whilst it's always more favourable to maximise project equity, FYI maintains a 35% stake whilst effectively having a **free carry through to production**. If the project is followed through to completion **Alcoa will fund US$243m of the US$250m total cost** whilst FYI would still be entitled to their proportion of the plants' **EBITDA which forecasts to be ~A$74.3m per annum**. Funding through this joint venture allows FYI to avoid the difficulties associated with acquiring debt funding without having to further dilute shareholders and it was necessary to sacrifice project equity to achieve this. Alcoa is a **world leader in the alumina space** and this joint venture provides FYI with access to an **extensive R&D team** to continue to refine their innovative HPA production process and look to establish potential off-take agreements. Alcoa and FYI will continue to pursue downstream HPA opportunities offering the potential for significant expansion in the future beyond the current planned timeline. Whilst the original JV only outlines progress up until completion of the first full scale plant; if any further plants are built FYI would possess equity in those also.

PHASE 1

- **Detailed design of an estimated 1,000 tpa demonstration facility and additional production trials over 2021 and 2022.**
- **Estimated cost at phase 1 is US$7m. AoA will contribute an initial A$5 million, over 2021-2022, to fund stage one project development.**
- **On completion of Phase one each party would make a decision whether or not to proceed to Phase two.**

PHASE 2

- **The parties would enter into an unincorporated joint venture and the demonstration facility would be constructed, and detailed engineering undertaken for a full-scale HPA plant that would produce 8,000 tpa.**
- **The estimated total cost of stage 2 is approximately US$50m. Upon entering phase two, Alcoa would contribute the first US$5m of FYI's funding requirement in relation to Phase 2 construction costs by sole funding the first US$14m of costs associated with the construction of the demonstration facility.**
- **On completion of Phase two each party will make a decision whether or not to proceed with Phase three.**

PHASE 3

- **The parties could establish an incorporated joint venture company and construction for the full-scale plant would commence.**
- **The full-scale facility (engineering and construction) is projected to cost approximately US$200m, subject to further engineering studies. Based on current forecasts, Alcoa's contributions would cover the primary production facility construction costs in their entirety.**

FYI AND ALCOA TO COMMENCE EXTENDED HPA PILOT PLANT TRIAL[7]:

FYI and Alcoa Australia are scheduled to commence extended pilot plant production of HPA on the 19th of October.

The pilot plant will operate continuously (24 hours per day) for two weeks.

A short break will then be taken to analyse the production results before another two weeks of continuous operation.

This production run will enable FYI to further demonstrate the end to end potential of their processing flowsheet and the resultant product can then be marketed to potential offset partners.

The plant will produce ~1.0kg/hour of HPA with the primary focus being 4n purity (>99.99%Al_2O_3) however some 5n purity may also be produced.

A focus on ESG will be prevalent throughout the process as the environmentally sustainable production of HPA is the goal of both FYI and Alcoa.

This will be the first pilot run since the signing of the FYI/Alcoa JV which will hopefully allow for greater transparency and joint promotion of the project.

The integration of FYI's IP with that of a world leader such as Alcoa should prove to yield outstanding results that will help push the project forward.

PROJECT RISKS:

TECHNOLOGY RISK:

Critical to the success of the JV will be the continued proof of FYI's production method. Since the MOA with Alcoa was entered the purity of the HPA produced has continued to improve as FYI can leverage the expertise of a world leading company. The JV signed allows for this process to continue as FYI and Alcoa can utilise their joint IP's to the fullest extent to perfect the production process. It should be noted that this JV will be Alcoa's sole target in the HPA market and that the **"joint development of past and future technologies and intellectual property of both companies will be held under the JV,"** signalling Alcoa's commitment to the project.

UNCERTAINTY OF JV:

Whilst stages 2 and 3 of the project are subject to a final investment decision, this is likely dependent on favourable HPA market conditions and the success of the pilot plant. All factors to this point have suggested that both these prerequisites will be met and as such it is our belief that the project has strong potential to proceed to completion. The HPA market is forecast to more than triple in the next 7 years and if the push for electric vehicles continues the performance of battery components such as HPA could prove to far exceed this. Alcoa stands to contribute an initial A$5m, over 2021-2022, to stage one project development activities that will include additional production trials, as well as the detailed design of an estimated 1,000 mtpa demonstration facility. It appears unlikely that a company that undertakes as much due diligence as Alcoa would throw A$5m away at a project for which it sees no future.

PROJECT TIMELINE:

Another prevalent concern has been the timeline of the project with the proposed completion date for the full scale plant not until 2024. FYI Managing Director Roland Hill however has noted that "2024 was drafted conservatively and could be expedited,"[8] leaving the possibility that the plant could be operational sooner. Even if the project isn't completed until 2024, that could also be the **perfect time to enter the HPA market**. 2024 is the year forecast to bring about a **supply side deficit** to the HPA market leaving a significant opportunity for a new player such as that offered by this joint venture to help meet demand.

MARKET RISKS

A decline in overall equity markets may put pressure on FYI as investors look to less speculative investments.

RELIANCE ON HPA PRICE

FYI's performance is reliant on the continued demand for HPA at strong prices. Whilst HPA is largely price inelastic at the moment, if there was a drop in the price (for example due to the discovery of a replacement product) this would put pressure on the performance of HPA.

REFERENCES

1 ANN:FYI and Alcoa Sign Binding JV Term Sheet For FYI's HPA Refining Project, 1/10/2021

2 ANN: FYI HPA Project NPV Increases to US$1.014Bn, 31/3/2021

3 ANN: FYI NWR Resources Conference 18th November 2020

4 PR Newswire, Insights on The Filament LED Bulb Market, 2021-2028

5 PR Newswire, Global Lithium Ion Battery Market, 2021-2030

6 Allied Market Research, High Purity Alumina Market, 2020-2026

7 ANN: FYI and Alcoa To Commence Extended HPA Pilot Plant Trial, 12/10/2021

8 The West Australian, FYI Resources Defends Deal With Alcoa Over High-Purity Alumina Plant, 3/10/2021

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KEY PEERS:

ALTECH CHEMICALS (ASX:ATC)

Altech chemicals (ASX:ATC) utilises a similar HCL leeching process to that utilised by FYI to produce HPA. Unlike FYI, however, whilst they will be mining their feedstock in WA they will be attempting to build and operate their production facility in Malaysia. This adds additional transport costs whilst exposing them to further risks of operating in a COVID ravaged nation. Also different to FYI is ATC's reliance on debt funding which to this stage they have been unable to fully secure, with the company still requiring an additional circa A$540m in debt funding.

ALPHA HPA (ASX:A4N)

Alpha HPA (ASX:A4N) utilises a process that involves solvent extraction, Al salt crystallisation, HPA-precursor production, and calcination to produce HPA. They have developed a HPA pilot plant in Brisbane and are looking to secure funding to develop a production facility in Gladstone. The issue with A4N, similar to ATC is their reliance on debt funding which they have not yet received to build their production facility.

ALUMINA LIMITED (ASX:AWC)

Although not a direct competitor, AWC provides an interesting idea as to what we could expect out of FYI. AWC is an Australian holding company whose sole asset is a 40% shareholding in Alcoa World Alumina & Chemicals. FYI is in a similar position in relation to Alcoa's High Purity Alumina division. Should the joint venture continue to completion, FYI will possess a 35% stake in all of Alcoa's HPA projects. AWC is capped at ~A$5.6b with a P/E ratio of 32.68. Any similarity in return of the FYI/Alcoa JV would be massive for FYI shareholders.