



DEVELOPING STRATEGIC HIGH PURITY ALUMINA (HPA)  
CADOUX KAOLIN PROJECT IN WESTERN AUSTRALIA

**BENCHMARK MINERALS WEEK 16-20 SEPTEMBER 2019**

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## COMPETENT PERSONS' STATEMENTS

The information in this report that relates to Ore Reserves is based on information compiled by Mr. Steve Craig, who is a Fellow of the Australasian Institute of Mining and Metallurgy. Steve Craig is a full-time employee of Orelogy Consulting Pty Ltd and has sufficient experience relevant to the style of mineralisation and type of deposit under consideration and to the activity which they are undertaking to qualify as a Competent Person as defined in the 2012 Edition of the "Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves". The information is extracted from the Ore Reserve announcement released 29 October 2018 and is available to view on the Company's website at [www.fyiresources.com.au](http://www.fyiresources.com.au)

The information in this report that relates to Mineral Resources is based on information compiled by Mr Grant Louw, under the direction and supervision of Dr Andrew Scogings, who are both full-time employees of CSA Global. Dr Scogings is a Member of the Australasian Institute of Mining and Metallurgy and a Member of the Australian Institute of Geoscientists. He is a Registered Professional Geologist in Industrial Minerals. Dr Scogings has sufficient experience relevant to the style of mineralisation and type of deposit under consideration and to the activity which he is undertaking to qualify as Competent Person as defined in the 2012 Edition of the "Australasian Code for the Reporting of Exploration Results, Mineral Resources, and Ore Reserves". The information is extracted from the PFS announcement dated 25 September 2018 and is available to view on the Company's website at [www.fyiresources.com.au](http://www.fyiresources.com.au)

The information in this report that relates to metallurgy and metallurgical test work is based on information reviewed and compiled by Mr Daryl Evans, a Competent Person who is a Fellow of the Australian Institute of Mining and Metallurgy (AusIMM). Mr Evans is an employee of Independent Metallurgical Operations Pty Ltd, and is a contractor to FYI. Mr Evans has sufficient experience that is relevant to this style of processing and type of deposit under consideration, and to the activity that he has undertaken to qualify as a Competent Person as defined in the 2012 Edition of the "Australasian Code for the Reporting of Exploration Results, Mineral Resources and Ore Reserves". Announcements in respect to metallurgical results are available to view on the Company's website at [www.fyiresources.com.au](http://www.fyiresources.com.au).

The Company confirms that it is not aware of any new information or data that materially affects the information included in the original market announcements and that all material assumptions and technical parameters underpinning the findings in the relevant market announcements continue to apply and have not materially changed and that all material assumptions and technical parameters underpinning the estimate in the relevant market announcement continue to apply and have not materially changed. The Company confirms that the form and context in which the Competent Person's findings are presented have not been materially modified from the original announcement.

# INTRODUCING FYI RESOURCES

FYI is aiming to become a dominant participant in the global HPA market

## Strategy



Developing the world-class Cadoux project with the goal of becoming a leading producer

## Quality



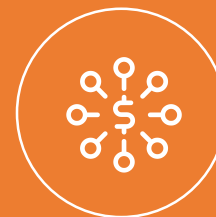
Simplified, innovative and efficient flowsheet deriving HPA from kaolin validated through extensive R&D and Pilot Plant testwork

## Economics



Building upon outstanding PFS results: low opex and capex operation

## Growth



The global HPA market is experiencing rapid demand growth that is forecast to continue

## Advantage



Fully integrated in a tier 1 mining jurisdiction with excellent infrastructure and Kwinana "Battery Alley" footprint

# HIGH PURITY ALUMINA (HPA)

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HPA is a processed premium non-metallurgical alumina product characterised by its purity level – i.e. 99.99% (4N), 99.999% (5N).



HPA is mainly used for its superior properties, such as corrosion and scratch resistance, high brightness, and its ability to withstand extreme temperatures.



Currently HPA is sourced from expensive feedstock, such as refined aluminium metal sourced from bauxite using antiquated processing. **FYI plans to produce low-cost HPA from kaolin using innovative processing route.**



Applications include: LEDs, in the manufacture of sapphire glass and in certain battery and static power storage components, aeronautical and medical applications.

# HPA MARKET OVERVIEW

## HPA FORMS A SIGNIFICANT PART IN HIGH-PERFORMANCE ELECTRONICS



Historically a small market – no justification for product innovation



New applications and technologies have created demand and market opportunities

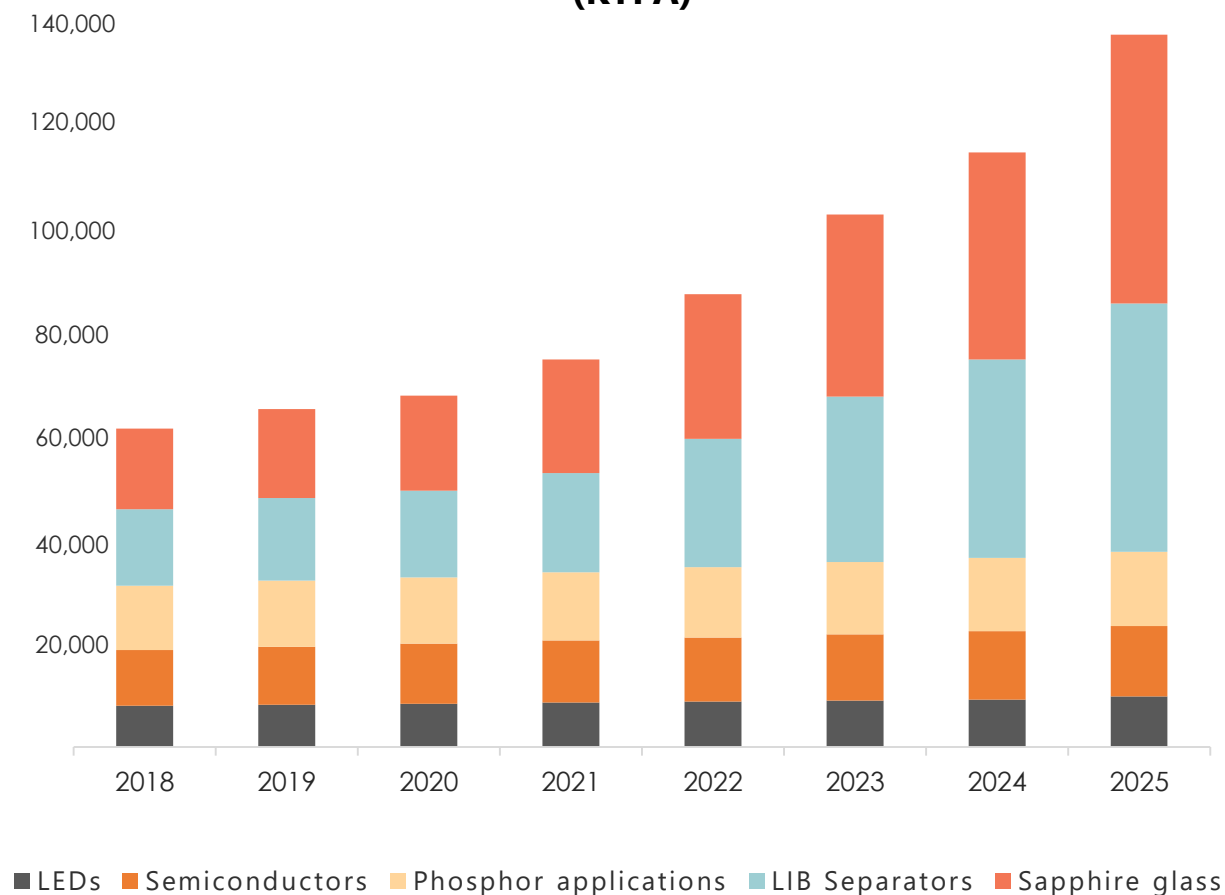


The current global 4N HPA market demand is ~60ktpa; this is expected to increase to **~90ktpa by 2022 and >130ktpa by 2025\***



The market for HPA is witnessing dramatic consumer driven growth, with the **HPA market forecasted to be US\$4.49Bn by 2022\*\***

## HPA FORECASTED DEMAND GROWTH (KTPA)



# HPA MARKET SNAPSHOT

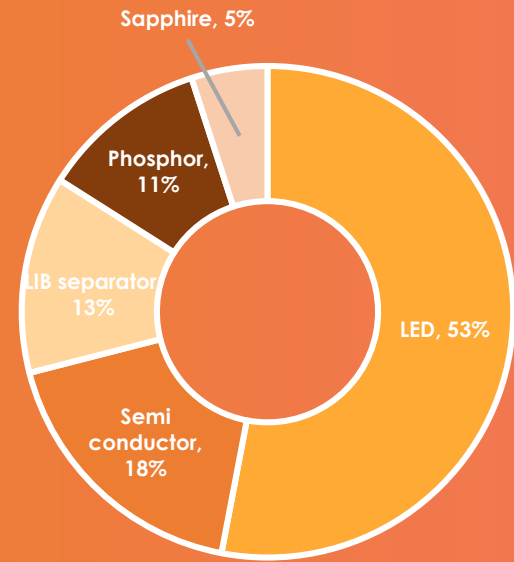
- Demand for HPA is predominantly driven by its applications in LEDs, this market is growing rapidly and will continue to be a key end-user of HPA
- HPA as a Lithium-ion battery separator coating (LIB separator) is expected to generate significant demand as electric vehicles (EV) revolution plays out
- EV battery-related HPA demand is expected to surpass the LED market demand within the next 5 to 10 years
- Applications in phosphor coatings, scratch-proof glass and semi-conductors are a steady source of demand for HPA
- Pricing of HPA varies depending upon the grade and other characteristics that effect application performance ie density, particle size crystal structure and matrix of remnant deleterious elements
- HPA is one of the bigger beneficiaries in the globalising of EV transport

References:

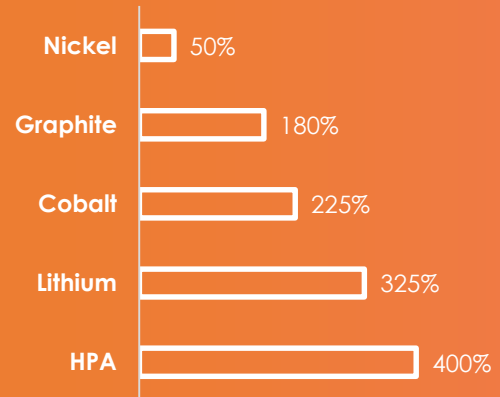
\*\* - CRU HPA Industry report  
 \*\*\* - Benchmark Minerals: Lights, Batteries, Action! – Q4 Review 2018



## HPA Market 2018 Segmentation\*\*\*



### EV Materials Demand Growth\*\*



### HPA Pricing by Purity\*\*

|     |                |
|-----|----------------|
| SGA | ~US\$400/t     |
| 3N  | ~US\$10-25kg   |
| 4N  | ~US\$25-50kg   |
| 5N  | ~US\$50-100kg  |
| 6N  | By negotiation |

# HPA IN THE EV BATTERY REVOLUTION



EV battery market forecast to grow from **US\$450Mn (2016) to US\$35Bn (2025)\***



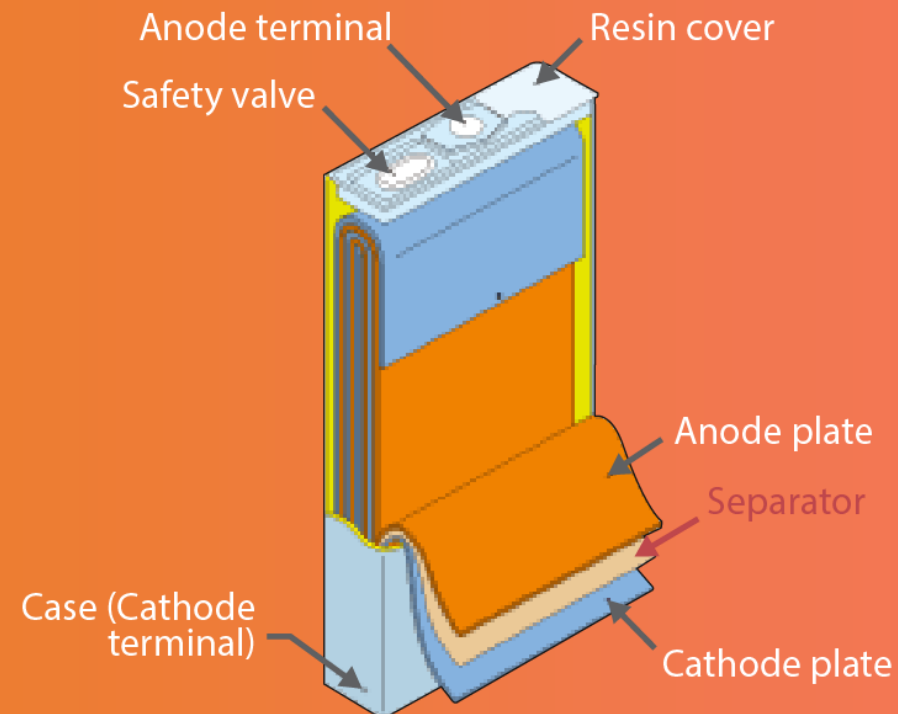
HPA is a major input into ceramic coated separators (CCS) in batteries



Battery performance (energy density) is increasing dramatically



HPA provides greater protection, battery integrity at much higher temperatures



Cross-Sectional view of lithium-ion battery

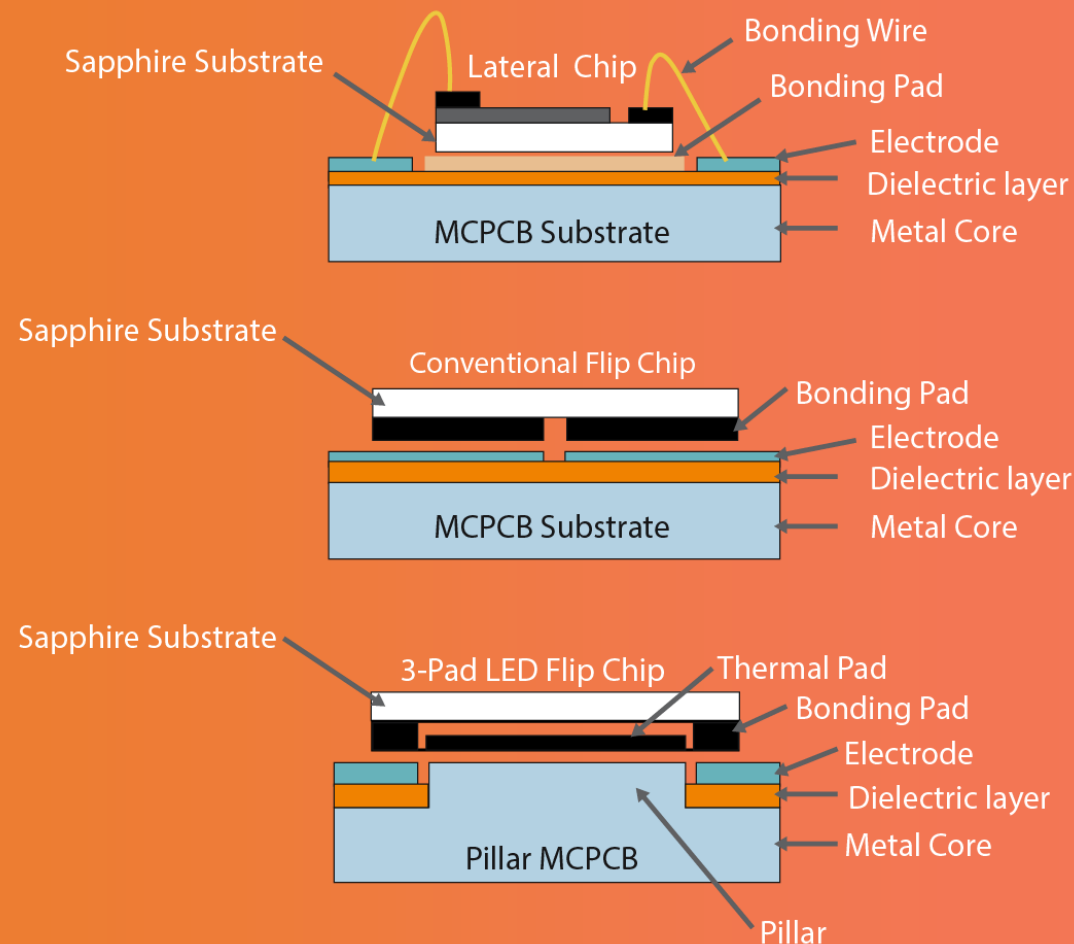
# HPA: A KEY COMPONENT IN LEDs

## Light emitting diodes (LED)

- Increasing environmental awareness and strict Government power and emission policies
- Phasing out of old and inefficient lighting applications (eg incandescent, neon, halogen)
- Providing assurance to manufactures of a reliable and consistent supply of HPA
- LED market is forecast to grow from **US\$26Bn (2016) to US\$54Bn by 2022** and progressively take the major share of the global market of US\$110Bn\*\*

### References:

\*\* - Zion Market Research LED Report | McKinsey – Global Lighting Market Report

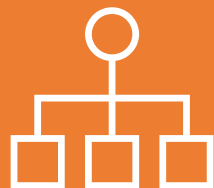


Cross-Sectional view of various LED designs

## KEY ACHIEVEMENTS - 12 MONTHS



Delivered outstanding PFS for Cadoux



Process flowsheet optimised to increase efficiencies + reduce Capex & Opex



Metallurgical results exceeded 99.99% target HPA



Cadoux DFS nearly completion



Initiated HPA offtake negotiations with customers



Pilot plant – validating of the process and de-risking the project



Project Reserves providing > 50 years mine-life



Kwinana "Battery Alley" refinery site applied for



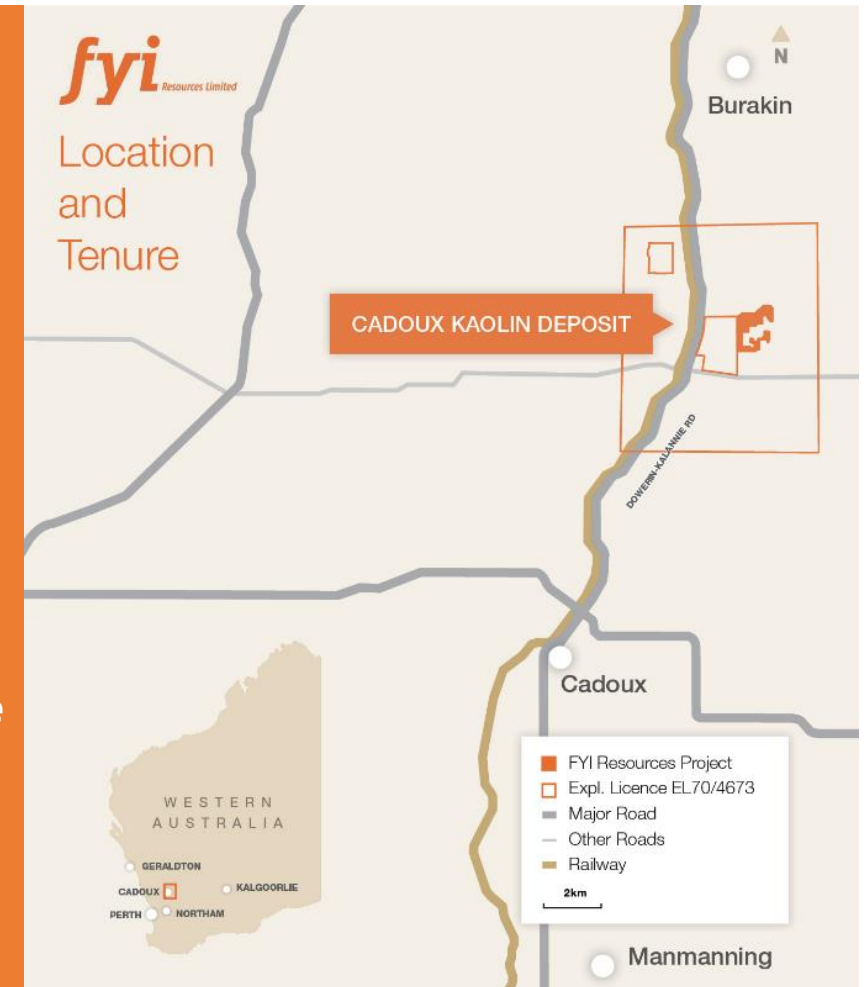
Mining Lease granted for 21 years



Project environmental permitting completed

# FYI HAS A RESOURCE IDEAL FOR HPA

- ⇒ The Cadoux Kaolin Project area boasts **excellent infrastructure**
- ⇒ **Deposit geology is ideal** – shallow, flat lying, low strip, free digging, homogenous excellent quality & easily accessible
- ⇒ Extensive drilling, **well understood geology** - Detailed Mine Study completed, reserves calculated, first 3 years of grade control completed
- ⇒ Excellent characteristics quality, grade and low deleterious elements – **extremely amenable to FYI's HPA innovative process design**
- ⇒ 100% owned project area private land, no native title, no EPA. **Permitting completed.**
- ⇒ Reserve of 2.89 million tonnes grading 24.4%  $\text{Al}_2\text{O}_3$  **supports PFS mine life of 25+ years**
- ⇒ Provides a fully **integrated, reliable, consistent and secure supply** of feedstock for the HPA refining



# FYI'S SIMPLE & INNOVATIVE FLOWSHEET DESIGN



Developed for Cadoux's exceptional quality and characteristics



Designed for efficiency, heavy duty, low maintenance and long life



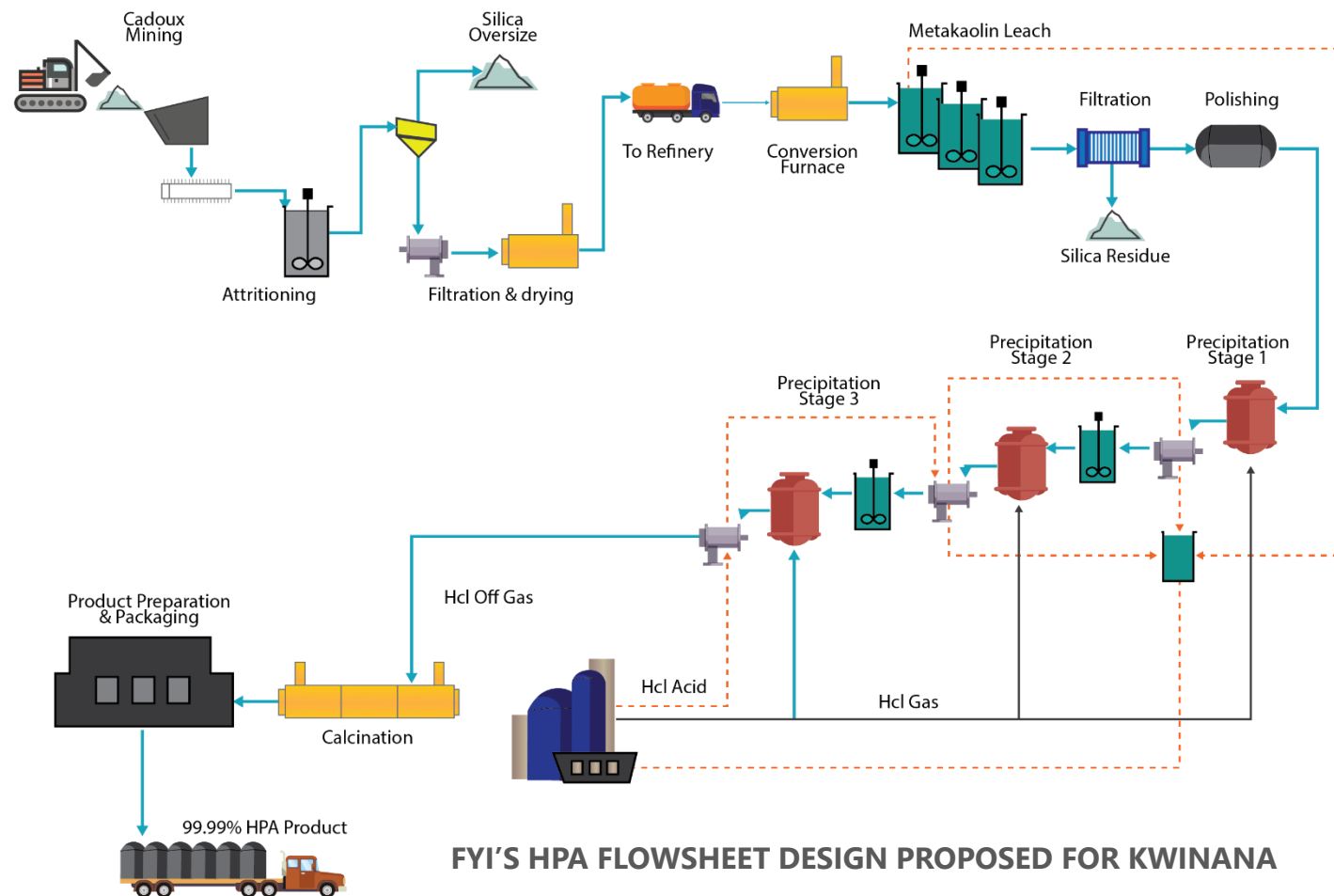
Successfully demonstrated high target grade and excellent recoveries



Low environmental footprint (non-toxic waste)



Processing plant planned for Kwinana's 'Battery Alley'



FYI'S HPA FLOWSHEET DESIGN PROPOSED FOR KWINANA

# OUTSTANDING PFS DELIVERED IN SEPTEMBER 2018

## MARKET LEADING PROJECT ECONOMICS

All-in NPV<sub>10</sub> of  
**US\$506m**

IRR of **46%**

Project payback of  
**3.6 years**

Lowest sector  
quartile opex  
**US\$6467/t** & capex  
of **US\$178m**

High Margin  
Project:  
**US\$17,533/t**

Lowest capital  
intensity of  
**US\$22,344/t**

# PILOT PLANT

DEMONSTRATING QUALITY HPA PRODUCT FOR END USERS / CUSTOMERS



Critical to commercialisation of process flowsheet and engineering design



Continuous and upscaled production



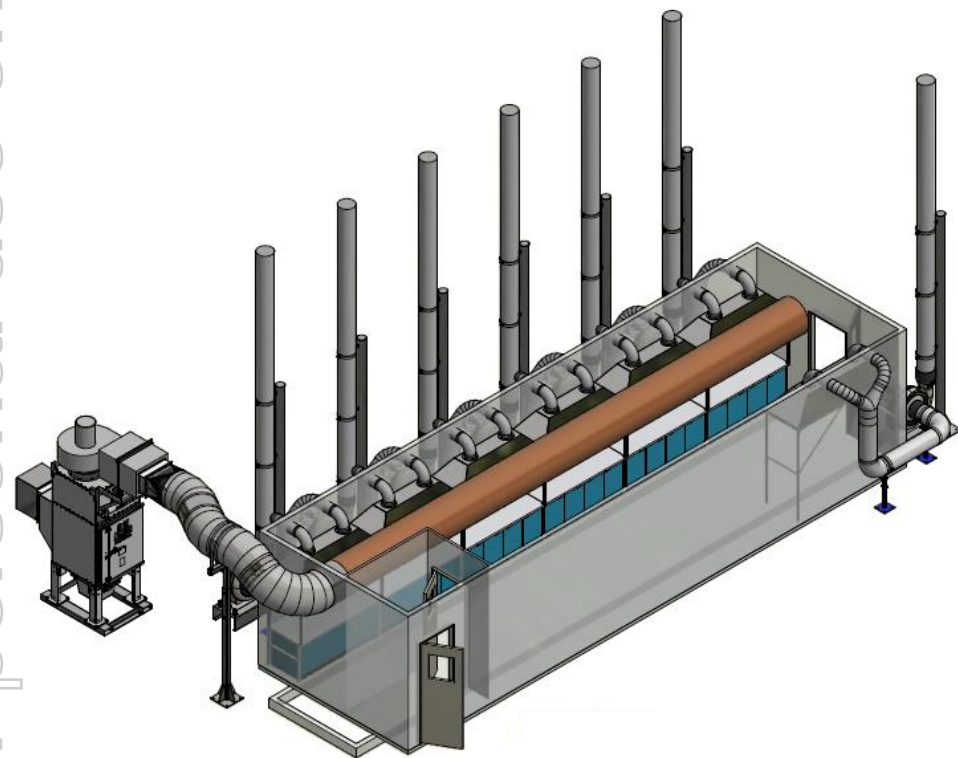
Important data discovery and development learning process and project de-risking



Essential step for project metrics and funding.

# FYI'S PILOT PLANT

## PROOF OF CONCEPT



Isometric design view



External view



Internal view



# STRONG FOCUS ON MARKET ENGAGEMENT

## FUNDING STRATEGY

FYI is examining a number of funding options to finance its future activities and development costs, including:

- Off-take
- Joint venture
- Cornerstone investor
- Project debt
- Equity
- Strategic investor



## FYI IS HEAVILY ENGAGED IN PRODUCT MARKETING AND OFF-TAKE

Strong focus on market engagement



Structured approach to achieving off-take and financing



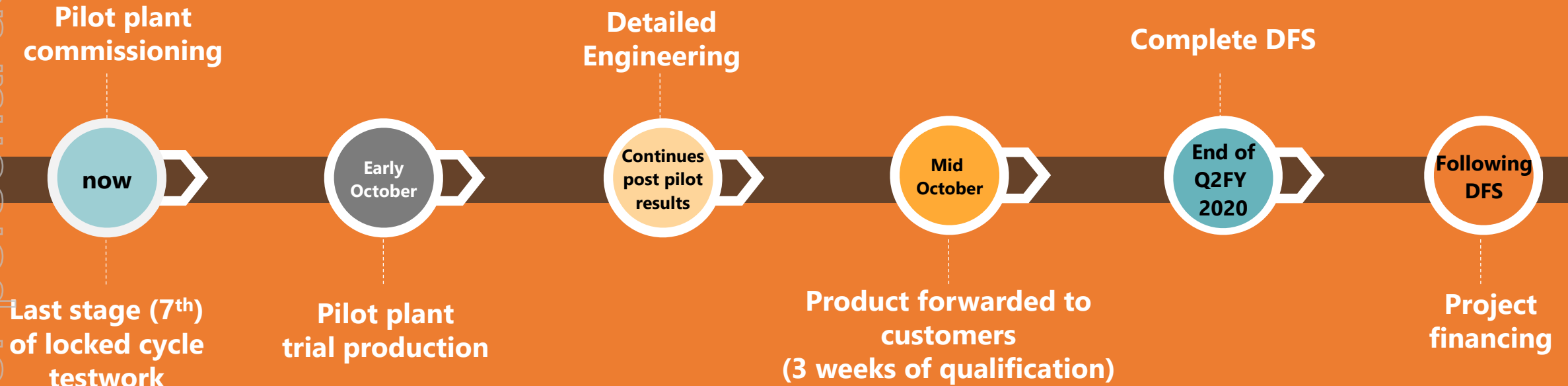
Multiple rounds of meetings conducted  
(China/South Korea/Japan)



HPA trial product to be shipped by request to market participants (HPA manufacturers, traders)

# KEY RE-RATING MILESTONES – 6 MONTHS DELIVERY

Progressing towards project development following an excellent PFS, project de-risking and finalising of a DFS.



## FYI SUMMARY



Robust HPA strategy founded on sound technical principles and project de-risking



Best-in-class project technicals with lowest quartile capex and opex



Innovative processing route delivering superior quality product



Compelling technical & geographical and business model advantages



Positive long-term market fundamentals



Expert study manager team and capabilities for successful project delivery



Argument for ideal project delivery timing coinciding with forecast market growth



Ground floor entry to an emerging growth sector with significant upside

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Resources Limited

# APPENDIX – PFS PROJECT ECONOMICS

| ITEM                                                   | UNIT                           | AMOUNT                             |
|--------------------------------------------------------|--------------------------------|------------------------------------|
| HPA production                                         | tpa                            | 8,000<br>(with capacity to expand) |
| Production grade                                       | Al <sub>2</sub> O <sub>3</sub> | > 99.99%                           |
| Capital cost                                           | US\$m                          | 178.8                              |
| Capital cost / t                                       | US\$/t                         | 22,344                             |
| Forecast average cost of production (C1)               | US\$/t                         | 6,467                              |
| Assumed HPA selling price / t                          | US\$/t                         | 24,000                             |
| Operating margin                                       | US\$/t                         | 17,533                             |
| Operating margin                                       | %                              | ~270                               |
| Exchange rate                                          | A\$:US\$                       | 0.75                               |
| Average annual EBITDA                                  | US\$m                          | 128                                |
| First phase of operations - total revenue (> 50 years) | US\$m                          | 11,376                             |
| First phase of operation - annual revenue              | US\$m                          | 190                                |
| Project NPV                                            | @10%                           | 506                                |
| Project IRR                                            | %                              | 46                                 |
| Project payback                                        | yrs                            | 3.6                                |