



High Purity Alumina

## **Strategy Progress Overview**

# What is HPA

- High purity alumina (**HPA**) is aluminum oxide ( $\text{Al}_2\text{O}_3$ ) powder with a purity equal to or greater than 99.99%
- HPA's properties include low-friction and high wear-resistance, hardness, thermal and electrical insulating ability, non-corrosive and broad chemical compatibility
- HPA is utilised extensively in applications such as:
  - light emitting diodes (**LEDs**)
  - Electric vehicle (EV) components
  - semiconductor wafers
  - sapphire glass for smart phones, television screens and watch faces
  - high-strength ceramic tools
  - space and aeronautics industry components
  - high tensile light weight fabrication applications
  - artificial gemstones (sapphires)
  - abrasives
  - fire-retardant insulation for electrical circuitry
  - battery technologies and energy storage



**HPA is a versatile material  
allowing a multitude of  
uses in new age industries**

# FYI'S HPA Strategy

- FYI's objective is to become one of the world's leading producers and suppliers of >99.99% HPA ( $\text{Al}_2\text{O}_3$ )
- To address the growing global demand for next generation high performance materials
- FYI's strategy is to own and control its HPA production chain from high quality feedstock through to processing, thus allowing FYI to meet the increasing quality and assurance demands of the market
- To meet the market's requirements through conventional chemistry but via a non-traditional IP processing route
- Our HPA process route should provide the following advantages over current conventional  $\text{Al}_2\text{O}_3$  production, including:
  - materially cheaper delivered feedstock
  - substantially lower capex & opex = improved economics
  - control of product chain and quality
  - lower energy requirement
  - less waste
  - lower overall environmental impact
  - ability to alter final product to meet market demand



**FYI's HPA strategy is to develop a vertically integrated business to address the forecast long term HPA shortfall**

# HPA Market

- Historically a small market – no justification for innovation
- Consistent, low-growth demand previously; new applications have created demand and new market opportunities
- The current global 4N (99.99%  $\text{Al}_2\text{O}_3$ ) HPA market demand is ~26k tpa; this is expected to increase to ~48k tpa by 2025
- Anticipated CAGR for HPA market is ~20.5%
- HPA is experiencing increasing demand due to its significance in today's high-performance electronic devices
- Major industry drivers include:
  - increasing environmental policies and awareness
  - phasing out of old and inefficient technologies (eg incandescent lighting and internal combustion engines)
  - burgeoning sustainable & clean technology industries (eg EV batteries)
  - providing assurance to manufacturers of a reliable and consistent supply of HPA

**FYI's HPA strategy is based upon positive market fundamentals**

## Al purity pricing scale



Smelter Grade Alumina  
99.5% Al

**US\$400/t**

**SGA**



Smelter Grade Aluminum  
99.9% Al

**US\$1600/t**

**SA**



High Purity Alumina  
99.9% Al

**US\$6000/t**

**HPA**

99.99%  $\text{Al}_2\text{O}_3$

**US\$23000/t**

**HPA**

99.999%  $\text{Al}_2\text{O}_3$

**US\$35000/t**

**HPA**

# What's Driving The HPA Market

- The market for HPA is witnessing dramatic growth
- HPA market forecast to be US\$4.49Bn by 2022\*
- Including a forecast volume growth of 20.5% CAGR\*
- Driven by a range of products (see page 1):
  - Stringent regulations
  - increasing penetration into traditional markets
  - Increasing per capita energy demand driving high specification energy efficient products
- LED & EV are the major drivers in the short term:
  - The EV battery market forecast to grow from US\$450Mn (2016) to US\$35Bn (2025)\*\*
  - The 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\*\*\*

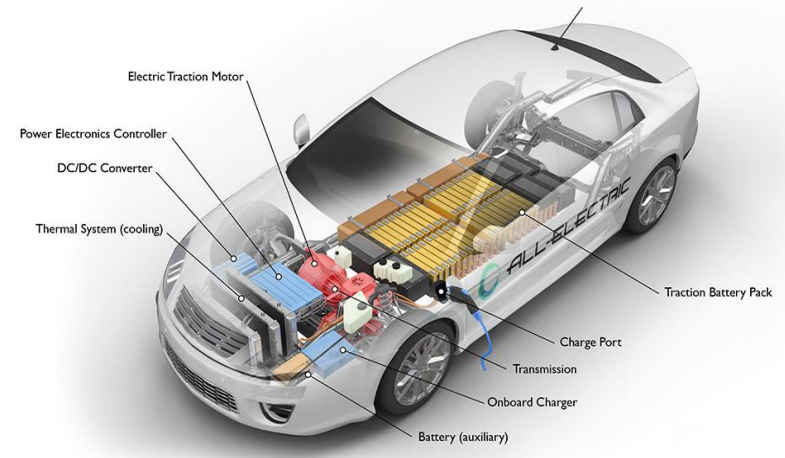
## References:

\* - Allied Market Research, World High Purity (HPA) – Opportunities and forecasts 2015-2022

\*\* - Goldman Sachs: Electric Vehicle Boom report, September 2017

\*\*\* - Zion Market Research LED Report

## Electric Vehicles (EV)

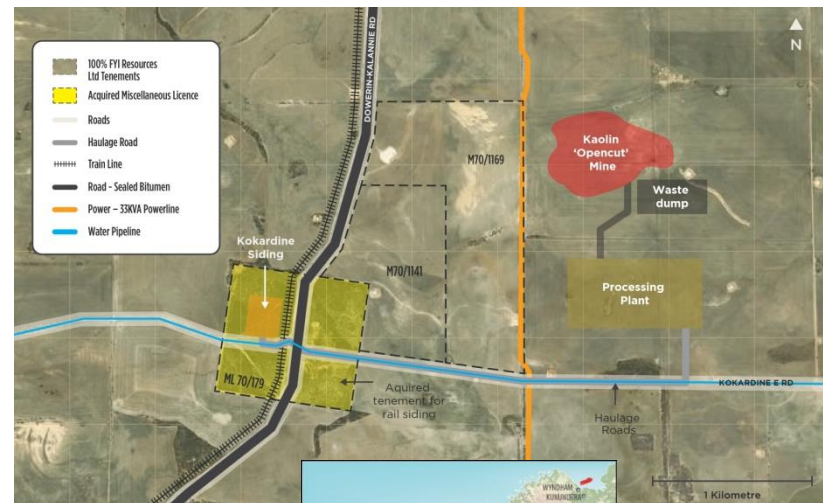


## Light Emitting Diode (LED)



# It All Starts With a Quality Resource

- Feedstock will be sourced from our 100% owned Cadoux Kaolin project (EL70/4673)
- Cadoux geology is ideal – shallow, flat lying, low strip, excellent quality & easily accessible
- The project area boasts excellent infrastructure:
  - 220kms from Perth
  - Major arterial sealed roads
  - Rail siding < 1km from site
  - Water, power and telephone services all on tenement boundary
- Cadoux contains over 50 years of high quality HPA feedstock



## Current JORC Resource (2012)\*

JORC (2012)	Tonnage (Mt)	%-45 Microns	Average Al%	Average Fe%	Average Ti%
Inferred Resource	16.1	84.4	11.76	0.36	0.25
<b>Total Resource</b>	<b>16.1</b>	<b>84.4</b>	<b>11.76</b>	<b>0.36</b>	<b>0.25</b>

**The Cadoux project is ideal quality feedstock for HPA**

\* See ASX Company announcement – 26<sup>th</sup> July 2017



# Confirmation of Process

- FYI's kaolin to HPA process flowsheet has been successfully demonstrated
- Targeted HPA of **99.99%** achieved\*
- High level of analysis used (laser ablation) to determine grade
- FYI's 100% owned Cadoux kaolin resource is ideally suited to our HPA process flowsheet
- Flowsheet design specifically engineered to Cadoux resource characteristics
- Process designed to enable consistent, high grade premium quality HPA product



*FYI's 99.99% final product HPA  
(laboratory photo)*

**The HPA process has been  
confirmed by demonstrating  
99.99% Al<sub>2</sub>O<sub>3</sub> recovery**

\* See ASX Company announcement – 23<sup>rd</sup> October 2017

# HPA processing

- FYI's kaolin HPA processing route has many advantages over the traditional bauxite derived HPA
- The traditional method of processing HPA is capex and opex intensive
- The FYI calcining / leaching process simplifies the flowsheet and reduces capex and opex in HPA production

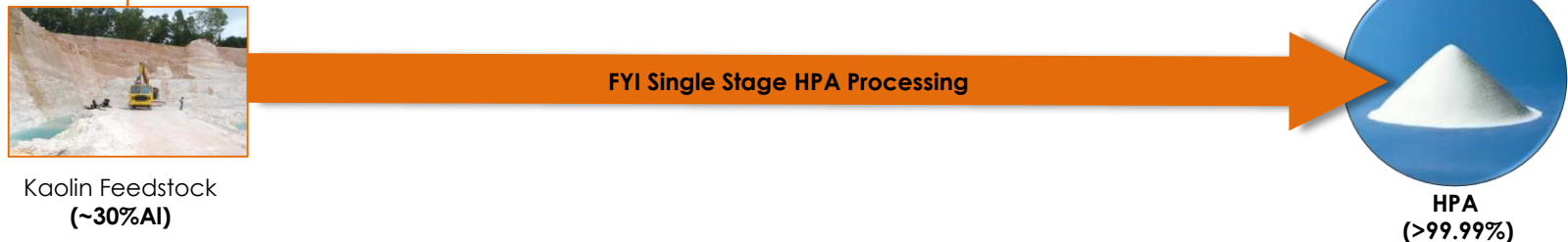
**The simplified HPA processing flow-sheet will provide immense commercial advantages**

## Simplified HPA Processing and Refining Pathways

### Traditional Route



### FYI Proposed Route





# FYI HPA Development

- FYI is developing its HPA project to meet forecast growth in market demand
- The development schedule is designed to support an integrated plant study and commercial production of 99.99% HPA
- Our continued test work will result in the optimising of the processing chemistry and simplification of process engineering and plant design
- Second stage studies are yet to be completed, however considerations for final development include:
  - development justification (economics and value return)
  - access and pricing of inputs
  - scale of throughput in relation to capex:opex optimisation
  - allowance for changes in market conditions & demand
  - project risk management & mitigation
  - project life cycle
  - project base lines: scope, schedules costs, revenues



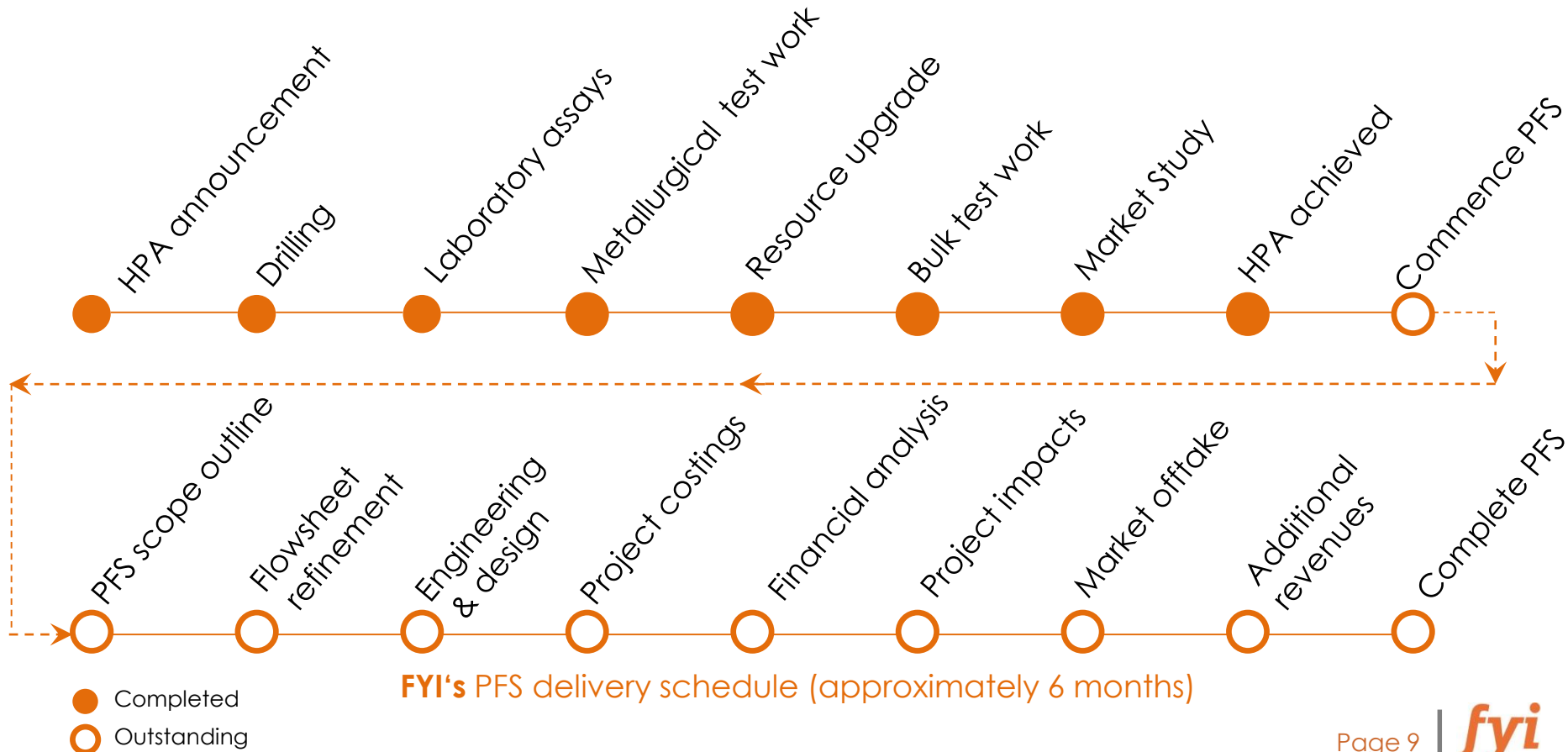
**FYI's HPA strategy is to address the forecast shortfall with a quality development**

# HPA Development Timeline

- FYI has an intensive development schedule

**FYI has a well defined development schedule leading to project delivery**

**FYI's** first six months development completed successfully



# Preliminary Project Metrics

- Current schedule of works is progressing to a Pre-Feasibility Study which will determine preliminary project metrics
- However, internal economic assessment has determined the following:
  - Capex & opex range – targeting lowest industry quartile
    - includes: mining, beneficiation and processing
  - sales range forecast – market
  - accelerated project payback anticipated
  - above average rate of return calculated long term
  - major production reactants and reagents are recycled
  - power requirement low in comparison to traditional HPA production
  - transport cost is minimal in comparison to product value
  - Low infrastructure spend expected (major items already established – i.e. road, rail, water, power etc)

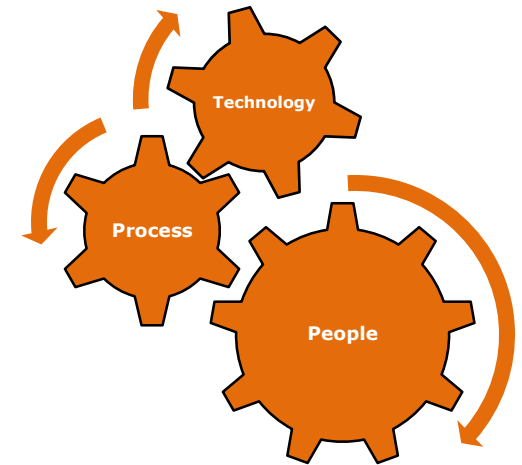


**FYI's HPA strategy offers considerable strong long term investment returns**

# FYI Capabilities

FYI's in-house capabilities include:

- includes first class management and technical team
- is accredited with multiple discoveries and project developments
- possesses a team with extensive operational experience
- has high calibre technical expertise – geological, metallurgical, hydrological, engineering
- dedicated HPA development team
- has assembled an accredited marketing team
- maintains a focused strategy and management
- has supportive long term shareholders that back the strategy



**FYI has the technical and operational capabilities to successfully develop the HPA strategy**

# Summary

- FYI's goal is to be a major HPA industry participant
- Proven top tier kaolin asset is the foundation of the strategy
- 99.99% Al<sub>2</sub>O<sub>3</sub> purity & high mass recovery achieved
- Industry supply and demand metrics are positive (short and long term)
- New and evolving technologies continue to drive HPA demand
- Preliminary evaluation studies suggest above average returns
- FYI management have appropriate skill set and capabilities to commercialise HPA
- Demonstrated HPA flowsheet
- Targeting 100% vertical control of production to market
- FYI is :
  - Progressing to feasibility studies
  - Targeting to be first quintile low cost producer
  - Capitalising on growth and demand in new and developing high tech industries



**2016 material consumption breakdown per application**  
(Excludes traditional watches, aerospace, defense, etc.)  
(Source: Sapphire Applications and Market 2016: LED and Consumer Electronics, September 2016, Yole Développement)



**FYI is extremely well positioned to successfully develop a world class HPA business**

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## **COMPETENT PERSON'S STATEMENT – CADOUX KAOLIN DEPOSIT**

The information in this release that relates to the Cadoux Mineral Resource is based upon information from the Company's announcement dated 8 May and 26 July 2017 and is available to view on the Company's website at [www.fyiresources.com.au](http://www.fyiresources.com.au). The information that relates to Mineral Resources is based on information compiled by Mr Andrew Kohler, a Competent Person who is a Member of the Australian Institute of Mining and Metallurgy. Mr Kohler is an employee of Strategic Resource Management, and consultant to the Company.

Mr Kohler has sufficient experience that is relevant to the style of mineralisation 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. The Mineral Resource estimate comply with recommendations in the Australian Code for Reporting of Mineral Resources and Ore Reserves (2012) by the Joint Ore Reserves Committee (JORC). Mr Kohler consents to the inclusion of the report in the form and context in which it appears. The Company confirms that it is not aware of any new information or data that materially affects the information included in the original market announcement and that all material assumptions and technical parameters underpinning the estimates in the relevant market announcement continue to apply and have not materially changed.

## **COMPETENT PERSON'S STATEMENT – METALLURGY**

The information in this release 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). 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).

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 (The JORC Code). Mr Evans consents to the inclusion of the report in the form and context in which it appears. 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 dated 5 September and 23 October 2017 and that all material assumptions and technical parameters underpinning the findings in the relevant market announcement continue to apply and have not materially changed.

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