

Alpha **HPA**  
ABN 79 106 879 690

**ALPHA HPA LTD (ASX: A4N)**

# **HPA FIRST PROJECT**

**LOW-COST HIGH PURITY ALUMINA (HPA) PRODUCTION TECHNOLOGY FOR  
THE BURGEONING ELECTRIC VEHICLE (EV) BATTERY & LED MARKETS**

**INVESTOR PRESENTATION  
OCTOBER 2019**

# Forward Looking and Cautionary Statements



Alpha HPA

## Cautionary Statement

The Pre-Feasibility Study (PFS) referred to in this announcement has been undertaken to assess the technical and financial viability of the HPA First Project. Further evaluation work including a Definitive Feasibility Study (DFS) is required before the Company will be in a position to provide any assurance of an economic development case. The PFS is based on the material assumptions described in the body of this report and summarised in the Summary of Material Assumptions and Summary of Modifying Factors in **Appendix 5**. These include assumptions about the availability of funding and the pricing received for HPA. While the Company considers all of the material assumptions to be based on reasonable grounds, there is no certainty that they will prove to be correct or that the range of outcomes indicated by this PFS will be achieved. To achieve the range of outcomes indicated in the PFS, Pre-Production Capital funding in the order of A\$198 million plus working capital will likely be required. Investors should note that there is no certainty that the Company will be able to raise the amount of funding when needed. It is also possible that such funding may only be available on terms that may be dilutive to or otherwise affect the value of the Company's existing shares. It is also possible that the Company could pursue other "value realisation" strategies such as a sale, partial sale or joint venture of the Project. If it does, this could materially reduce the Company's proportionate ownership of the Project. Given the uncertainties involved, investors should not make any investment decisions based solely on the results of the PFS. The Company confirms that all material assumptions underpinning the updated PFS released in March 2019 continue to apply and have not materially changed.

## Forward Looking Statements

This PFS contains certain forward-looking statements with respect to the financial condition, results of operations, and business of the Company and certain plans and objectives of the management of the Company. These forward-looking statements involve known and unknown risks, uncertainties and other factors which are subject to change without notice, and may involve significant elements of subjective judgement and assumptions as to future events which may or may not occur. Forward-looking statements are provided as a general guide only and there can be no assurance that actual outcomes will not differ materially from these statements. Neither the Company, nor any other person, gives any representation, warranty, assurance or guarantee that the occurrence of the events expressed or implied in any forward-looking statement will actually occur. In particular, those forward-looking statements are subject to significant uncertainties and contingencies, many of which are outside the control of the Company. A number of important factors could cause actual results or performance to differ materially from the forward looking statements. Investors should consider the forward looking statements contained in this PFS in light of those disclosures.

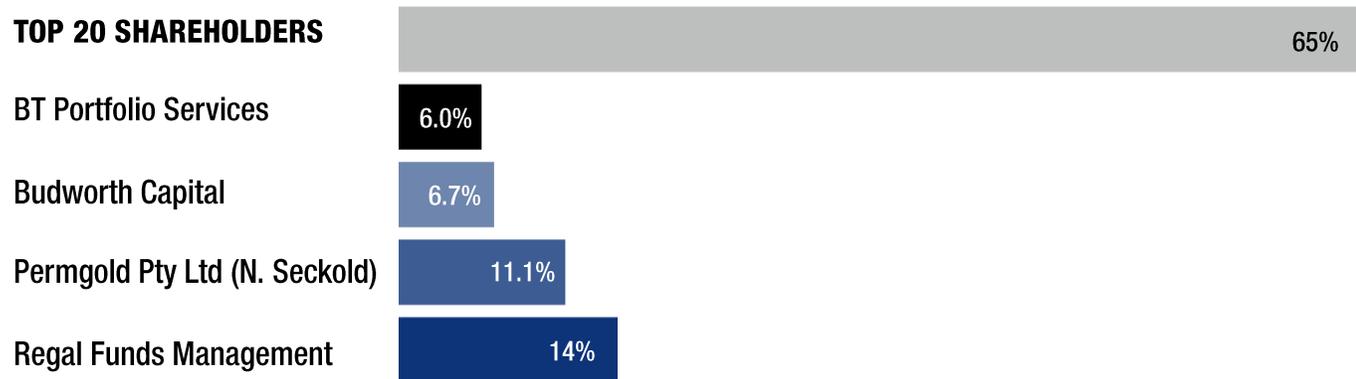
# Corporate Snapshot



Alpha HPA

## SHAREHOLDERS

### TOP 20 SHAREHOLDERS



### RECENT HIGHLIGHTS



## PFS



## DFS

First HPA production using the HPA First process  
**99.994%**

HPA First Pre-Feasibility Study Completed Nov 2018 Updated Feb 2019

HPA First Pilot Plant Commenced July 2019

Reagent Sale By-Product Offtake Agreement & Project Location

First HPA Offtake Agreements

HPA First Definitive Feasibility Study Dec 2019

# Corporate Snapshot



Alpha HPA

## TRADING INFORMATION

ASX CODE	A4N
Share Price (9-Oct-19)	18c
52 week trading range	8.2c – 18.0c
Issued Shares	609.1M

## CAPITAL STRUCTURE

Issued Shares	609.1M
Unlisted options (@10c)	23.0M (expire 31 October 2019)
Unlisted options (@15c)	12.0M (expire 31 October 2020)
Unlisted options (@20c)	10.0M (expire 31 July 2022)
Market Cap	\$109.6M
Est Cash (01-Oct-19)	\$3.4M
Enterprise Value	\$106.2M

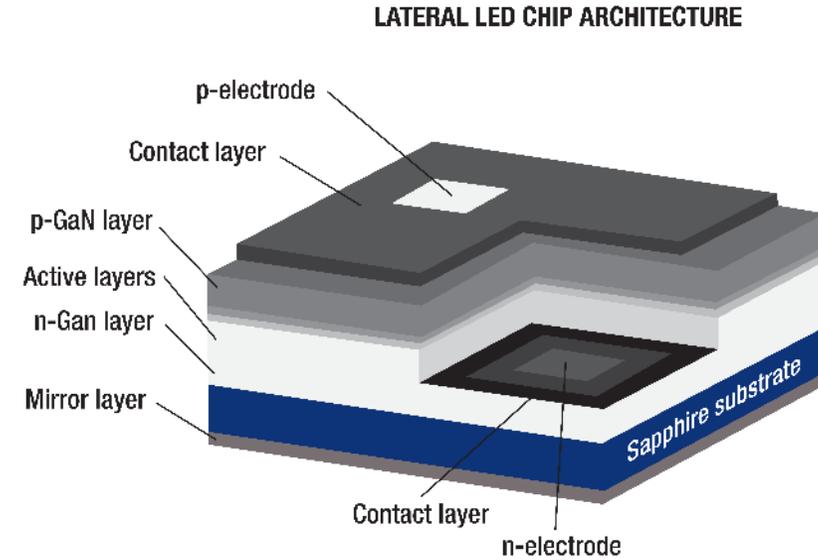
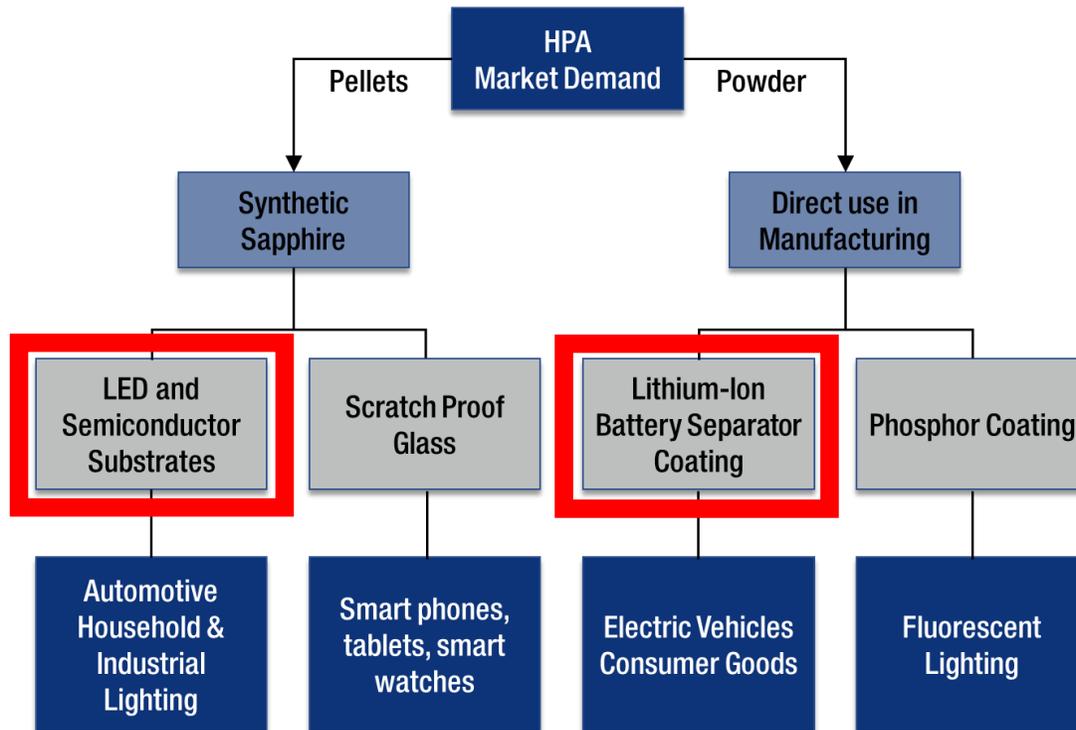
## SHARE PRICE PERFORMANCE



# High Purity Alumina (HPA) Market

HPA demand dominated by:

- LED market (for sapphire substrates)
- Coatings for Lithium-Ion Batteries (LiB's)



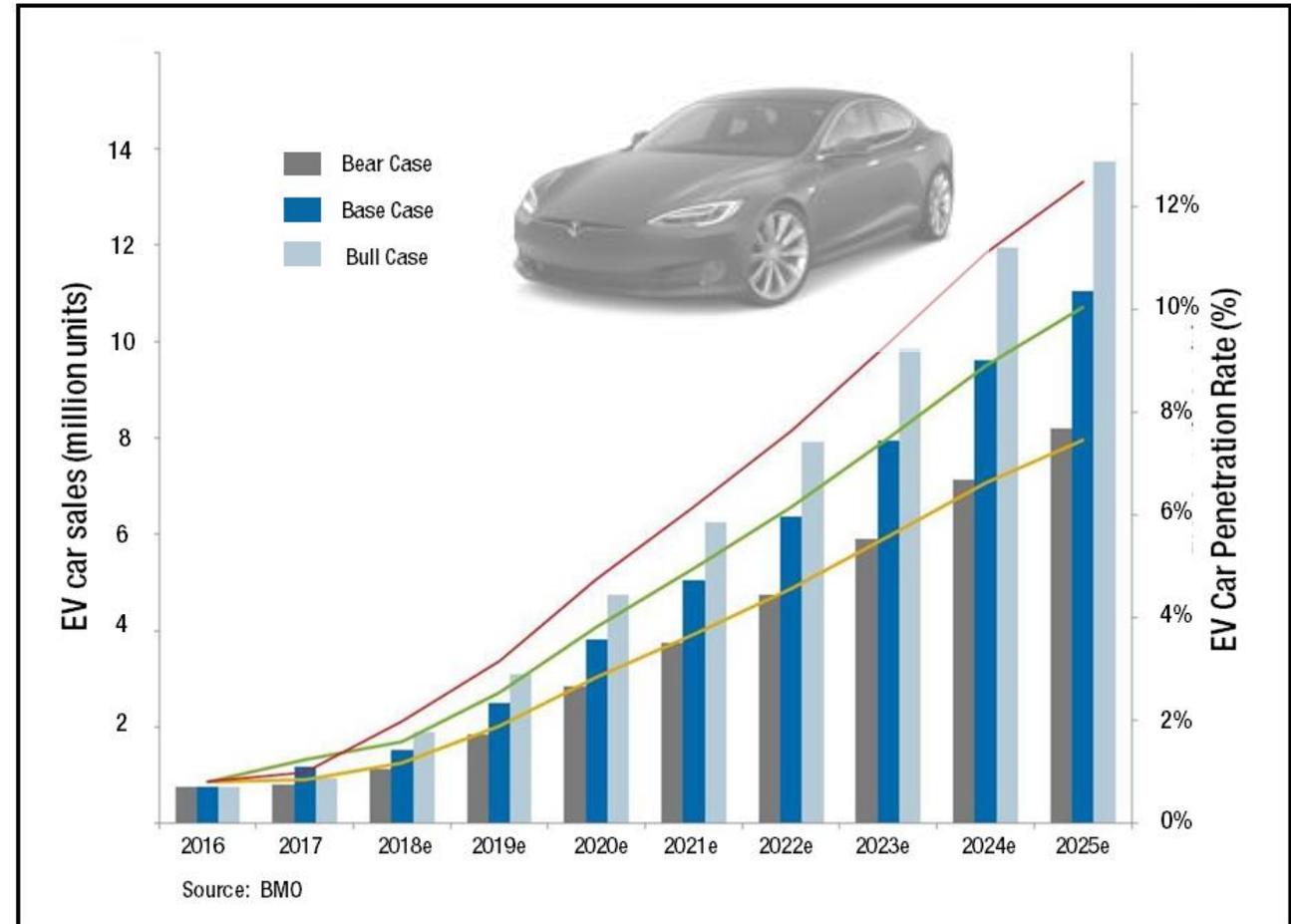
# Global Transportation is Electrifying



Alpha HPA

- The Electric Vehicle (EV) revolution has arrived, underpinned by Government mandated EV targets, led by China and Europe
- 'de-carbonisation' a key investment mega-trend for the decade to 2030
- 70 lithium ion battery mega-factories under construction across four continents to meet EV demand
- Attendant demand for battery materials, lithium, graphite, cobalt, nickel and **High Purity Alumina (HPA)**

## Dramatic EV penetration rates – driven by Govt Regulation

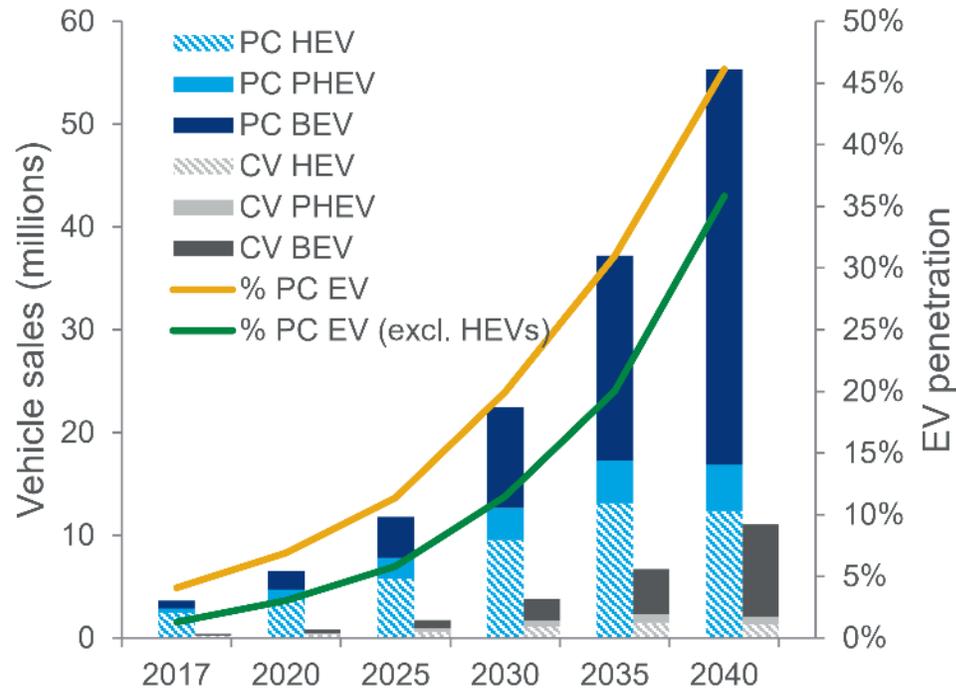


# Global Transportation is Electrifying

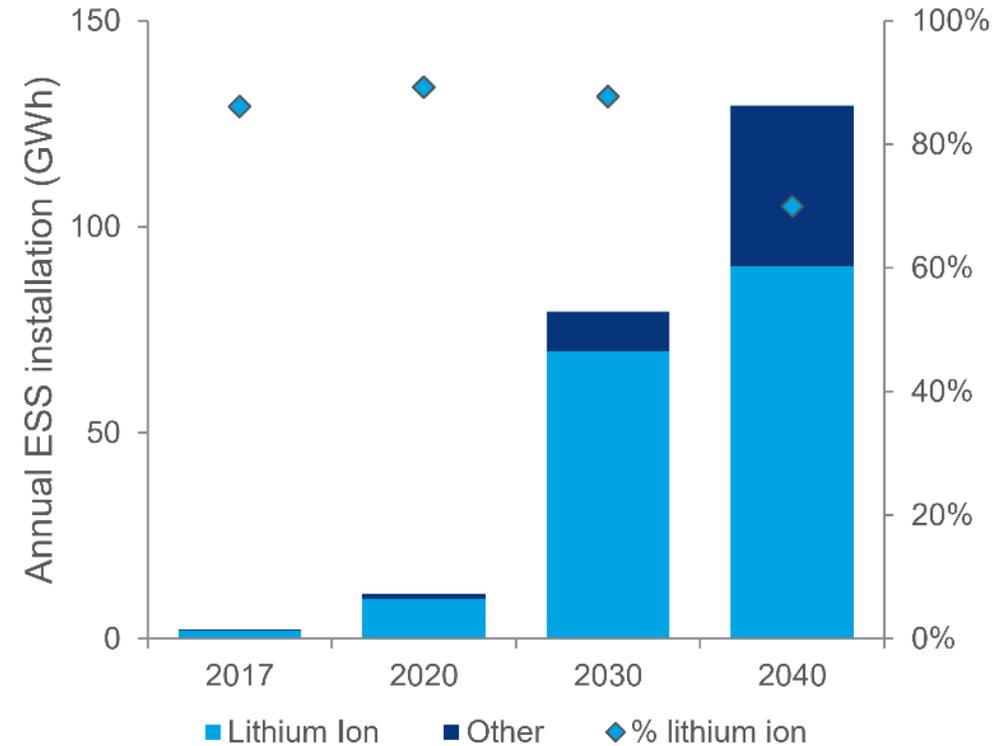


Alpha HPA

## Passenger car (PC) and commercial vehicle (CV) EV sales forecast



## Global ESS installations (GWh)



ESS = Energy Storage Systems  
Source: Wood Mackenzie

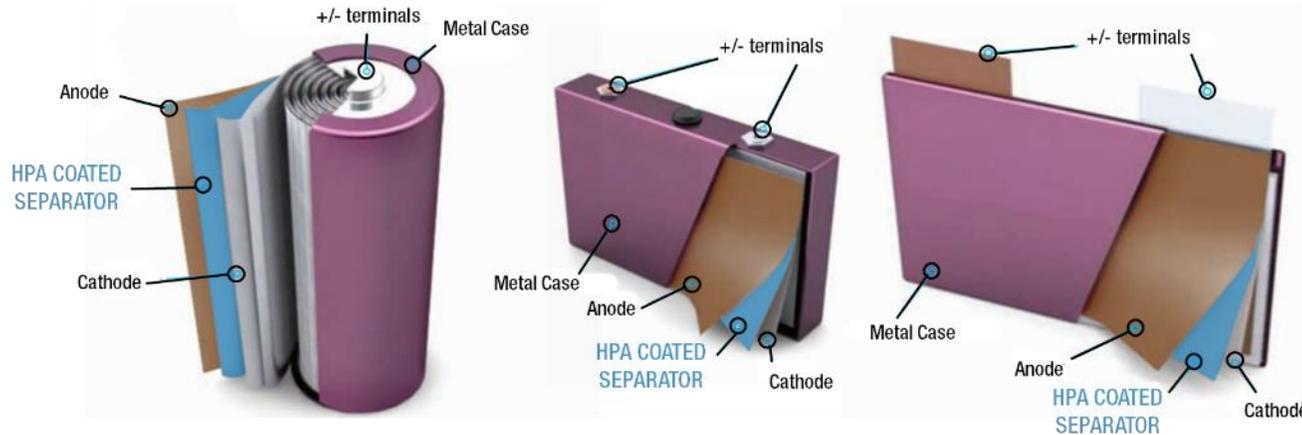
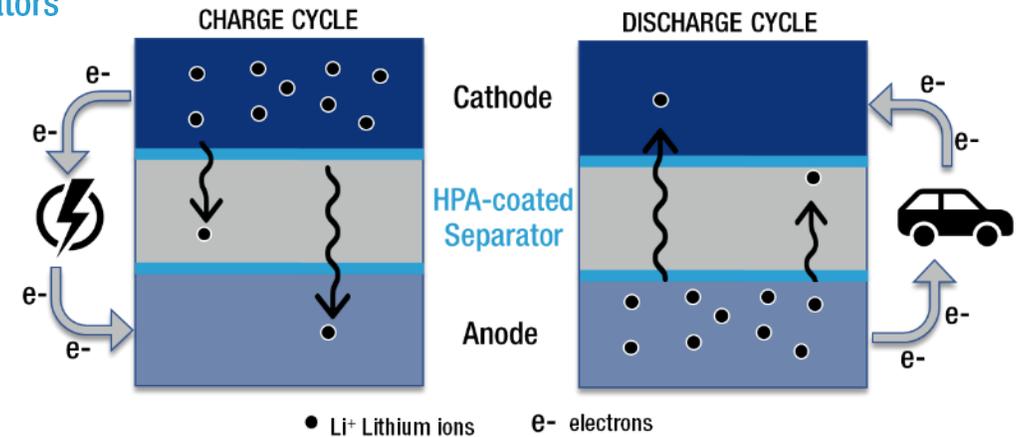
# HPA – A critical part of the EV/battery revolution



Alpha HPA

## LITHIUM-ION BATTERY SEPARATORS

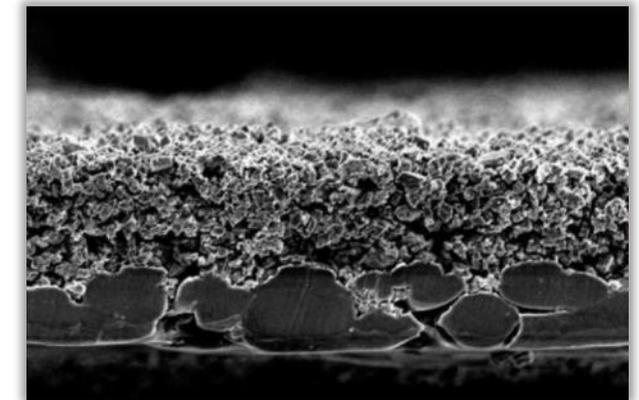
- High Purity Alumina (HPA) is the pure form of aluminium oxide ( $Al_2O_3$ ). HPA is a pre-cursor material for the manufacture of ceramic coated Lithium-Ion-Battery (Li-B) separators
- Ceramic (HPA) coated separators and/or ceramic coated electrodes are a key safety and performance element for the high-temperature EV batteries
- Ceramic (HPA) coating provides thermal stability whilst allowing ionic exchange
- Ceramic (HPA) coating of electrodes now a key Li-B trend, connected to reduced cobalt cathode chemistry
- Purity a critical requirement to prevent battery ageing



Ceramic (HPA) Coating



Separator (usually Polyolefin)

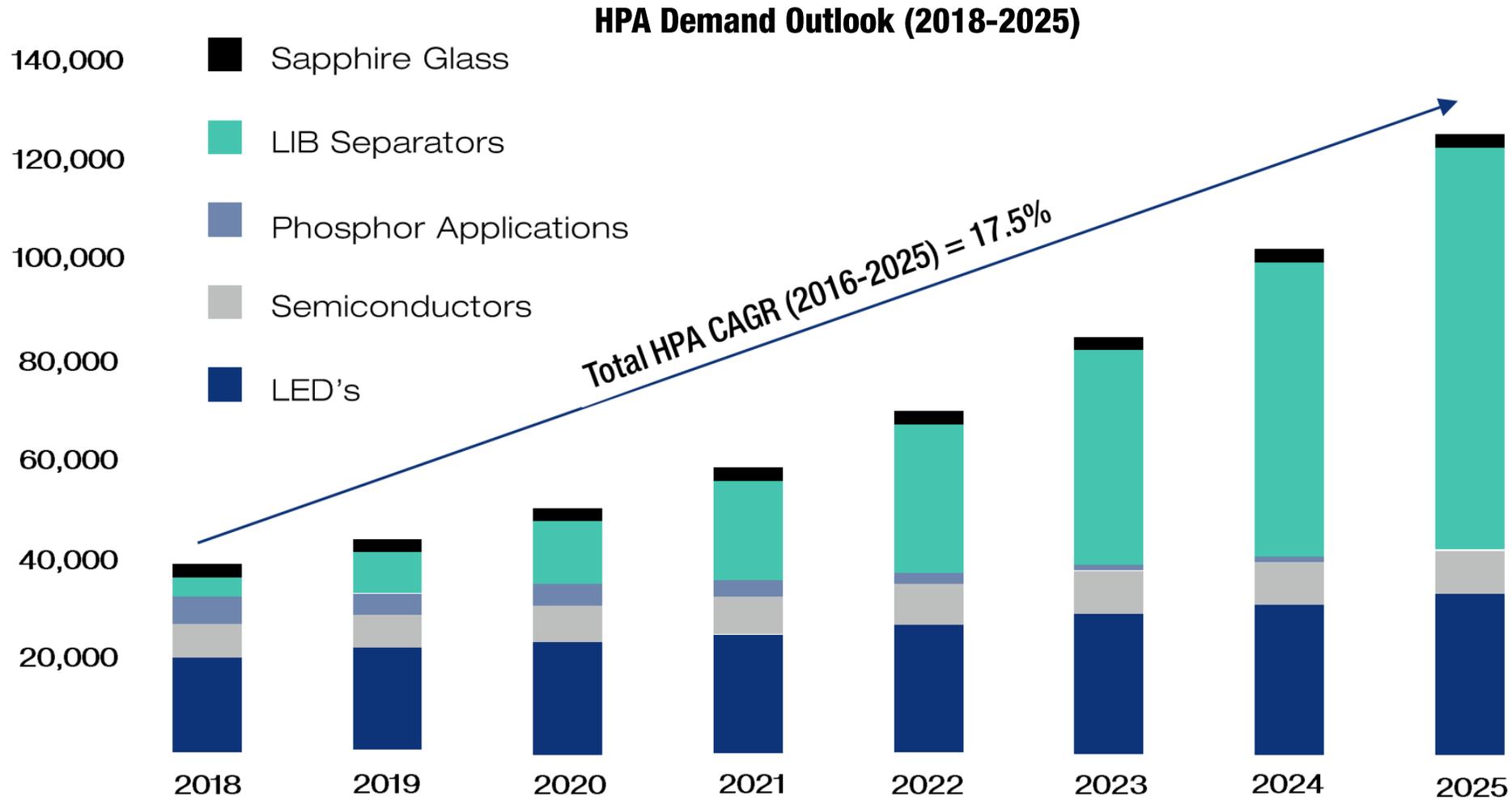


SEM Image – Ceramic Coated Separator

# HPA Demand 1:1 linked with the Battery Boom



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Source: CRU (2018)

# High Purity Alumina (HPA) – Price for Purity



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- HPA's value derives from its physical properties of extreme hardness, high thermal conductivity, and being chemically inert
- Purity is determined by the concentration of trace elements in the alumina compound e.g. iron, magnesium, sodium
- Price and performance of HPA varies upon product density, crystal structure, particle size and distribution and degree of purity

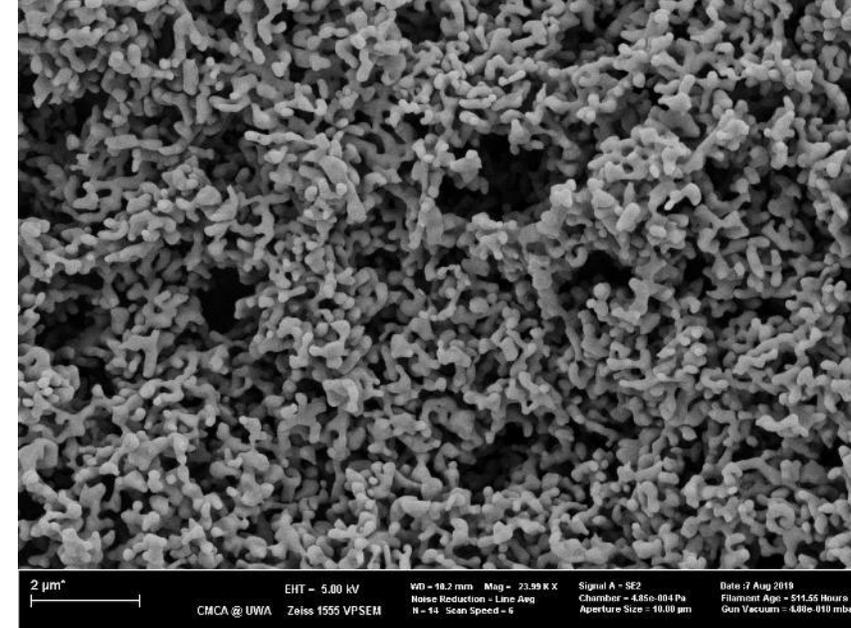
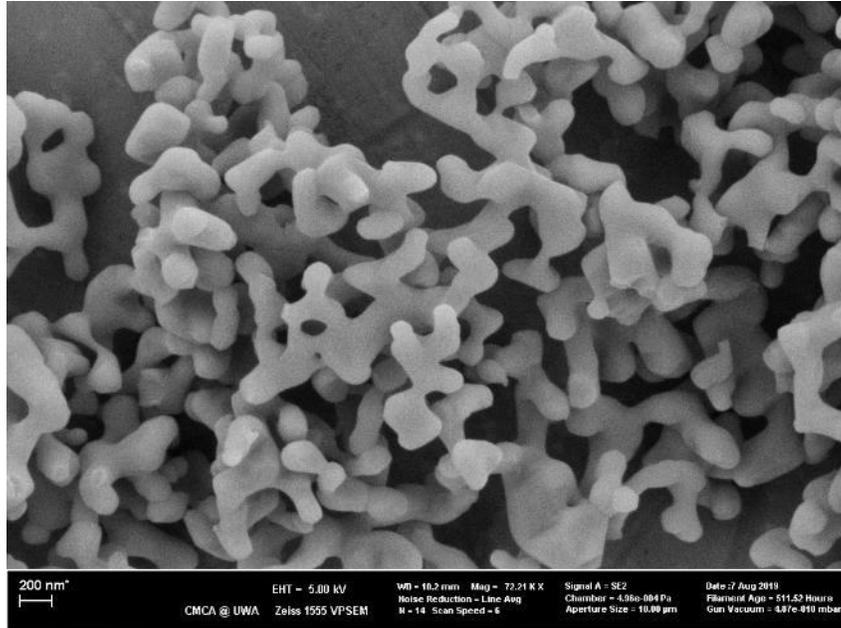
## PRICE FOR PURITY

SGA	99.5% purity	~US\$400/t
3N HPA	99.9% purity	~US\$5,000-15,000/t
4N HPA	99.99% purity	~US\$15,000-30,000/t
5N HPA	99.999% purity	~US\$30,000-50,000/t
6N HPA	99.9999% purity	By negotiation in a very limited market.

4N HPA is the largest sector of the HPA market and is seen by Alpha HPA as the most logical sector of the market in which to focus in terms of demand volumes and margin optimisation

Source: CRU and Alpha HPA

# HPA – Physical Specifications & Morphology



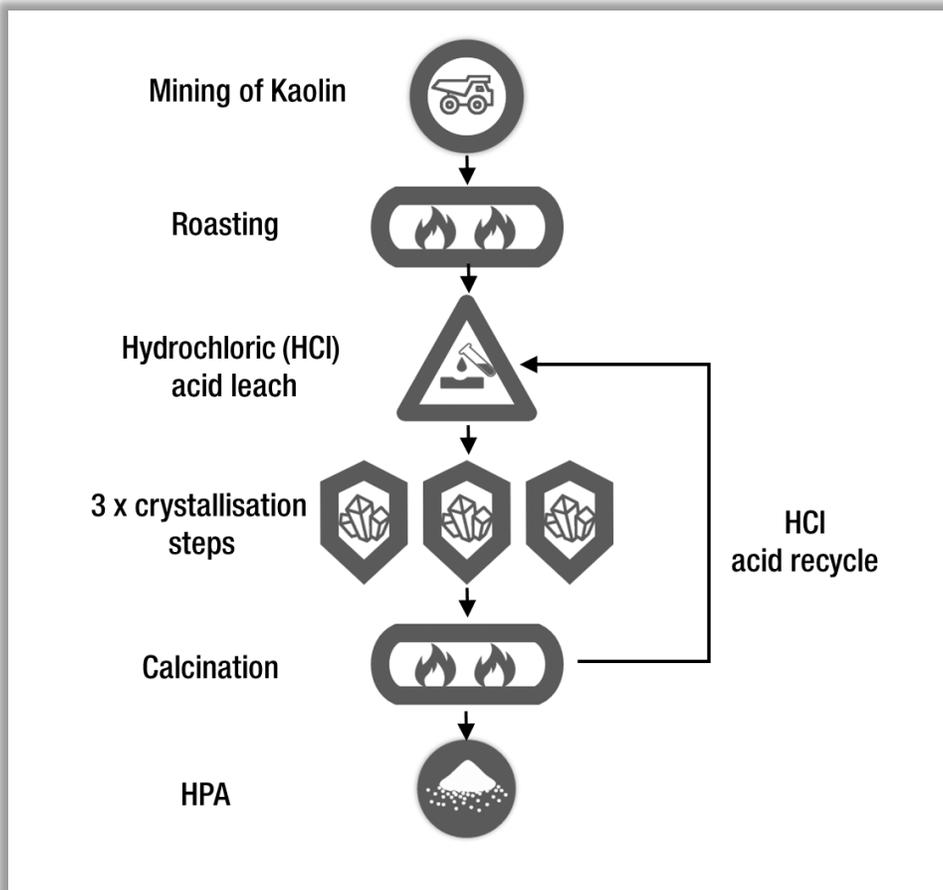
- SEM shows the primary  $\alpha$ -HPA particles are in rod-like shape and roughly 500 nm (0.5 $\mu$ m) in size.
- Particle size can be adjusted to suit customer requirements
- Particle size distribution (PSD) target below

P10%	P50%	P90%
<0.4 $\mu$ m	<0.5 $\mu$ m	<2.0 $\mu$ m

# Existing HPA Market Production Processes

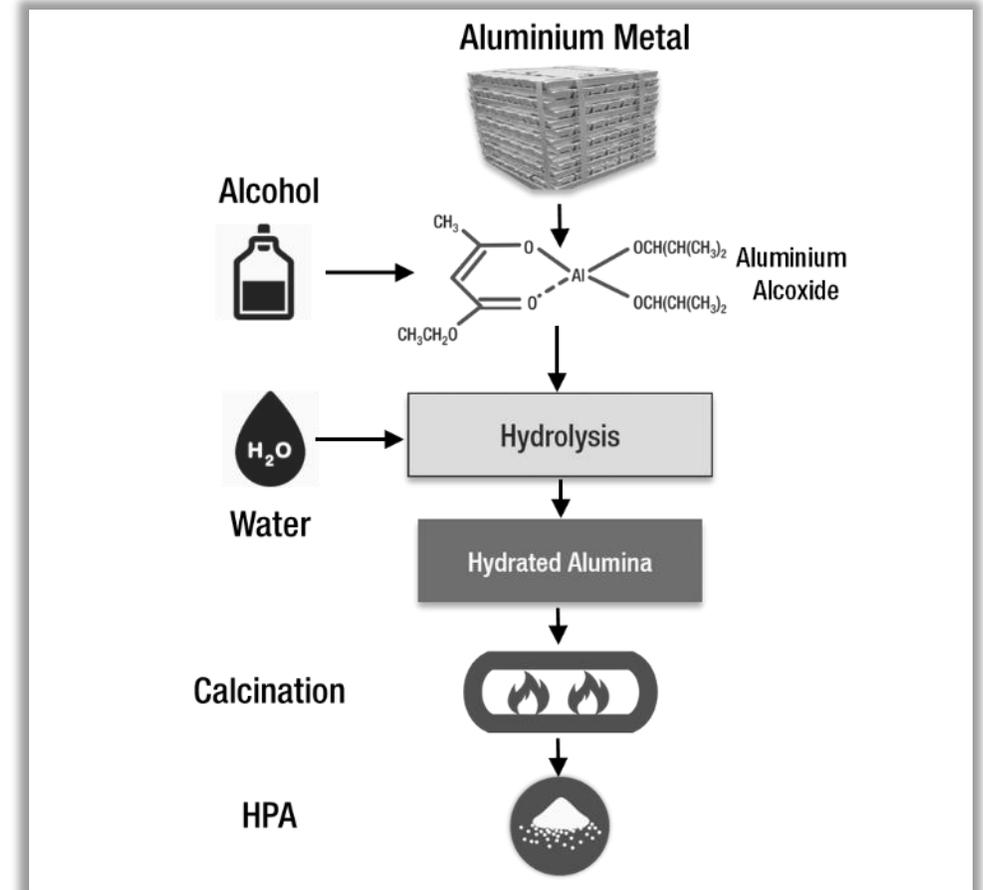
Existing HPA production is synthesised from Aluminium metal feedstock or produced from hydrochloric acid leach of kaolin clay.

### HPA from kaolin – schematic flow sheet



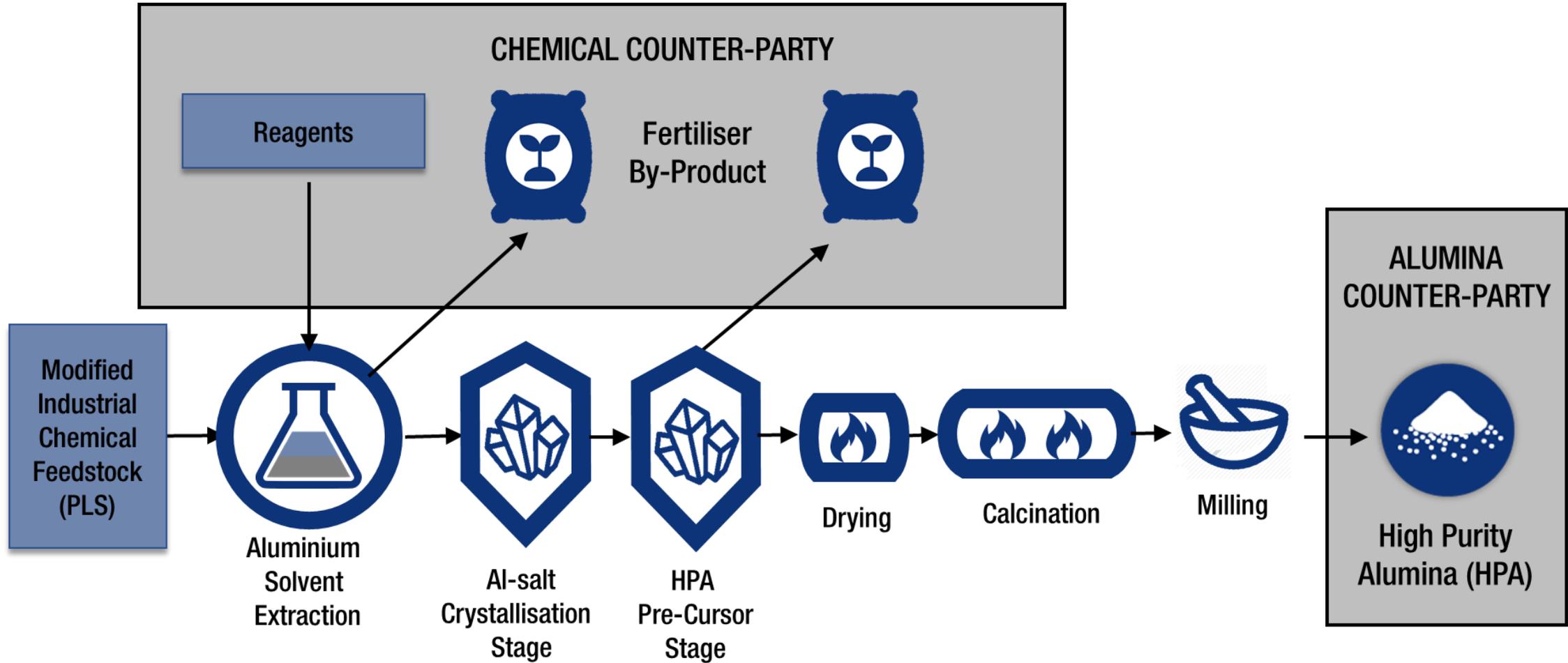
Source: various company and technical presentations

### HPA from Al metal – schematic flow sheet



Source: Sumitomo Chemicals

# HPA First - Process technology based on established SX process

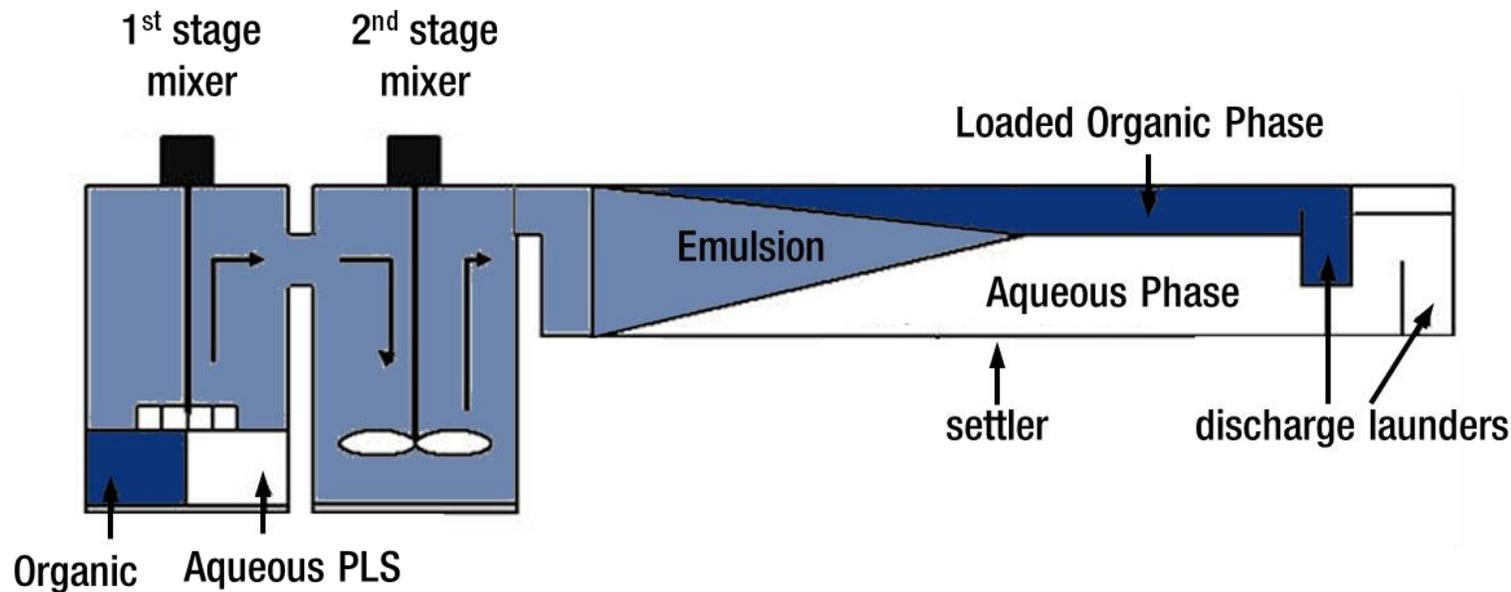




Alpha HPA

# HPA Process technology based on established SX process

- Alpha HPA holds an Australian, proprietary process approach to HPA production – including by-product credits – producing HPA from an aluminium chemical feedstock
- Based on established Solvent Extraction (SX) Process (SX accounts for ~25% of global copper production)
- Highly selective process delivers HPA purity
- Atmospheric wet chemical process – no high-risk pressure vessels



Copper SX Plant - Chile

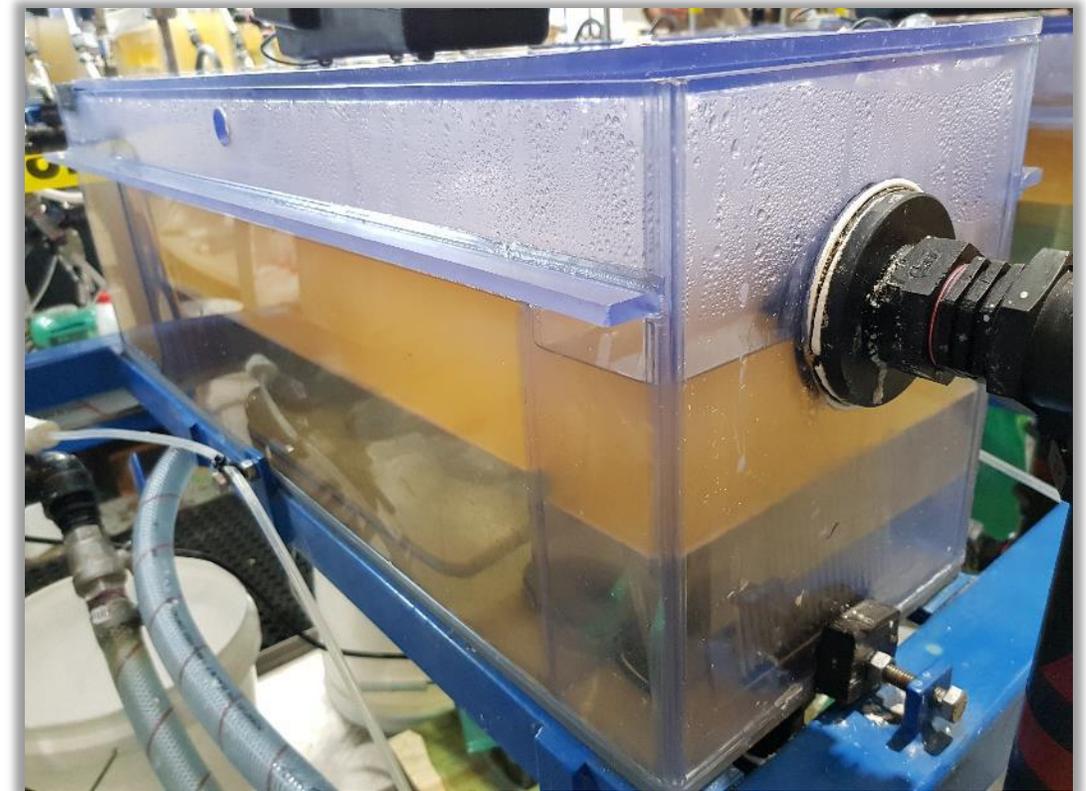
# HPA Process technology based on established SX process



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SX Pilot in Operation



Mixer-Settler cell - Pilot Plant SX

# 'HPA First' – Pre-Feasibility Study – Updated Feb '19



Alpha HPA

- The 'HPA First' PFS has delivered a compelling business case, capable of delivering 10,200tpa of 4N (99.99% purity) High-Purity Alumina (HPA) into the burgeoning HPA market
- PFS Highlights include:
  - Production rate of **10,200tpa** HPA
  - Unit cash costs of A\$6,830 (**US\$5,123**)/t HPA after by-product credits
  - Annual pre-tax free cash flow (FCF) of A\$265M (**US\$199M**)\*
  - Project CapEx of A\$198M (US\$149M)
  - Capital Intensity of A\$19,417 (US\$14,563) per tonne of HPA
  - Sensitivity Analysis shows a strongly profitable project at HPA prices as low at US\$10,000/t
- Compelling financials achievable by commercialising the Company's innovative, proprietary process flow sheet
- The Company is now completing the Pilot Plant and Definitive Feasibility Study (DFS) to position the Company to make a Final Investment Decision (FID)

\* Assumes HPA Pricing of USD\$25,000/tonne

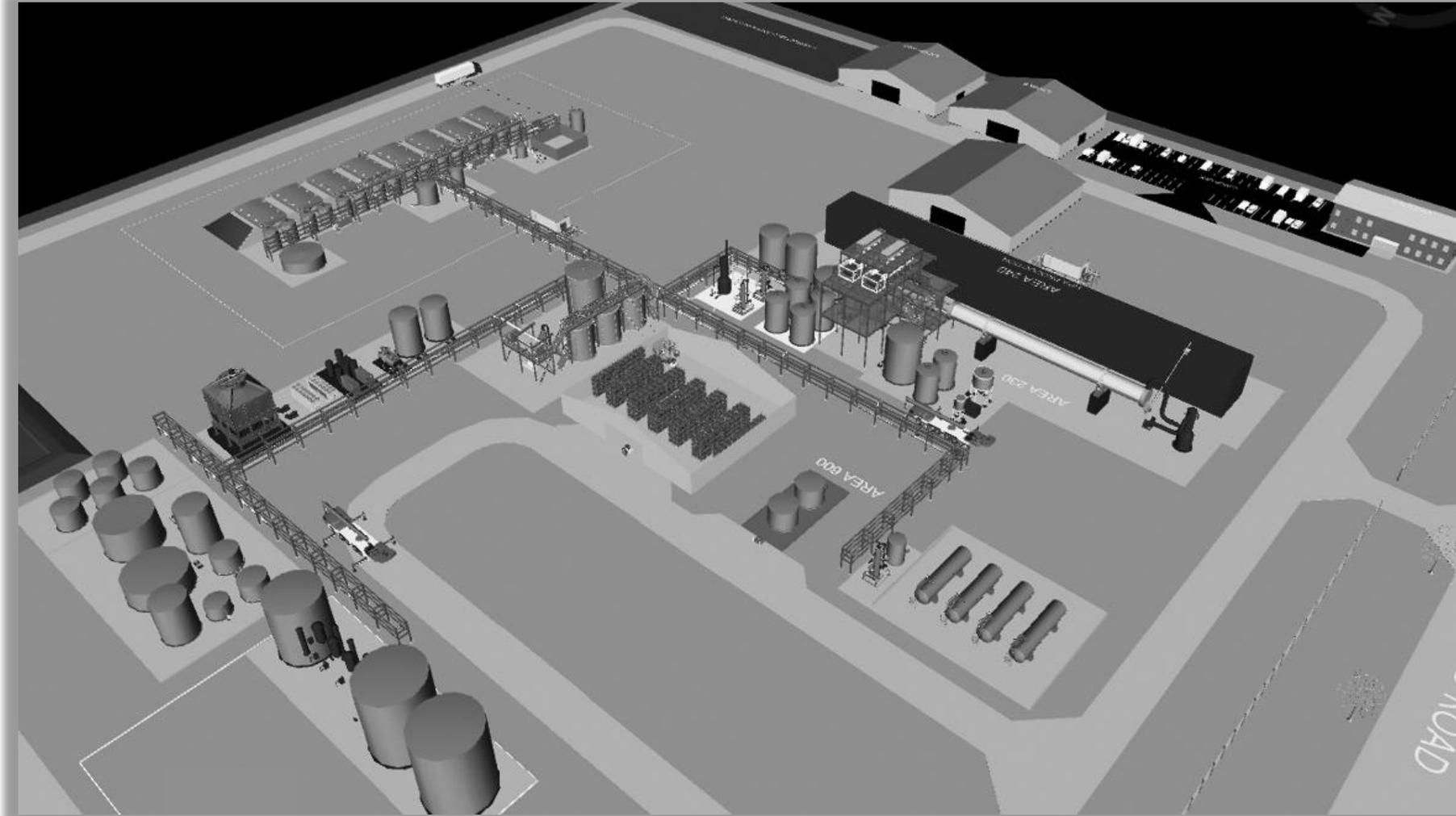
# 'HPA First' – Key Financial Metrics



Alpha HPA

	A\$	US\$
HPA Production (t/y)	10,200	
HPA Price Assumption (per/t HPA)	\$33,333	\$25,000
Annual Revenue (including by-products)	\$413 million	\$310 million
Annual Average Cash Operating Cost	\$143 million	\$107.5 million
Unit Cash Cost accounting for by-products (per/t HPA)	\$6,830	\$5,123
<b>Annual Free Cash Flow (FCF)</b>	<b>\$247 million</b>	<b>\$185 million</b>
Annual EBITDA	\$265 million	\$199 million
Aluminium Feedstock Processed (t/y)	20,400	
Capital Cost Estimate	\$198 million	\$149 million
Capital Intensity (CapEx\$ per tpa HPA)	\$19,417	\$14,563
Payback (years)	Less than 2 years	

# Indicative Project Layout

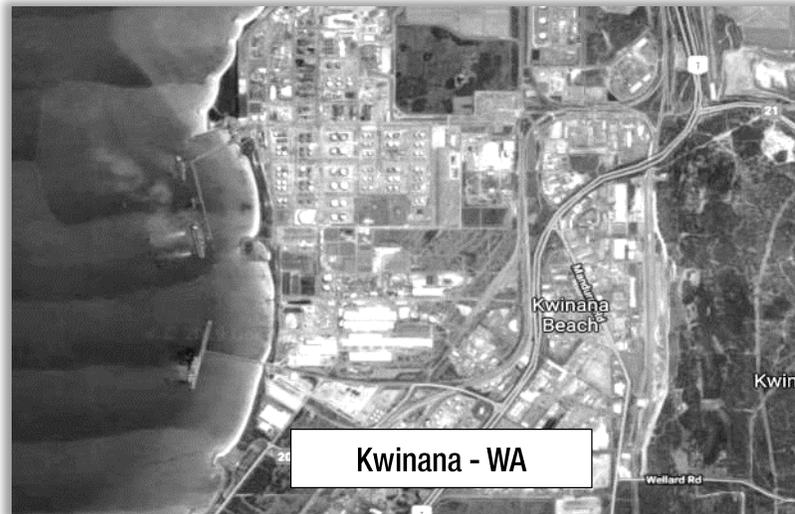


Alpha HPA



# Site Selection: Strategic Options

- The 'HPA First' process allows for the **discretionary location of an HPA Plant** within an existing industrial zone offering highly favourable logistics
- Gladstone SDA (QLD), Kwinana (WA) and Newcastle Port (NSW) offer industrial processing facilities, extensive infrastructure and an appropriately skilled workforce to construct and support the HPA Plant
- Each area has large bulk and container port facilities to utilise for the import of feed materials, key equipment and export of HPA product
- Each area is strategically located near likely suppliers of key reagents and by-product offtake partners
- Final site selection due Sept Qtr 2019 – **conditional on Chemical Counter Party**



# Board & Management



Alpha HPA



**Norman Seckold**  
Chairman

40+ years in the full time management of natural resource companies. Past Chairman and Director of listed companies including Bolnisi Gold NL, Timberline Minerals Inc., Perseverance Corporation Limited, Valdora Minerals NL, Palmarejo Silver and Gold Corp. and Cockatoo Coal Limited. Currently Chairman of Santana Minerals Limited and Sky Metals Limited and Deputy Chairman of Nickel Mines Limited.



**Rimas Kairaitis**  
Managing Director

20+ years experience in minerals exploration and resource development in gold, base metals and industrial minerals. Led the geological field teams to the discovery of the Tomingley and McPhillamy's gold deposits in NSW and steered the Hera gold-lead-zinc Project from discovery through to successful commissioning and commercial production. Previously founding Managing Director and CEO of ASX-listed Aurelia Metals.



**Peter Nightingale**  
Director and CFO

30+ years as a Director or Company Secretary for a range of resource companies including Pangea Resources Limited, Timberline Minerals Inc., Perseverance Corporation Limited, Valdora Minerals NL, Mogul Mining NL, Bolnisi Gold NL and Cockatoo Coal Limited. Currently a Director Nickel Mines Limited and unlisted Prospech Limited.



**Justin Werner**  
Non-Executive Director

20+ years' mining and management experience. Previously consulted to a number of blue chip mining companies including BHP, Rio Tinto and Freeport McMoran. Successful track record of mine discovery and development. Currently Managing Director of Nickel Mines Limited.



**Tony Sgro**  
Non-Executive Director

Chemical Engineer with 45+ years' senior management experience in the supply of specialised equipment to the process industries with an emphasis on mining and oil & gas. Co-founder, Director and General Manager of Kelair Pumps for 36 years.



**Martin Kaderavek**  
COO

Chemical engineer with 25+ years' experience in complex process plant design, procurement / fabrication, construction, commissioning, operations and maintenance management across a variety of chemical plants across Australia, New Zealand and SE Asia.

# Indicative Project Delivery Timetable



Alpha HPA

- Pilot-plant operation and DFS completion targeted for CY19 ahead of project construction starting CY20

Task	From	To	MarQ	JunQ	SepQ	DecQ												
<b>PRE-CONSTRUCTION</b>																		
<b>Pilot Plant + DFS</b>	1/03/19	31/12/19		■	■	■												
<b>EIS</b>	01/14/2019	31/03/20		■	■	■	■											
<b>Regulatory Approvals</b>	1/01/19	31/03/20			■	■	■	■										
<b>Strategic Supply &amp; Offtake</b>	1/01/19	31/12/19	■	■	■	■												
<b>Financing</b>	10/06/19	31/12/19		■	■	■	■											
<b>PROCESS PLANT</b>																		
<b>Establishment</b>	1/01/20	31/03/20					■	■										
<b>Detailed Engineering</b>	9/12/19	17/07/20				■	■	■	■									
<b>Procurement</b>	6/01/20	4/06/21					■	■	■	■	■	■						
<b>Construction</b>	30/09/19	8/10/21					■	■	■	■	■	■	■	■	■	■		
<b>Commissioning</b>	11/10/21	18/02/22											■	■				
<b>Production Ramp-Up</b>	21/02/22	9/02/24													■	■	■	■

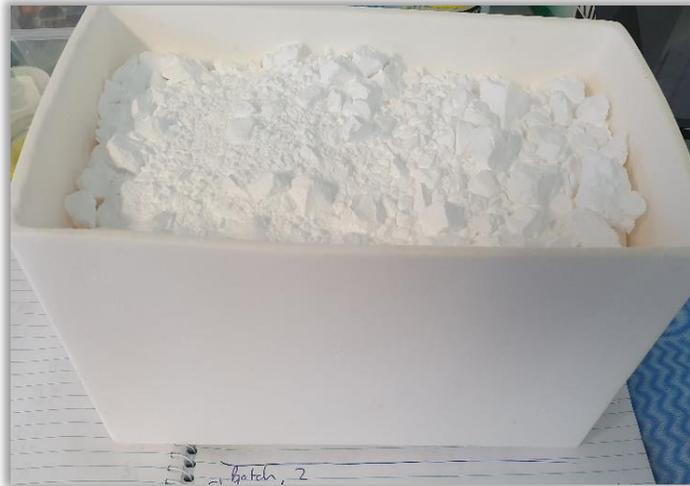
# HPA First Pilot Plant – Commenced July 2019



HPA Pre-Cursor Production



Pilot Plant Operations Team



HPA Pre-Cursor – prior to calcination



~21kg of intermediate Al-Salt produced over a 24hr period

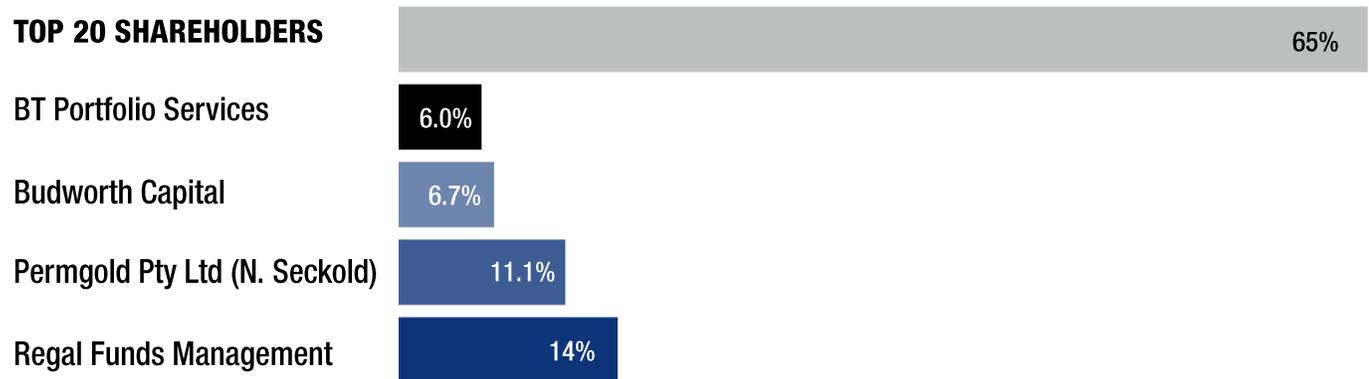
# Corporate Snapshot



Alpha HPA

## SHAREHOLDERS

### TOP 20 SHAREHOLDERS



### RECENT HIGHLIGHTS



## PFS



First HPA production using the HPA First process  
**99.994%**

HPA First Pre-Feasibility Study Completed Nov 2018 Updated Feb 2019

HPA First Pilot Plant Commenced July 2019

### PENDING 2019 MILESTONES



Reagent Sale By-Product Offtake Agreement & Project Location



First HPA Offtake Agreements

## DFS

HPA First Definitive Feasibility Study Dec 2019

# 'HPA FIRST' - FAST TRACK PATH TO HPA PRODUCTION

The HPA First process uses the Company's proprietary licenced solvent extraction (SX) and refining technology and a feedstock blend of readily available industrial products rather than mine generated feedstock

## SIMPLE



### Does not require a mining operation

- Simplified flow sheets with no mining operations or tailings
- Uses established, atmospheric pressure wet chemistry process
- Single site industrial location

## COMPELLING



### Compelling business case:

- Production rate of 10,200tpa HPA
- Unit cash costs of A\$6,830 (US\$5,123)/t HPA after by-product credits
- Annual pre-tax free cash flow (FCF) of A\$265M (US\$199M)\*

## FAST



### Fast track to cashflow:

- DFS due December 2019
- Faster Permitting - single site industrial zoning
- Fast track to financing and construction to operational cash-flow

\* Assumes HPA Pricing of US\$25,000/tonne

**Norman Seckold**  
Chairman

[nseckold@alphahpa.com.au](mailto:nseckold@alphahpa.com.au)

**Rimas Kairaitis**  
Managing Director

[rkairaitis@alphahpa.com.au](mailto:rkairaitis@alphahpa.com.au)

**Peter Nightingale**  
Director/Chief Financial Officer

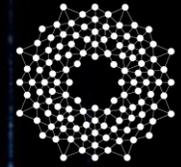
[pnightingale@alphahpa.com.au](mailto:pnightingale@alphahpa.com.au)

**Cameron Peacock**  
Investor Relations and Business Development

[cpeacock@alphahpa.com.au](mailto:cpeacock@alphahpa.com.au)

+61 (0) 439 908 732

**THANK YOU**



Alpha HPA

[\*\*www.alphahpa.com.au\*\*](http://www.alphahpa.com.au) T: + 61 2 9300 3310 F: + 61 2 9221 6333

**ALPHA HPA LTD (ASX:A4N)**

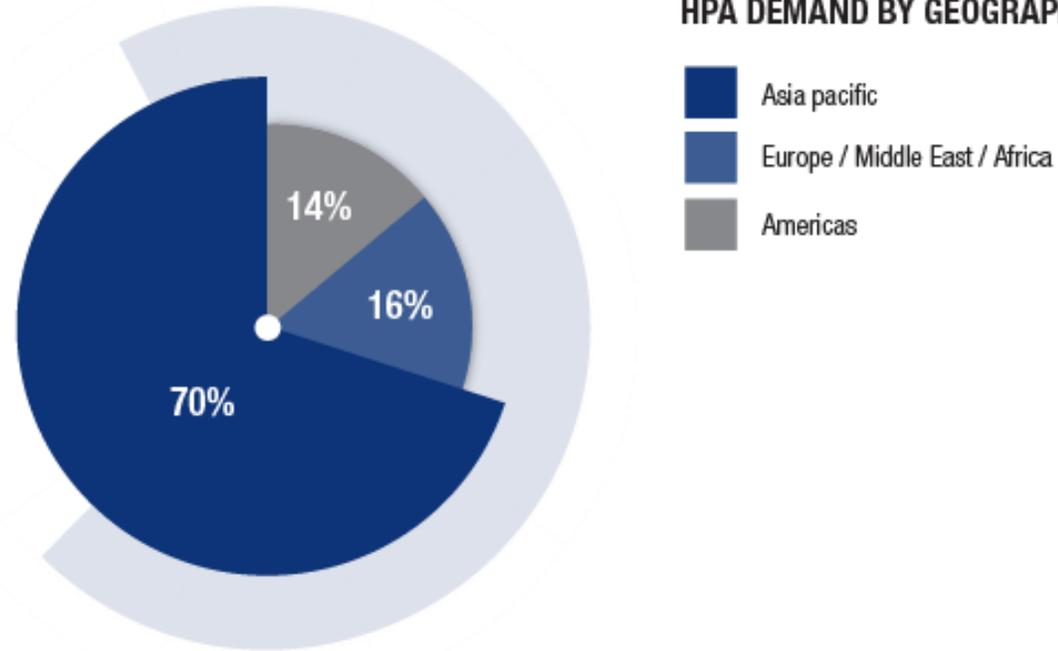
# **Appendices**

## Appendix 1

# Demand for HPA – Regions

Demand for HPA is primarily being driven by , separators in lithium ion batteries (Li-B's), the increasing adoption of LED (Light Emitting Diode) products and scratch resistant artificial sapphire glass for smartphone screens and watches

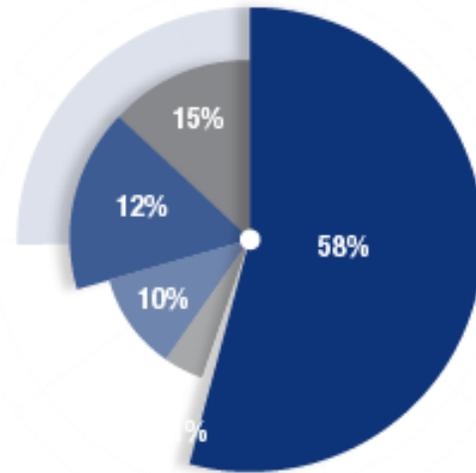
HPA DEMAND BY GEOGRAPHIC REGION (2016)



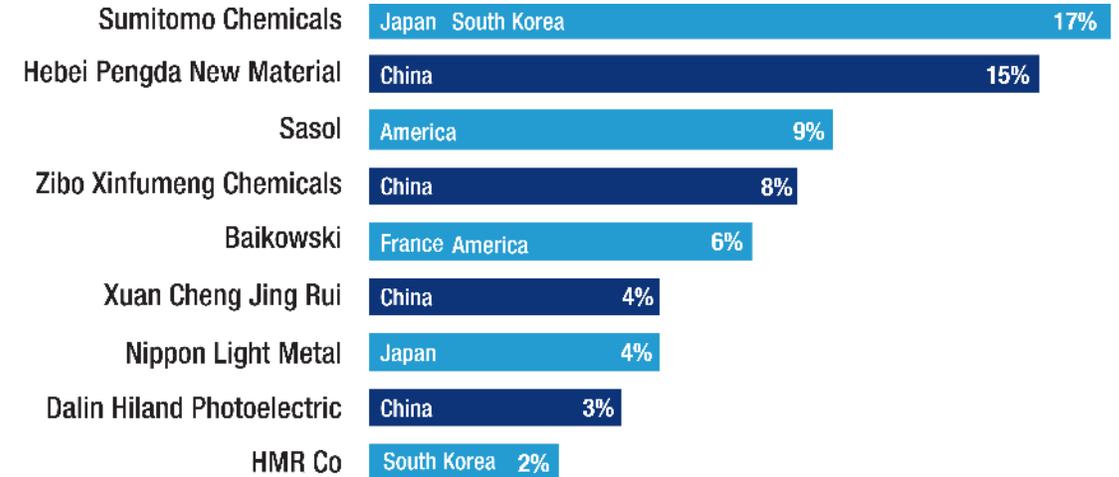
Growth demand is dominated by the APAC Region (~70% in 2016) primarily China, Japan and South Korea

As a would-be Australian based HPA producer, Alpha HPA is ideally placed to service the most dominant region of global HPA demand

## Appendix 2 Supply of HPA



GLOBAL HPA SUPPLY DISTRIBUTION - 2016E



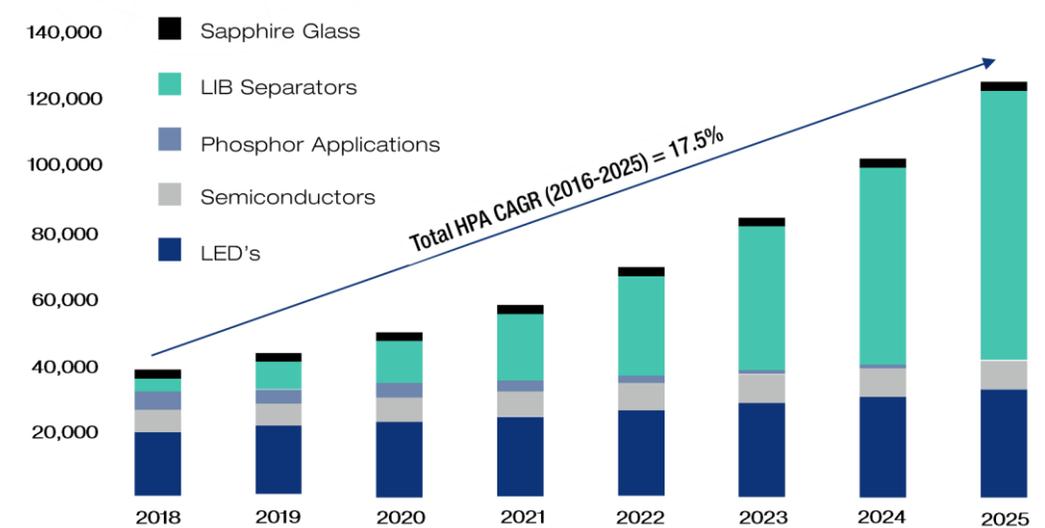
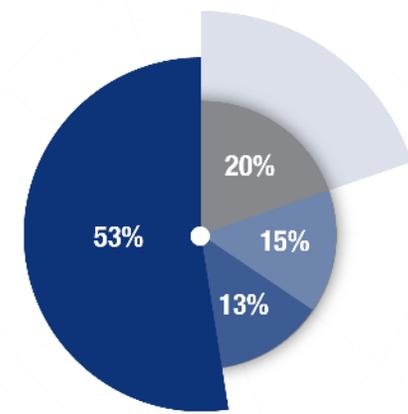
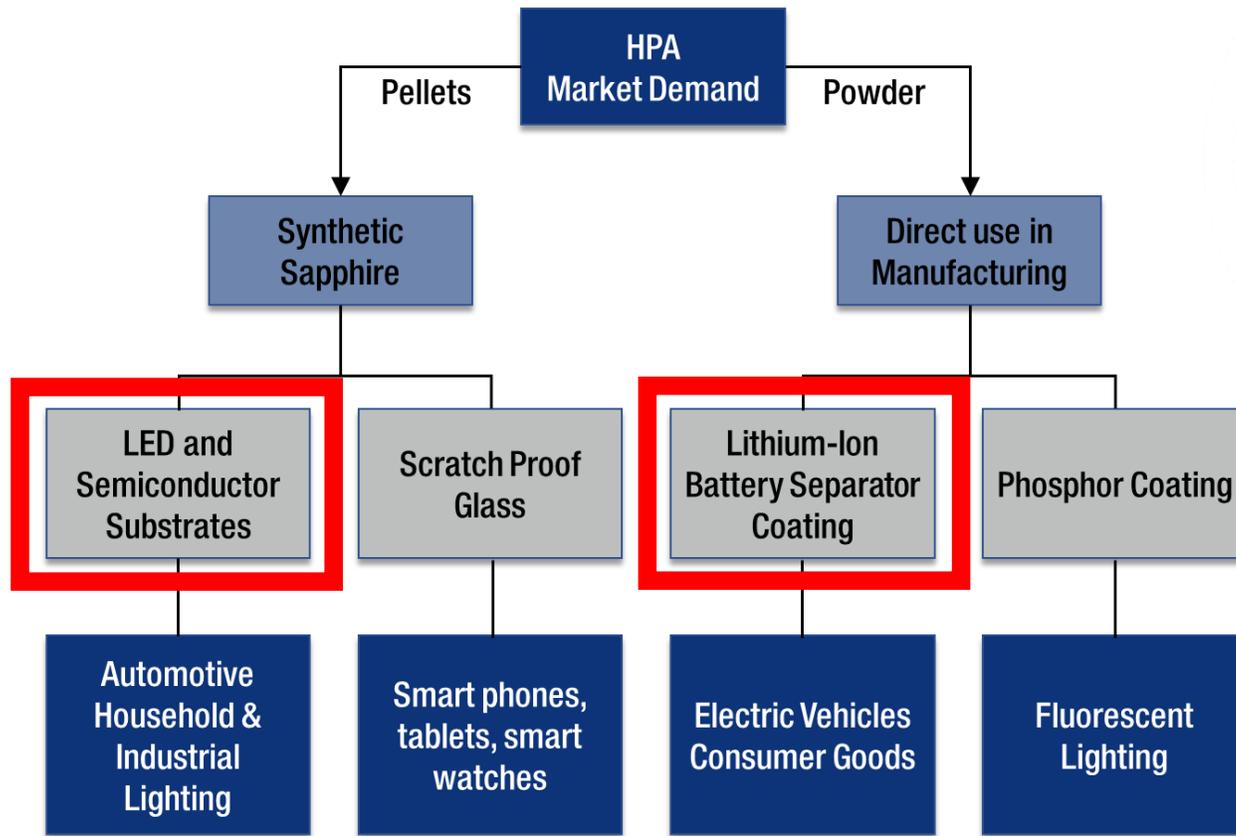
% EXPECTED 2016 OUTPUT

SOURCE: PERSISTENCE MARKET RESEARCH

- Current HPA supply is concentrated in the Asia Pacific region (~83%) with China the most prolific producer
- Current production is Dominated by large diversified chemical companies where HPA is a non-core product
- Alpha HPA sees enormous opportunity as a focused HPA producer to:
  - Become a genuine alternative supply source to the existing dominant APAC producing countries, and more importantly
  - Fill an expected supply shortage as forecast HPA demand escalates over the next decade
- Alpha HPA stands to become an extremely low-cost HPA producer
- The HPA First Project represents a large volume, single source, high purity HPA production proposition

# Appendix 3

## High Purity Alumina (HPA) Market



Source: CRU

## Appendix 4

# Statement of Compliance



Alpha HPA

### Competent Persons Statement (Process Development Testwork)

Information in this announcement that relates to metallurgical results is based on information compiled by or under the supervision of Dr Stuart Leary, an Independent Consultant trading as Delta Consulting Group. Dr Leary is a Member of The Australasian Institute of Mining and Metallurgy (AusIMM). Dr Leary has sufficient experience to the activity which he is undertaking to qualify as a Competent Persons under the 2012 Edition of the 'Australasian Code for reporting of Exploration Results, Mineral Resources and Ore Reserves'. Dr Leary consents to the inclusion of the technical data in the form and context in which it appears.

For further information on testwork results and processes see ASX announcements dated 23 September 2019, 28 August 2019, 5 August 2019, 25 July 2019, 2 July 2019, 3 June 2019, 17 April 2019, 7 March 2019, 4 December 2018, 20 November 2018, 6 September 2018, 31 August 2018, 9 July 2018, 30 April 2018, 26 April 2018, 21 March 2018, 6 March 2018, 21 February 2018, 8 December 2017, 30 November 2017, 29 November 2017, 24 November 2017 and 13 November 2017.

# Appendix 5

## Modifying Factors



Alpha HPA

Criteria	Commentary
<b>Study Status</b>	<p>The 'HPA First' Pre-Feasibility Study (PFS) indicates the project is technically and financially viable. The Study was completed by Prudentia Process Consulting, with input from the Company and other specialist consultants. The activities and findings of all other disciplines are summarised in the PFS document, and detail derivation of other modifying factors such as processing recoveries, costs, revenues, government and permitting.</p> <p>Overall the results of the PFS demonstrate that the HPA project is technically and financially robust.</p> <p>Alpha HPA confirms in the subsequent public report that all the material assumptions underpinning the +production target, or the forecast financial information derived from a +production target, in the initial public report referred to in rule 5.16 or rule 5.17 (as the case may be) continue to apply and have not materially changed.</p>
<b>Mining factors or assumptions</b>	<p>The HPA First PFS does not assume any material sourced from a mining operation</p>
<b>Processing (including Metallurgical factors or assumptions)</b>	<p>The production of HPA using a Solvent Extraction (SX) based process is a novel process flow sheet.</p> <p>The process plant design can be summarised by the following sequential activities:</p> <ul style="list-style-type: none"> <li>• The preparation of the industrial feedstock blend</li> <li>• Solvent extraction of the feedstock solution to produce an aluminium strip liquor and aqueous solution of dilute fertiliser by-product (raffinate).</li> <li>• Production of fertiliser by-product A from the raffinate involving evaporative crystallisation, dewatering, drying and packaging.</li> <li>• Crystallisation of the aluminium salt from aluminium strip liquor.</li> <li>• Production of HPA pre-cursor.</li> <li>• Calcining of HPA pre-cursor to HPA, micronizing and packaging.</li> <li>• Evaporation circuit to produce fertiliser by-product B</li> </ul> <p>The process flow sheet has been validated for the purposes of the PFS through the following testwork:</p> <ul style="list-style-type: none"> <li>• Bench scale SX and batch HPA refining</li> <li>• 2 x continuous SX mini-rig campaigns to produce aluminium strip liquors</li> <li>• 1 x processing of SX aluminium strip liquors to HPA assaying 99.99% purity</li> </ul> <p>The process testwork was conducted on a blend of industrial aluminium chemicals from 2 x different vendors. Some minor feedstock variability between vendors was noted.</p>
<b>Environmental and Permitting</b>	<p>Alpha HPA Ltd has engaged AECOM Consultants to assist with the Environmental and Regulatory Approvals process. The final Project Site remains subject to negotiations with reagent suppliers and potential offtakers of the process by-product</p>

# Appendix 5

## Modifying Factors



Alpha HPA

Criteria	Commentary
Financial	<p>Project costs have been estimated by Prudentia Process Consultants on the basis below.</p> <p><b>CapEx:</b> The capital cost estimate is provided at an accuracy level of +30% to -15%. The capital cost estimate has been based on the implementation of an Engineering, Procurement, Construction Management (EPCM) contracting strategy.</p> <ul style="list-style-type: none"> <li>• Pricing for mechanical equipment and packages are based on budget quotes sourced from reputable vendors or internal database information and scaled accordingly</li> <li>• Contingency of 18% has been added to the total reflecting the status of engineering, maturity of the process technology and data contained within this pre-feasibility study</li> <li>• No allowance for taxes, import duties, value added tax (VAT), goods and services tax (GST) and the like was made</li> </ul> <p>The total capital cost is based on the direct cost of mechanical equipment delivered and installed at site. The cost of the mechanical equipment is based on the process flow diagrams, stream table, design criteria and equipment list. Over 75% of mechanical pricing is based on vendor budget quotes with the remainder a mix of in-house (Prudentia) database, internal estimates, factored estimates, internet sourced data and allowances.</p> <p><b>OpEx:</b> The operating cost estimate has been calculated based on a first principle build-up including reagents, utilities, consumables, labour, general expenses, maintenance and contract services to operate the plant. The operating costs were apportioned into fixed costs and variable costs with adjustments made to variable costs in the financial model for annual tonnage with ramp-up. Labour costs have been built up from an organisational chart typical of a processing facility of this scale. The annual operating costs at year 3 (full ramp-up) are summarised in Table 6, above, and are considered accurate to +/- 25%.</p> <p><b>Sensitivities:</b> Sensitivity cases were considered by flexing key model inputs including sale price, operating costs and foreign exchange. The sensitivity analysis has been reported in EBITDA as there is no mine setting the project life. As expected with the operating margin the project is most sensitive to changes in the HPA product price in comparison to the other sensitivity factors modelled. Foreign exchange has the next biggest impact on the Project's EBITDA because the HPA price is traded in USD. The Project is fairly resilient to changes in operating cost.</p>
Marketing	<p>Alpha HPA Ltd commissioned the independent research group CRU to complete an HPA market study. The key conclusions of the study included:</p> <ul style="list-style-type: none"> <li>• The HPA global market is expected to increase from around 35kt in 2017 to 125kt in 2025, and 4N HPA produced by established suppliers in Japan, South Korea, USA and Europe is trading within the range of US\$25-50/kg</li> <li>• A strong demand outlook and rising cost inputs are expected to place upwards pressure on prices. The main downside risk is increased competition from Chinese producers and changes to technology which reduce HPA intensity in manufacturing processes.</li> </ul>
Social, legal and Governmental	<p>The final Project Location has yet to be determined, however the Company is investigating a number of sites in Newcastle, NSW, Gladstone QLD and Kwinana WA. The Company is advised by AECOM consultants with respect to Government Permitting and Environmental Studies</p>