



Alpha **HPA**

ABN 79 106 879 690

The Manager Companies - ASX Limited  
20 Bridge Street  
Sydney NSW 2000

ASX: **A4N**  
ASX Announcement  
1 June 2021

(12 pages)

## **ACCELERATING PRODUCTION FROM THE HPA FIRST PROJECT WITH THE PRECURSOR PRODUCTION FACILITY**

- **Alpha HPA commits to build a Precursor Production Facility ('PPF') to accelerate production and to cater for significant demand for the Company's high purity Aluminium Precursor products**
- **The PPF;**
  - **is to be constructed on the HPA First Project site within the Gladstone State Development Area**
  - **will produce +200 tonnes per annum of ultra-high purity Aluminium precursors for delivery to a global customer base;**
  - **establishes Alpha HPA as a premium manufacturer of high-purity aluminium products and enables the Company to build meaningful market share and a premium product reputation ahead of the construction of its Full Scale HPA First Plant;**
  - **will fast-track commercial cash flows;**
  - **will not impact the timing of the Full Scale HPA First Plant, and is to be incorporated as the dedicated manufacturing unit for Alpha's Al-Precursor #2 (cathode precursor)**
- **PPF CapEx estimated at A\$27.6M including contingency**
- **PPF revenues estimated between \$10M - \$15Mpa**
- **Orica to supply key chemical reagents and offtake by-product under similar terms and conditions as the Full Scale HPA First Plant**
- **PPF Commercial Production expected to commence Q3 CY2022**

The Board of Alpha HPA Limited ('Alpha' or 'the Company') is very pleased to provide an update on activities for its HPA First Project, representing the evaluation and intended commercialisation of the production of ~10,000tpa equivalent of high purity alumina (HPA) and related products using the Company's proprietary licenced solvent extraction ('SX') and HPA refining technology.

### **PRE-CURSOR PRODUCTION FACILITY**

The Board of Alpha advises it intends to construct a Precursor Production Facility ('PPF') to capitalise on growing customer interest for its suite of high purity (5N) aluminium precursor products and to accelerate production and revenue from the HPA First Project. The PPF will provide Alpha with the opportunity to fast-track project cash flows, build market share, strengthen relationships with key customers, and to establish a reputation as a premium producer of high purity aluminium products ahead of the Full Scale HPA First Plant, whilst not interrupting the full scale Project schedule.

The commitment to the construction of the PPF is based off discussions with end users seeking precursor supply that is immediately available. These discussions include both direct interaction and also via Alpha's market intermediaries.

The market for Alpha's precursor products is rapidly evolving, with numerous end user supply chains actively seeking new sources of near-term supply, particularly from low-carbon, ESG friendly sources. As a result, the Company believes the ability to market the construction of, and product availability from its PPF will be of enormous commercial benefit and will complement the commercial case for the Full Scale HPA First Plant.

Commenting on the Company's decision to build its PPF, Managing Director Rimantas Kairaitis, commented:

*"Alpha is extremely excited to be building this Precursor Production Facility. Our recent market engagement has convinced us there is an immediate global demand for our precursor products, which is likely to grow as decarbonisation trends continue to take effect. Alpha's positive market feedback on the premium nature of our ultra-high purity products combined with the observation that live demand for precursors is considerably influenced by immediate product availability, provides a key motivation for Alpha to proceed with the PPF. The construction and delivery of our PPF will enable us to rapidly capitalise on this demand, accelerate project cash flows, and importantly, to establish meaningful market penetration and brand awareness for our premium, high purity, low carbon products that will be of clear benefit to our Full Scale HPA First Plant."*

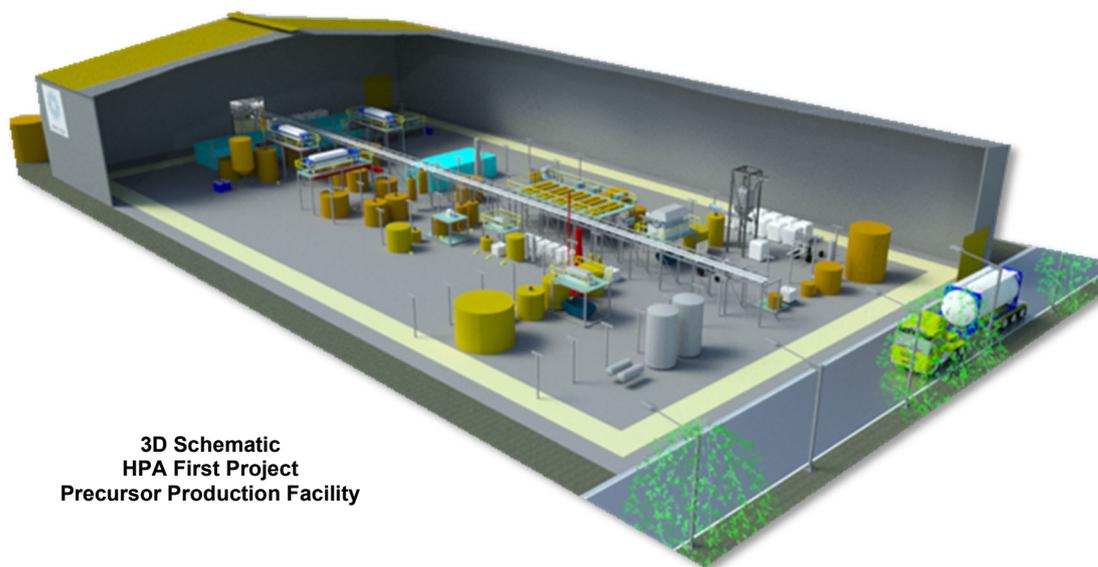
### **Design and Production Capacity**

The PPF design and production estimates have been built up from the process mass balance and is based off the existing HPA First Project Design.

The PPF will have production capacity of:

- **200 tonnes per annum** (~17 tonnes per month) of either **Precursor #1** or **Precursor #2** with product mix to be determined by customer orders. Further details on the Company's precursor products are provided below; and
- **3 tonnes per annum** of high-purity boehmite or **2 tonnes of high purity alumina** for both pre-commercial orders and/or product development.

Once the Full Scale HPA First Plant is commissioned, the PPF will be used exclusively for the manufacture of >200tpa of Precursor #2 (cathode precursor), converting a high purity aluminium feed directly from the Full Scale HPA First Project.



**3D Schematic  
HPA First Project  
Precursor Production Facility**

### **Orica Agreement**

Alpha has reached agreement with Orica Australia Ltd ('Orica') with respect to the supply of key process reagents and the offtake of process by-product ('Orica PPF Agreement'). The Orica PPF Agreement is based on the final draft of the Definitive Supply and Offtake Agreement for the Full Scale HPA First Plant, with the amendment that the PPF reagents and by-product will be delivered by truck load-out until the proposed pipe connections are in place. Costs of truck delivery and offtake will be borne by Alpha.

## PPF Feedstock

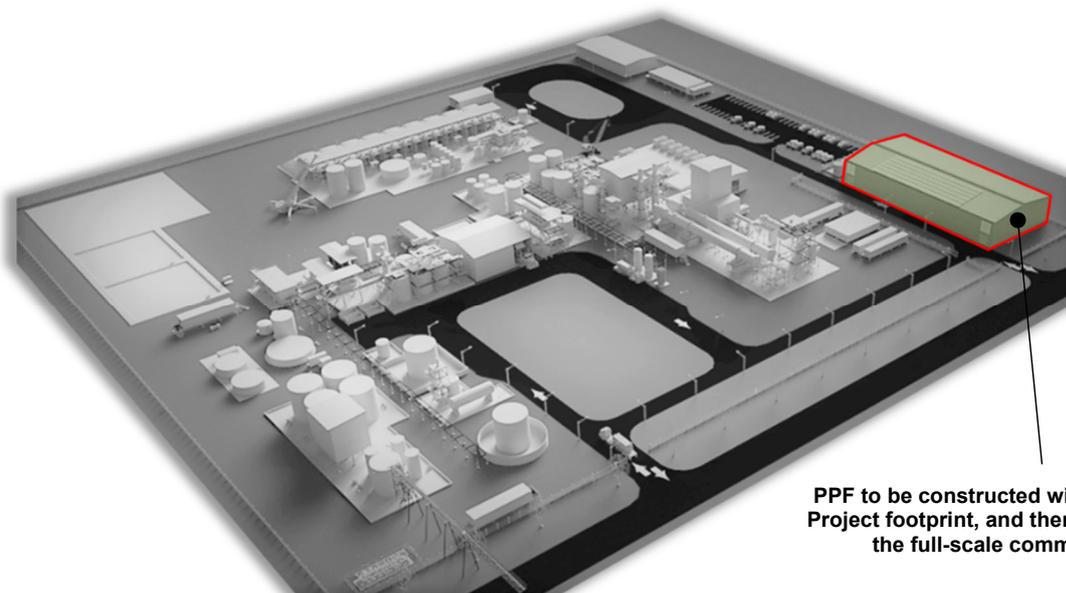
Alpha will continue to source feedstock for the PPF from the same feedstock supplier to the Brisbane Demonstration Plant.

## Location and Permitting

The PPF will be constructed within the Gladstone State Development Area ('GSDA') on the existing 10ha plot of land the Company has optioned (Lot 12/SP239343) adjacent to Orica's Yarwun refinery. Following consultation with the relevant Qld Govt agencies, the PPF will be able to be constructed with only minor amendments to the existing MCU approval (Development Permit) received from the Queensland State Government in February 2021.

AECOM Consultants have been engaged and have commenced the amendment process. The amendment documentation, together with the combined Environmental Authority ('EA') application, is due for lodgement in July 2021, with an anticipated approval by August 2021.

Alpha has also engaged with Economic Development Queensland ('EDQ') and commenced the minor contract changes with respect to the land contract relating to Lot 12/SP239343.



**PPF to be constructed within the HPA First Project footprint, and then incorporated into the full-scale commercial plant.**

## EPCM and Construction Timeframe

Alpha has engaged Prudentia Process Consultants ('Prudentia'), principal engineers to the HPA First Project, to deliver the 12 week Front End Engineering and Design (FEED), ahead of the Engineering, Procurement and Construction Management (EPCM) for the PPF. Alpha and Prudentia have been working closely on the HPA First Project since 2017, with Prudentia authoring both the Pre-Feasibility Study (March, 2019) and the Definitive Feasibility Study (March, 2020) for the Project.

Prudentia's established working knowledge of the process and their wider expertise on delivering SX based process solutions makes them ideally suited for the EPCM of the PPF. It is the intention of the Company to begin construction of the PPF in Q4 FY 2021, with commercial production scheduled for August 2022.

The PPF will not impact the proposed schedule for the Full Scale HPA First Plant, which will be constructed around the PPF (refer graphic above) with the PPF then used exclusively for the manufacture of Precursor #2 (cathode precursor), converting a high purity aluminium feed directly from the Full Scale HPA First Plant. The PPF will then be linked into the full scale utilities, reagents and process control.

## Technology Licensing Agreement

Alpha has reached agreement with its IP/technology licensors to modify the licence agreement to accommodate the additional production with the PPF. Alpha will pay a 2% gross revenue royalty on PPF product sales and a \$50,000pa licence fee.

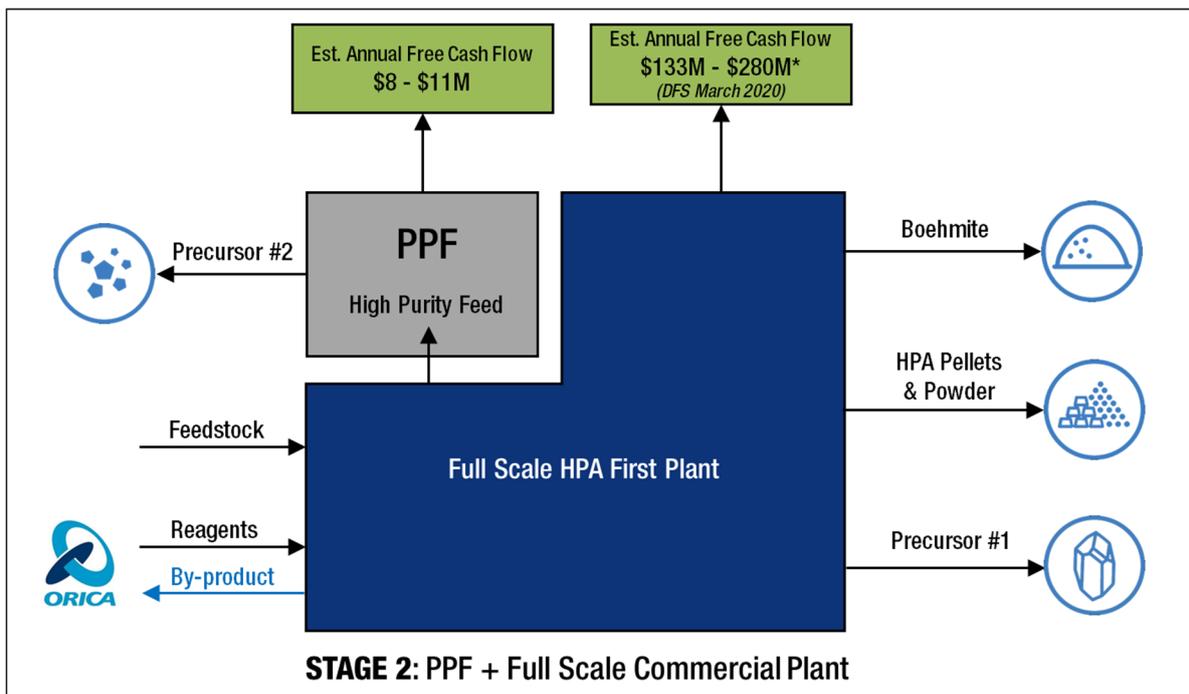
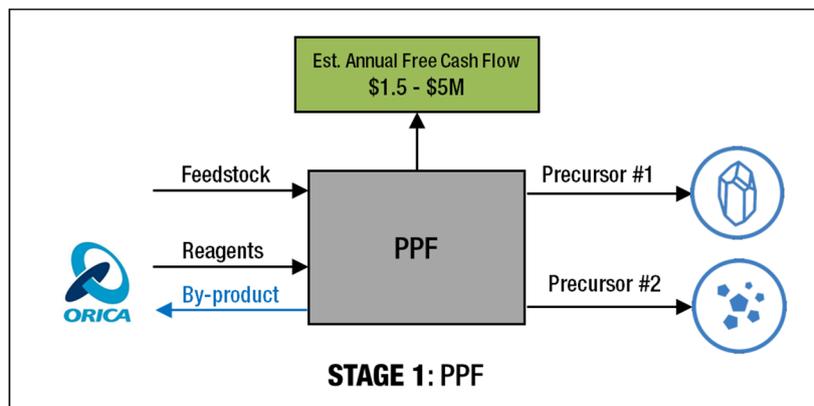
## PRE-CURSOR PRODUCTION FACILITY – PROJECT METRICS

The PPF is designed to immediately deliver positive cash flows from precursor sales, to build market share, strengthen relationships with key customers, and to establish a reputation as a premium producer of high purity aluminium products ahead of the Full Scale HPA First Plant.

The PPF will focus on the production and sale of 5N aluminium Precursor # 1 and #2, with smaller pre-commercial production of HPA and boehmite.

Once the Full Scale HPA First Plant is in place;

- The PPF will focus exclusively on Precursor #2 (cathode precursor) processing a high purity aluminium feed directly from the Full Scale HPA First Plant with **an enhanced capacity of +200tpa**.
- The majority of the PPF fixed costs will be transferred to the Full Scale HPA First Plant, and the variable costs (reagents, utilities etc) will fall to ~\$0.1M pa. The Full Scale HPA First Plant will take on the duty of the manufacture of Precursor #1, dramatically improving free cash flow generated from both Precursors.
- The PPF is expected to generate free cash flow of between **\$8M - \$11M** pa, in addition to free cash flows generated from the full scale facility. This increases significantly as Precursor #2 production increase above 200tpa.



## PPF Capital Expenditure (CapEx)

The PPF Project financials presented below have been built from vendor quotes ('CapEx') and the existing HPA First Project cost database ('OpEx').

The PPF CapEx estimates have been built up by Prudentia to a total of \$27.6M, as per below. There is an estimated \$10M-\$15M capital benefit to the Full Scale HPA First Plant.

Cost	Detail	(\$M)
Direct	Vendor quotes	\$19.15M
Indirect	Factored Estimates	\$4.85M
Contingency	15%	\$3.6M
<b>TOTAL</b>		<b>\$27.6M</b>

Full details of CapEx Estimates are set out in **Appendix 1**:

## PPF Operating Expenditure (OpEx)

The PPF OpEx estimates have been built up by Prudentia from the existing HPA First Project cost database and the Orica PPF Agreement to a total of \$9.7M pa, as per below:

PPF OpEx – PPF Only		
Cost	Detail	(\$M)
Fixed	Labour and general expenses	\$7.1M
Variable	Reagents, utilities & consumables	\$2.6M
<b>TOTAL</b>		<b>\$9.7M</b>

Once the full scale commercial facility is in place, the majority of the PPF fixed costs will be transferred to the full scale facility, and the variable costs (reagents, utilities etc) will fall to ~\$0.1M pa.

PPF OpEx – PPF + Full Scale Commercial		
Cost	Detail	(\$M)
Fixed	Labour and general expenses	\$1.4M
Variable	Reagents, utilities & consumables	\$0.1M
<b>TOTAL</b>		<b>\$1.5M</b>

Full details of OpEx Estimates are set out in **Appendix 2**:

## PPF Revenues and Cashflow

PPF product revenue and cash flow assumptions are based off recorded sales (AI-Precursor #1) and discussions with end-users both directly, and through intermediaries.

AUD/USD =0.75

Product Pricing	Scenario 1	Scenario 2	Scenario 3
AI Precursor #1 (US\$/kg)	\$50	\$55	\$65
AI Precursor #2 (US\$/kg)	\$35	\$40	\$45
Boehmite/HPA (US\$/kg)	\$15	\$20	\$25
<b>Cash Flows PPF Only</b>			
Annual Revenue (\$A)	\$11.4M	\$12.75M	\$14.8M
Free Cash Flow (\$A): PPF Only	\$1.25M	\$2.6M	\$4.6M
<b>Cash Flows PPF + Full Scale HPA First Plant</b>			
Annual Revenue (\$A)	\$10.3M	\$11.75M	\$13.2M
Free Cash Flow (\$A) : PPF + Full Scale	\$8.4M	\$9.9M	\$11.4M

## 5N PURITY ALUMINIUM PRE-CURSORS

Over the last 18 months, Alpha has developed and built-in a robust process for the manufacture of ultra high-purity (5N) aluminium precursor salts. Alpha's proprietary aluminium purification process allows for the production of 5N purity precursors from a comparably low priced, and widely available industrial chemical feed.

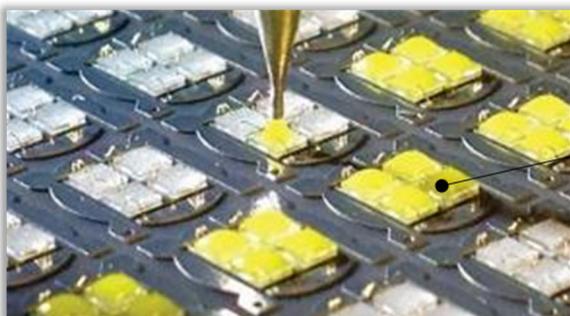
Alpha's precursor manufacturing method represents a significant cost and purity disruption to the incumbent process for these precursor salts which involves a feedstock of 6N refined aluminium metal and purified acids.

### 5N Al-Nitrate (Al-Precursor #1): $(Al((NO_3)_3).9H_2O)$

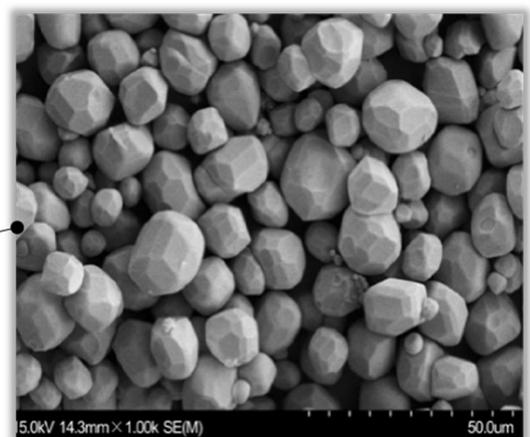
Through direct market engagement, and through its various marketing intermediaries, Alpha has identified significant existing demand, as well as supply constrained demand for this 5N precursor for the following applications:

Technology	Application
Specialised Coatings	<ul style="list-style-type: none"> <li>• Speciality Electronics</li> <li>• Film Coatings</li> </ul>
Li-B batteries coatings	<ul style="list-style-type: none"> <li>• For high purity alumina coating of anode particles</li> <li>• For high purity alumina coating of cathode particles</li> </ul>
LED Phosphor Synthesis	For synthesis of ultra fine grained aluminate phosphors (eg: Ce-YAG, LuAG) for mini-LED's and micro-LED's
Optical Scintillators	<ul style="list-style-type: none"> <li>• Medical imaging scintillators</li> <li>• YAG laser crystals</li> </ul>
Other	<ul style="list-style-type: none"> <li>• Dielectrics</li> <li>• Photovoltaics</li> <li>• Nanomaterials</li> </ul>

Of these applications, the application of Al-Precursor #1 in the synthesis of nano-sized YAG phosphor particles for mini-LED's and micro-LED's is considered the most prospective, based on the forecast growth of micro-LED's in particular. Ce-YAG, represents the most abundant LED phosphor globally, and is routinely applied to Ga-N LED's to down-convert blue light to the white light LED's as perceived by the human eye (*refer graphic below*).



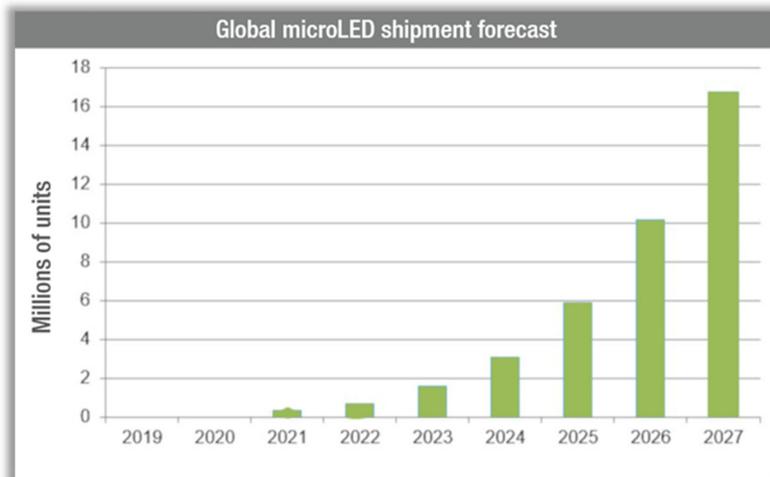
Addition of YAG phosphors to LED lighting circuits



SEM of YAG (Yttrium-Aluminate-Garnet)

*Graphic: Application of Ce-YAG to Ga-N LED's to in the manufacture of white light LED's*

The increasing growth of mini-LED's and micro-LED's requires the corresponding reduction in LED phosphor particle grain size. This requirement has seen the increasing utilisation of the wet-process, co-precipitation method for the manufacture of aluminate phosphors using Al-Precursor #1. This process allows for finer particle sizing, required for high efficiency mini and micro-LED's.

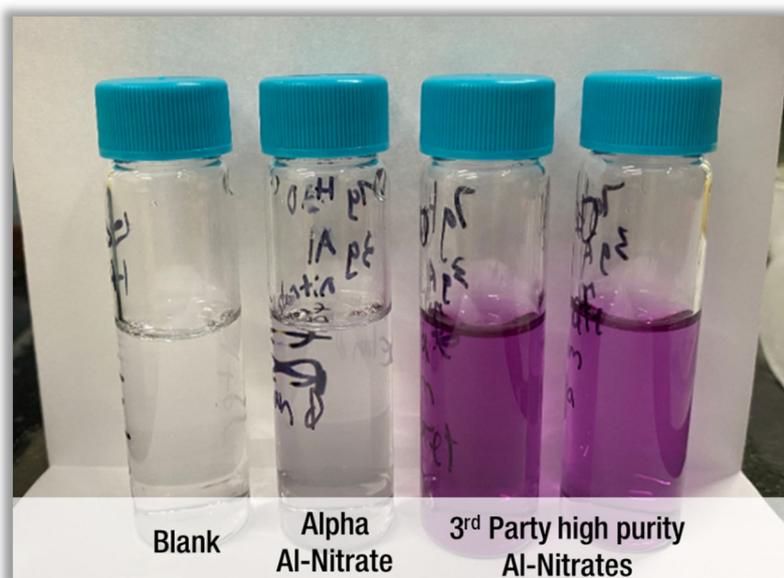


Graphic: Forecast growth in micro-LEDs to 2027  
Source ([www.microled-info.com](http://www.microled-info.com))

## Key Market feedback on Alpha 5N Al-Nitrate (Al-Precursor #1)

Key market feedback collected by Alpha to date include:

- The Alpha Al-precursor#1 represents the highest purity product tested
- The Alpha product contains **zero detectable iron**, and **zero detectable colour impurities** (see below). These observations are a key positive discriminator for any optical applications including LED phosphors and scintillators.
- Very high purity product demand is substantially supply constrained

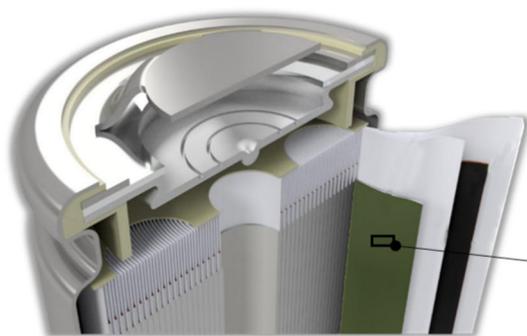


Third party test work showing the absence of colour impurities in Alpha's Al-nitrate in comparison to competitor products

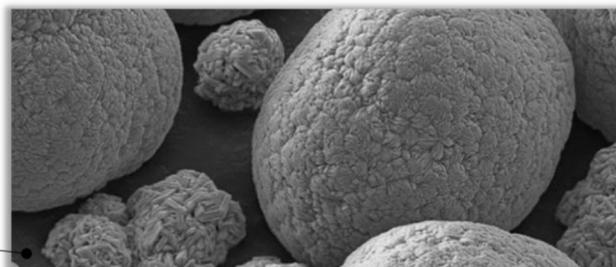
## 5N Al-Sulfate (Al-Precursor #2): $(Al_2((SO_4)_3).xH_2O)$

Alpha's Al-Precursor #2 has been developed specifically to service the growing adoption of **aluminium bearing cathode chemistries** within high-power lithium-ion batteries (Li-B's).

Li-B cathodes active materials ('CAM') are manufactured from mixed metal sulphate solutions using the co-precipitation method. The increasing adoption of high-nickel cathode chemistries has seen a corresponding increased demand for high-purity nickel-sulphates as the key nickel pre-cursor. In the same manner, increasing adoption of aluminium bearing CAM (notably NCA and NCMA chemistries) builds corresponding demand for high purity aluminium-sulphate as the key aluminium precursor.

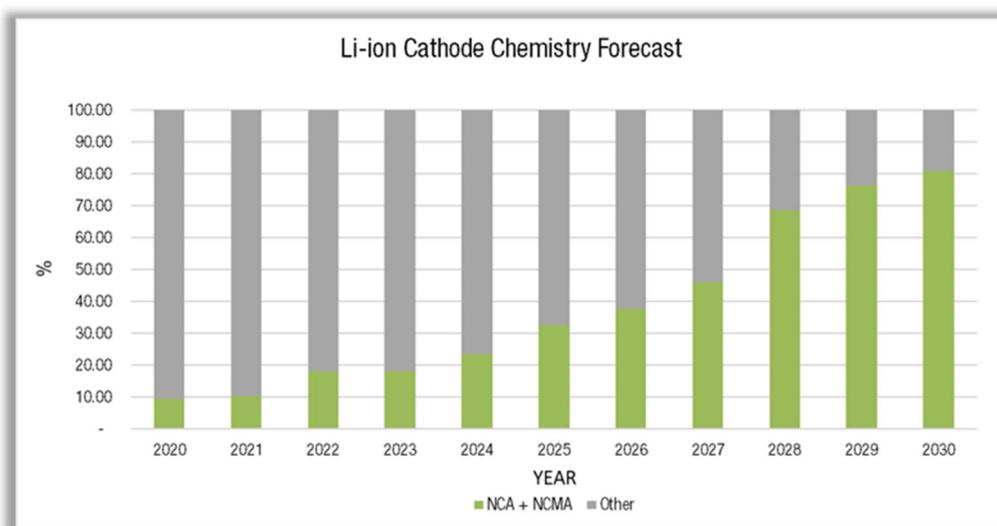


Lithium-ion battery breakaway



SEM of NCA Cathode Active Materials (CAM)

The incorporation of aluminium into the CAM plays a key role in the physical stabilisation of the CAM and improved aging performance of the lithium-ion battery. Cathode chemistry forecasts from UBS (December, 2020) shows aluminium bearing cathode chemistries representing 80% of all EV cathode chemistries by 2030 (see graphic below).



*NCA + NCMA Cathode Chemistries ~80% by 2030*

*Source: UBS – Dec 2020*

Alpha's recent production batches of Al-Precursor #2, using improved process conditions, resulted in an upgraded product purity to beyond the detection levels of the third-party analytical techniques (ME-ICPMS), recording <1ppm total impurities.

**Alpha is not aware of comparable purity levels for this product globally.**

The Company is now in the early stages of market outreach to targeted CAM manufacturers. Similar to feedback received on the Al-Precursor #1, it is apparent that live demand is considerably influenced by immediate product availability, providing a key motivation for Alpha to proceed with the PPF.

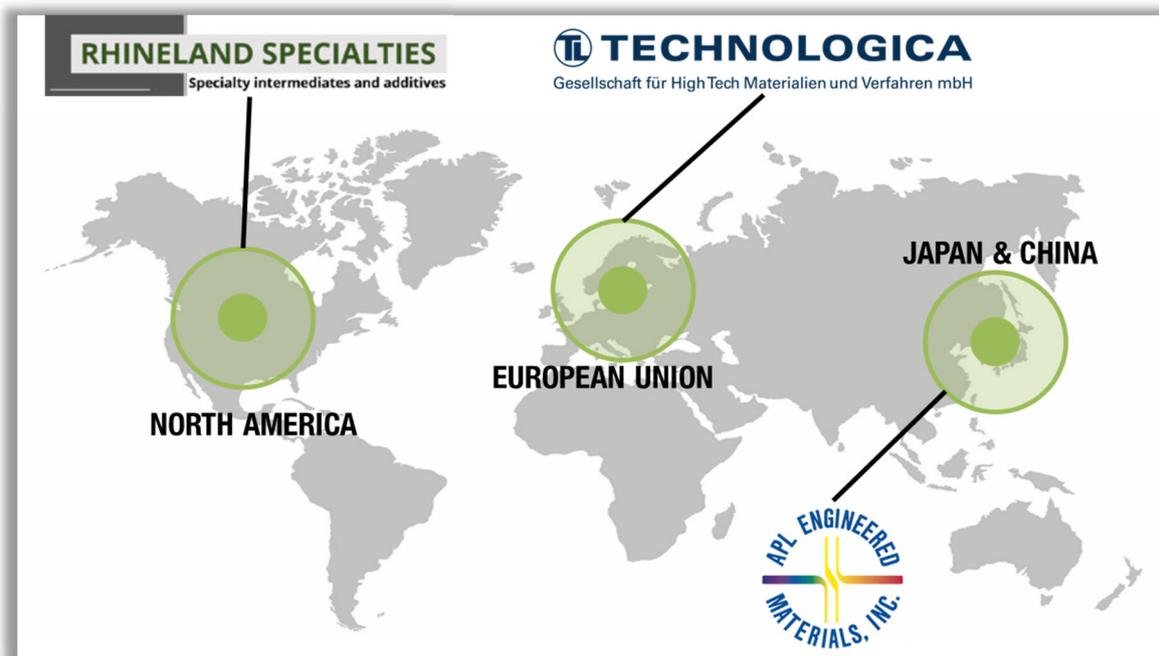
## Precursor Sales and Marketing

Alpha has now established a network of marketing arrangements covering the key technology jurisdictions of North America, Japan, China and the European Union (EU) via a series of MOU's with marketing counterparties focusing on specialty market applications, these now include:

- North America - via Rhineland Specialties (ASX announcement: 25 November 2020);
- Japan and China - via APL Engineered Materials, (ASX announcement: 28 April 2021); and
- European Union - via Technologica (ASX announcement: 3 May 2021)

Each of the MOU's has been designed with a particular focus on marketing Alpha's high purity aluminium precursor products and to complement existing marketing and distribution arrangements with Traxys (ASX: 20 August 2020) and the Company's various direct end-user engagements.

Each of these arrangements allows for Alpha's products to access a range of high value specialty applications and markets.



*Alpha has established a global network of marketing counterparties to access high value specialty markets*

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### About the HPA First Project

The Company's HPA First Project represents the evaluation and intended commercialisation of the production of ~10,000tpa equivalent of high purity alumina (HPA) and related products using the Company's proprietary licenced solvent extraction and HPA refining technology. The technology provides for the extraction and purification of aluminium from an industrial feedstock to produce 4N (>99.99% purity) alumina for the intended use within the lithium ion battery and LED lighting industry. Following a successful testwork program and completion of a Pre-Feasibility Study (PFS), updated in March 2019, Alpha has now completed Definitive Feasibility Study (DFS) based on the successful completion of its Pilot Plant program at its dedicated laboratory facility in Brisbane.

The Company is now in the mature phases of project permitting, market outreach and project financing processes, with the expectation of positioning the HPA First Project to Final investment Decision.

## Cautionary Statement

The Definitive Feasibility Study (DFS) referred to in this document has been undertaken to assess the technical and financial viability of the HPA First project. The DFS is based on the material 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 outcomes indicated by this DFS will be achieved. To achieve the range of outcomes indicated in the DFS, additional funding will 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 HPA First project. If it does, this could materially reduce the Company's proportionate ownership of the HPA First project. Given the uncertainties involved, investors should not make any investment decisions based solely on the results of the DFS.

## Forward Looking Statements

The DFS referred to in this document 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, give 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 the DFS in light of those disclosures.

## Appendix 1- PPF Financial Detail CapEx

DIRECTS			
Basis	WBS	Area Description	TOTAL
	PROCESS PLANT	1100 Feed Preparation	\$764,637
		900 Autotitrator	\$138,990
		1105 Feed Pre-Treatment	\$345,615
		1110 Extraction	\$2,506,549
		1120 Washing	\$56,195
		1130 Strip	\$176,625
		1140 Impurity #1 Removal	\$58,751
		1145 Impurity #2 Removal	\$24,887
		1150 Crud	\$195,340
		1200 Crystallisation	\$871,328
		1210 Dissolution	\$74,534
		1220 Precursor	\$329,497
		1230 Precursor Filter	\$1,366,914
		1260 By-Product Treatment	\$644,797
1270 Boehmite Production	\$2,751,175		
1280 Al Precursor #2 Production	\$960,104		
		Drying and Calcining	\$1,000,025
	REAG	1600 Reagent #1	\$109,042
		1605 Oxidising agent	\$25,578
		1610 Reagent #2	\$141,706
		1620 Other Reagents	\$17,712
	UTILS	1710 Water	\$83,573
		1720 Waste Water	\$149,655
		1730 Cooling Water	\$176,848
		1740 Boiler	\$423,561
		1750 Air Compressor	\$264,245
	Other	Earthworks	\$1,000,000
		Roads and Carpark	\$262,200
		Fencing and Security	\$189,600
		Infrastructure Connections	\$250,000
		Civils	\$1,351,537
		Site Building, lab and offices	\$1,648,000
		Structural Steel	\$256,000
		Fire Water	\$250,000
		Laboratory Equipment	\$250,000
		<b>TOTAL DIRECTS</b>	<b>\$19,115,217</b>
INDIRECTS			
Factored	INDIRECTS	900 Project Management, procurement, engineering	\$2,173,823
Factored		901 Construction Management	\$543,456
Factored		902 Temporary Construction Facilities	\$90,576
Factored		903 Spares	\$181,152
Factored		904 Commissioning	\$362,304
Factored		905 Operations Readiness	\$362,304
		906 Owners Costs	
Factored		907 Contractors G&A Costs	\$181,152
Factored		908 Cranes	\$90,576
Factored		909 First Fill	\$181,152
Factored		910 Contractor Plant and Equipment	\$181,152
Factored		911 Flights, and accommodation	\$181,152
Factored		912 Mob and Demob	\$181,152
Factored		913 Survey, Geotech, Soil Testing	\$18,115
Factored		914 HSE and Medical Services	\$18,115
Factored		915 Project Security	\$90,576
Factored	916 Roads and Buildings Maintenance	\$18,115	
		<b>TOTAL INDIRECTS</b>	<b>\$4,854,872</b>
		<b>TOTAL DIRECTS AND INDIRECTS</b>	<b>\$23,970,089</b>
Factored	Contingency (of Directs & Indirects)		\$3,595,513
		<b>TOTAL (AUD)</b>	<b>\$27,565,602</b>

## Appendix 1- PPF Financial Detail OpEx

AREA	DESCRIPTION	Amount
<b>FEED REAGENTS &amp; TRANSPORT</b>		
	<b>Total</b>	<b>\$911,963</b>
<b>UTILITIES</b>		
	Water - Potable	\$9,807
	Water - Raw	\$0
	Water Chemicals (boiler, cooling & demin)	\$12,395
	Power, (connection, demand, capacity cha	\$0
	Power, (usage)	\$0
	Diesel - plant vehicles	\$1,461,919
	Natural Gas - (dryers, calciner, boiler)	\$13,316
	<b>UTILITIES total</b>	<b>\$ 1,497,437</b>
<b>CONSUMABLES</b>		
	Filter Cloth	\$48,000
	HPA product bulka bags & liner	\$7,500
	Dust Collector Bags	\$20,000
	Laboratory Chemicals / Costs	\$104,000
	<b>CONSUMABLES total</b>	<b>\$ 179,500</b>
<b>OTHER</b>		
	Residue Costs	\$20,300
	Feed treatment costs	\$20,864
	Other #1	\$234
	Tradewaste	\$0
	<b>OTHER total</b>	<b>\$ 41,398</b>
<b>Variable Costs (AU\$ pa)</b>		<b>\$ 2,630,298</b>
<b>LABOUR</b>		
	Management	\$848,813
	General Administration	\$113,175
	Process Plant	\$3,204,162
	Maintenance	\$414,975
	Health, Safety, Environment and Quality	\$924,250
	<b>LABOUR Total</b>	<b>\$5,505,375</b>
<b>GENERAL EXPENSES</b>		
	Insurances	\$170,000
	Vehicle Leasing and Running Costs	\$97,150
	Other	\$556,464
	<b>GENERAL EXPENSES Total</b>	<b>\$823,614</b>
<b>MAINTENANCE</b>		
	Maintenance	\$340,000
	<b>MAINTENANCE Total</b>	<b>\$340,000</b>
<b>CONTRACT SERVICES</b>		
	Process Related (e.g. testwork)	\$440,000
	Administration and General	\$69,520
	<b>CONTRACT SERVICES Total</b>	<b>\$509,520</b>
<b>Fixed Costs (AU\$ pa)</b>		<b>\$ 7,178,509</b>
<b>TOTAL (AUD)</b>		<b>\$ 9,808,806</b>

