PURE ALUMINA
ACN 072 692 365

Revised Investor Presentation **17 June 2019**

ASX Code: PUA, PUAOC

Investor Presentation - Revised

Pure Alumina Limited (ASX: PUA) (Pure Alumina) advises that it has received a request from the Australian Securities Exchange (**ASX**), in relation to the announcement entitled "*Investor Presentation – Updated – Correction*" (**14 June Investor Presentation**) released via the ASX Market Announcements Platform on 14 June 2019, to provide additional information in, and to make amendments to, the 14 June Investor Presentation.

Pure Alumina therefore provides the attached investor presentation (**Revised Investor Presentation**) which includes the following changes made to the 14 June Investor Presentation:

Slide 14

This slide has been modified to include a footnote to refer readers to slide 31 for details on how the production cost on slide 14 was calculated and provide a detailed breakdown.

Former Slide 18

This slide, Slide 18 in the 14 June Investor Presentation, presented aggregated data using standard metrics in "best, average & poor" categories to compare processes used or proposed to produce High Purity Alumina (**HPA**). As the processes are in different stages of development, Pure Alumina is of the view that to be consistent with the approach adopted for former Slide 19, as referred to below, Slide 18 should be retracted from the Investor Presentation.

Former Slide 19

This slide, Slide 19 in the 14 June Investor Presentation, compared features of Polar Sapphire's HPA project to those of other companies who are developing HPA projects. While the data contained on this slide was sourced from those companies' publicly issued releases, the ASX bought to Pure Alumina's attention that the projects being compared were at different stages of development and, as noted in ASX Compliance Update 08/18 issued on 19 September 2018, peer comparisons between companies at different stages of development may potentially be misleading.

Pure Alumina therefore retracts this slide from the Investor Presentation.

Other Changes

Minor updates have been made to other slides to ensure the information remains current.

The Revised Investor Presentation replaces the 14 June Investor Presentation and former Slides 18 and 19, as referred to above, are retracted and investors should not rely on any comparisons made on those retracted slides.

Martin McFarlane
Managing Director

Media - For further information, please contact: Paul Armstrong - Read Corporate +61 8 9388 1474

PURE ALUMINA

polar sapphire

A NEW COMMERCIAL LOW COST PRODUCER OF HIGH PURITY ALUMINA

Disclaimer

Forward-looking Statements

This announcement contains forward-looking statements which are identified by words such as ‘anticipates’, ‘forecasts’, ‘may’, ‘will’, ‘could’, ‘believes’, ‘estimates’, ‘targets’, ‘expects’, ‘plan’ or ‘intends’ and other similar words that involve risks and uncertainties. Indications of, and guidelines or outlook on, future earnings, distributions or financial position or performance and targets, estimates and assumptions in respect of production, prices, operating costs, results, capital expenditures, reserves and resources are also forward-looking statements. These statements are based on an assessment of present economic and operating conditions, and on a number of assumptions and estimates regarding future events and actions that, while considered reasonable as at the date of this announcement and are expected to take place, are inherently subject to significant technical, business, economic, competitive, political and social uncertainties and contingencies. Such forward-looking statements are not guarantees of future performance and involve known and unknown risks, uncertainties, assumptions and other important factors, many of which are beyond the control of the Company, the directors and management. We cannot and do not give any assurance that the results, performance or achievements expressed or implied by the forward-looking statements contained in this announcement will actually occur and readers are cautioned not to place undue reliance on these forward-looking statements. These forward-looking statements are subject to various risk factors that could cause actual events or results to differ materially from the events or results estimated, expressed or anticipated in these statements.

PURE ALUMINA

Investment Highlights

Pure Alumina is raising capital to acquire Polar Sapphire (**"Polar"**) and to fund a commercial-scale factory

1. One of the world's highest quality, lowest cost HPA suppliers
2. CapEx substantially lower than other potential HPA suppliers – near term cash flow positive
3. Rapid market growth and order backlog
4. Compelling valuation and lower risk proposition vs industry peers

Team

Highly qualified team with extensive industry experience and proven track record of building cleantech companies

Scott Nichol
Founder, CEO

Experience:
- Experienced cleantech/advanced material manufacturing entrepreneur
- COO - Jaco SolarSi
- Founder, President, CTO - 6N Silicon (purifying silicon for solar cells)

Education:
- MBA, Western University
- P. Eng, Materials Engineering, McMaster University

Dan Smith
VP of Operations

Experience:
- Experience scaling new technologies to production scale
- Broad manufacturing and management
- 6N Silicon – designed, managed construction, commissioned and procured equipment for 100,000 sq. ft. manufacturing facility

Education:
- P. Eng, Mechanical Engineering, Queen's University

Iman Zargaran
R&D Manager

Experience:
- 10+ years of materials development experience
- Technical Project Manager - PNFCO (nano-materials)
- Engineering Coordinator - Pishgaman Catalyst Alvand (alumina)

Education:
- Master's, Materials Engineering, University of Tehran
- P. Eng, Materials Engineering,

David Leavy
VP of Finance

Experience:
- 25+ years experience in the banking and mining industries
- CFO of multiple mining companies during project development

Education:
- B.Econ, Murdoch University
- M. App. Fin., Macquarie University

The Acquisition – Polar Sapphire

Polar Sapphire, a private Canadian company, has perfected its unique patented HPA production technology over 6 years.

- Polar's innovative process produces 99.999% (5N) HPA (Al_2O_3) - the highest commercial grade of HPA, commanding a price premium.
- Polar can also produce 3N and 4N HPA using lower cost feedstock
- Polar's technology is proven – its Toronto pilot plant has capacity to produce HPA at 145 tonnes/year
- Commercial production is only a modest 2.4 times scale up – low risk – many current components already operate at commercial scale

Sapphire Boule made from Polar Sapphire Technology

The Acquisition – Polar Sapphire

Polar's modular production process has key advantages over existing methods of HPA production

- Polar's modular system has many advantages compared to other methods of producing HPA including:
  - significantly lower CapEx and Operating Costs,
  - flexibility to produce multiple grades at once; and
  - rapid expansion
- Polar has passed the rigorous qualification process of multiple sapphire producers and is now receiving orders exceeding current capacity
- Polar's 5N process has a significantly lower capital intensity than other Kaolin HPA projects and its operating costs are in line or better than most 4N HPA cash costs

Quality testing of a Polar Sapphire Boule

Key Acquisition Terms

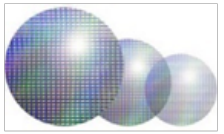
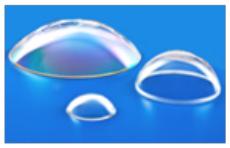
PUA acquires all of the outstanding equity in Polar Sapphire in exchange for:

- C$13.75m in PUA Shares
- C$12m in cash
- 3 board seats in PUA

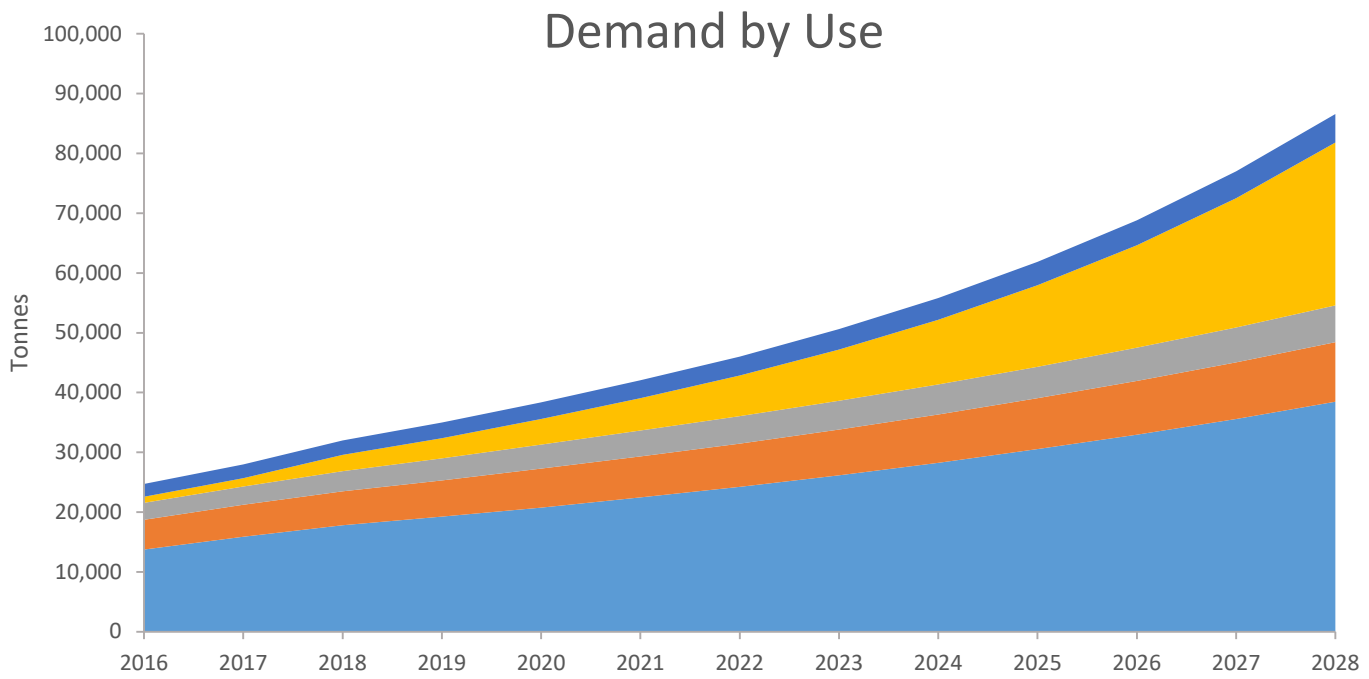
Conditions Precedent Include:

- Raising a minimum of A$30m of equity
- Completion of due diligence
- Progress on sale of PUA gold assets
- Other standard CPs
- All management and employees of Polar are continuing with the combined group

HPA Applications

LEDs (5N & 4N grade)		• Used to produce sapphire boules, which are turned into sapphire wafers (substrates) for LEDs
Semiconductors (5N & 4N grade)		• Ceramic materials, dielectric components for semiconductor wafers, wafer polishing • Potential to displace quartz tooling
Phosphor (for Plasma Displays) (4N grade)		• Used in plasma displays (e.g. TVs and computers) to control the characteristics of phosphorous material
Other Sapphire (Non-LED) (5N & 4N grade)		• High-strength, scratch-resistant glass for smart phones, watches • Lasers, optical components windows, buttons
Lithium-Ion Battery Separators (4N & 3N grade)		• Used to coat separators to prevent excessive and abnormal heat generation
Other (6N to 3N grades)		• HPA has other applications in the industrial, chemical, defense, and medical sectors

Rapid HPA Growth from Multiple Sectors



	CAGR 2018-2028
Others	7.0%
Batteries	26.0%
Phosphor	6.2%
Semiconductor	5.8%
LED	8.0%

Total: 10.5%

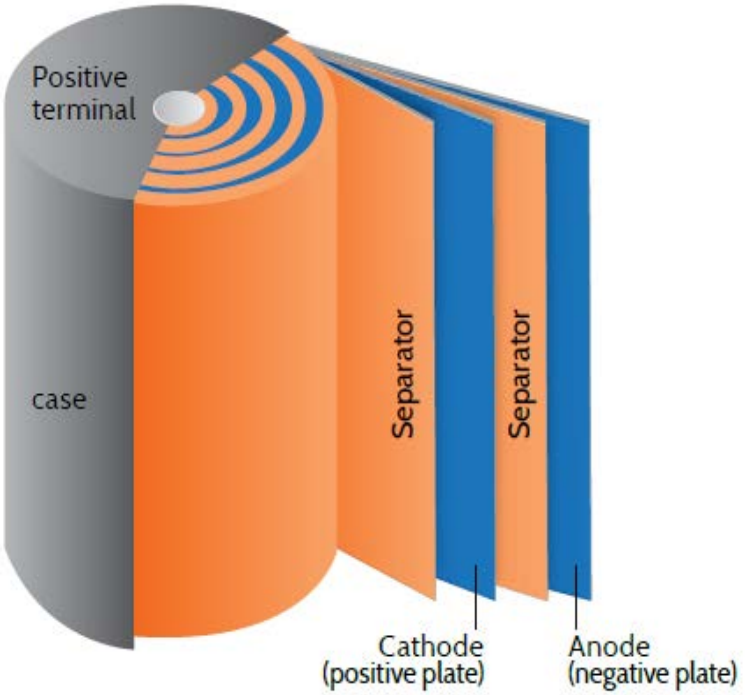
Demand for HPA has risen eight-fold since 2003 and is forecast to triple by 2030

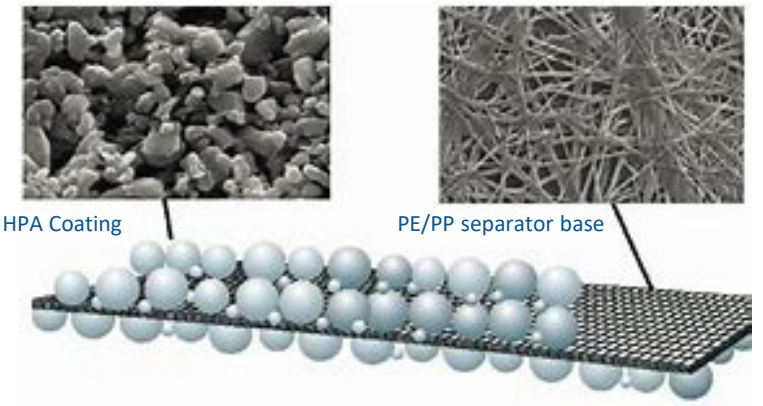
- LED's consume >50% of HPA demand and is growing strongly. LED's currently have ~20% of the lighting market with saturation expected above 80%.
- Lithium batteries are an emerging HPA market and forecast to become the largest HPA market within 10 year as electric vehicle and power storage markets take off.
- PUA plans to sell into market growth rather than cannibalizing competitors market share

Source: Roskill 2017

Coated Battery Separators

- Lithium batteries generate significant heat that, if unmanaged, may result in thermal runaway e.g. Samsung Galaxy Note 7
- Demand for larger batteries and greater energy density e.g. EV batteries, increases the thermal management issue
- Coating battery separators with HPA has been found to significantly improve safety and efficiency:
  - provide greater thermal stability to the battery,
  - significantly improves impedance (Macmullan number <3) allowing for high power capability,
  - improve battery life cycle and lowers self-discharge

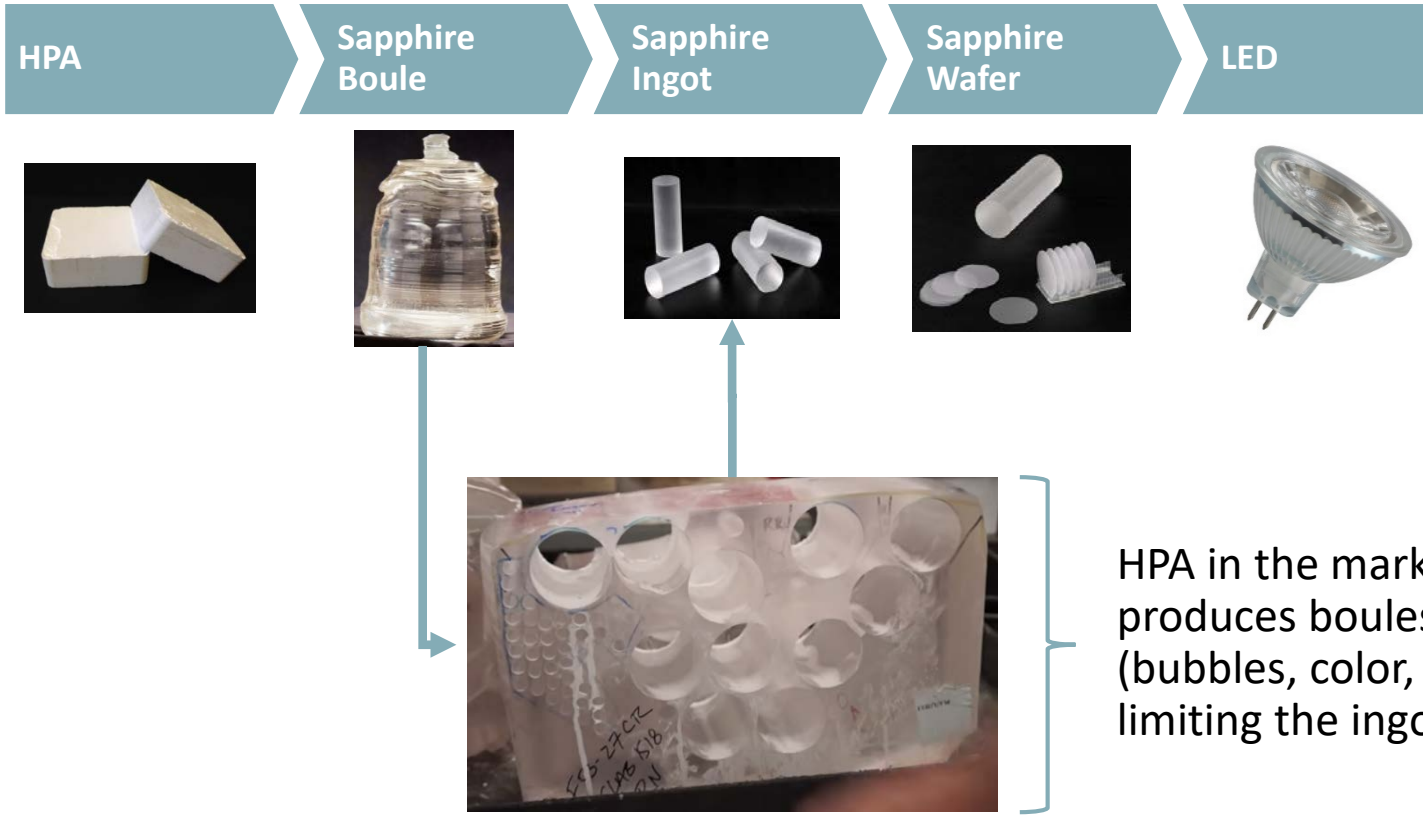




Polar's HPA – Value Proposition

Polar Sapphire HPA produces higher quality boules with fewer defects, increasing ingot yields and revenue for customers by up to 25%

HPA in the LED Supply Chain



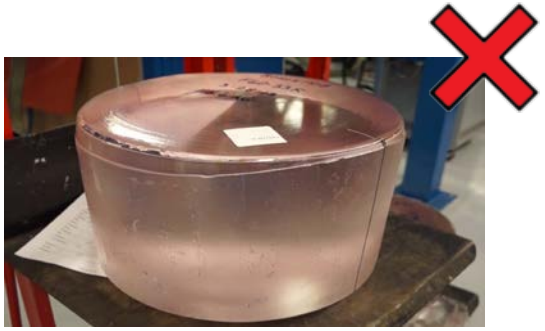
HPA in the market today produces boules with defects (bubbles, color, clarity), limiting the ingot yield/boule

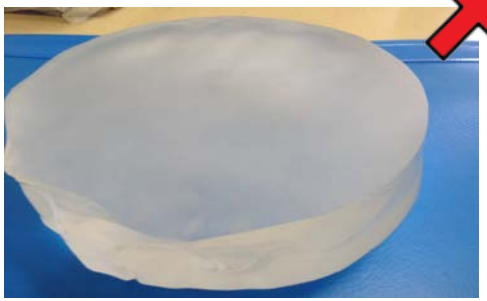
Polar is Solution to Existing Issues

Polar HPA has increased value in use while solving current HPA issues

Competitors HPA

HPA in the market today produces boules with defects (bubbles, colour, cloudy), limiting the ingot yield/boule





Sapphire for LED's

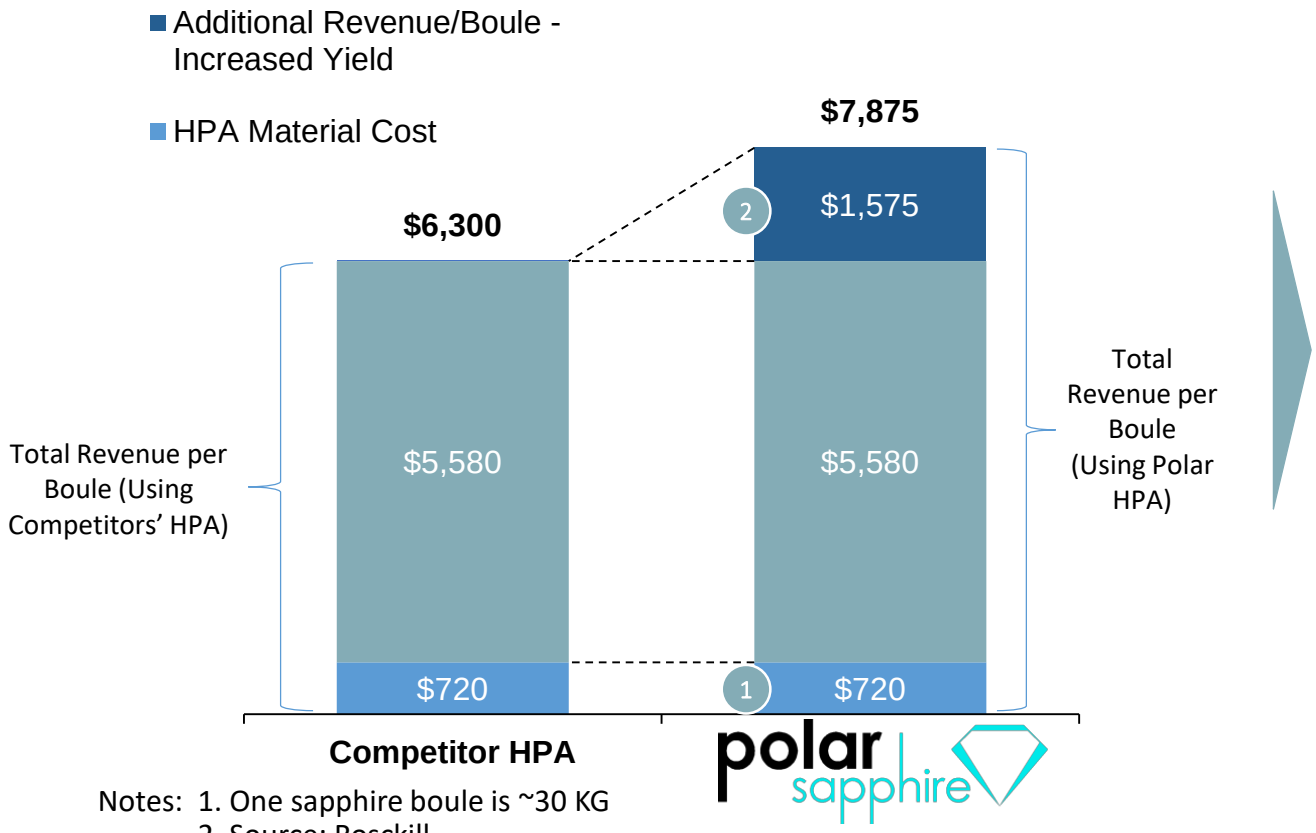
- Increased clarity
- Increased Yield
- Fewer defects

Powder for Battery Separators

Competitive Advantage

Polar HPA generates 25% more revenue for producers than competitor HPA

Revenue/Sapphire Boule with Competitor HPA vs. Polar HPA (USD $/Boule[1])



- Full value of Polar Sapphire HPA is ~USD $77/KG:
  1. $24/KG[2] ($720/30 KG boule
  - o $53/KG[3] ($1,575/30 KG
  2. boule) – additional revenue, given 25% increase in ingot yield per boule from Polar Sapphire HPA

Notes: 1. One sapphire boule is ~30 KG
2. Source: Rosckill
3. Polar analysis. Value to customer of using Polar HPA, assumes customer increases revenue by 25 % per boule from increased yield and fewer defects

Business Model

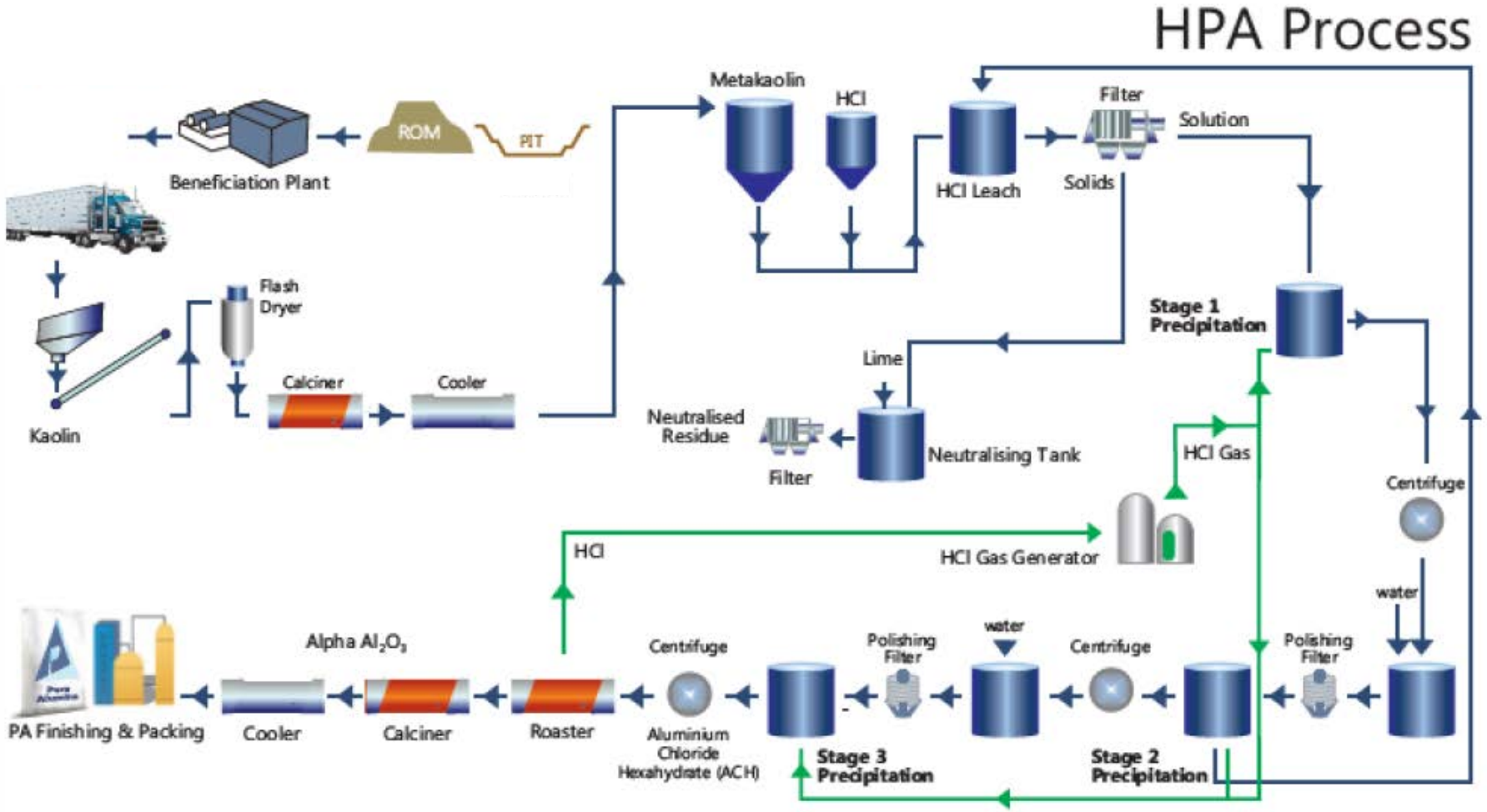
Polar's proprietary low-energy process generates one of the world's highest-purity, lowest production cost alumina

- Simple process uses aluminium to produce high quality 5N HPA, which few can compete with.
- Polar forecast production cost $7/kg*, equivalent to competitor 4N cost
- Low cost ensures strong sustainable margins
- PUA will look to reduce input costs further by implementing this technology into its current Kaolin process

* Refer slide 31 for production cost methodology and detailed break down of production costs

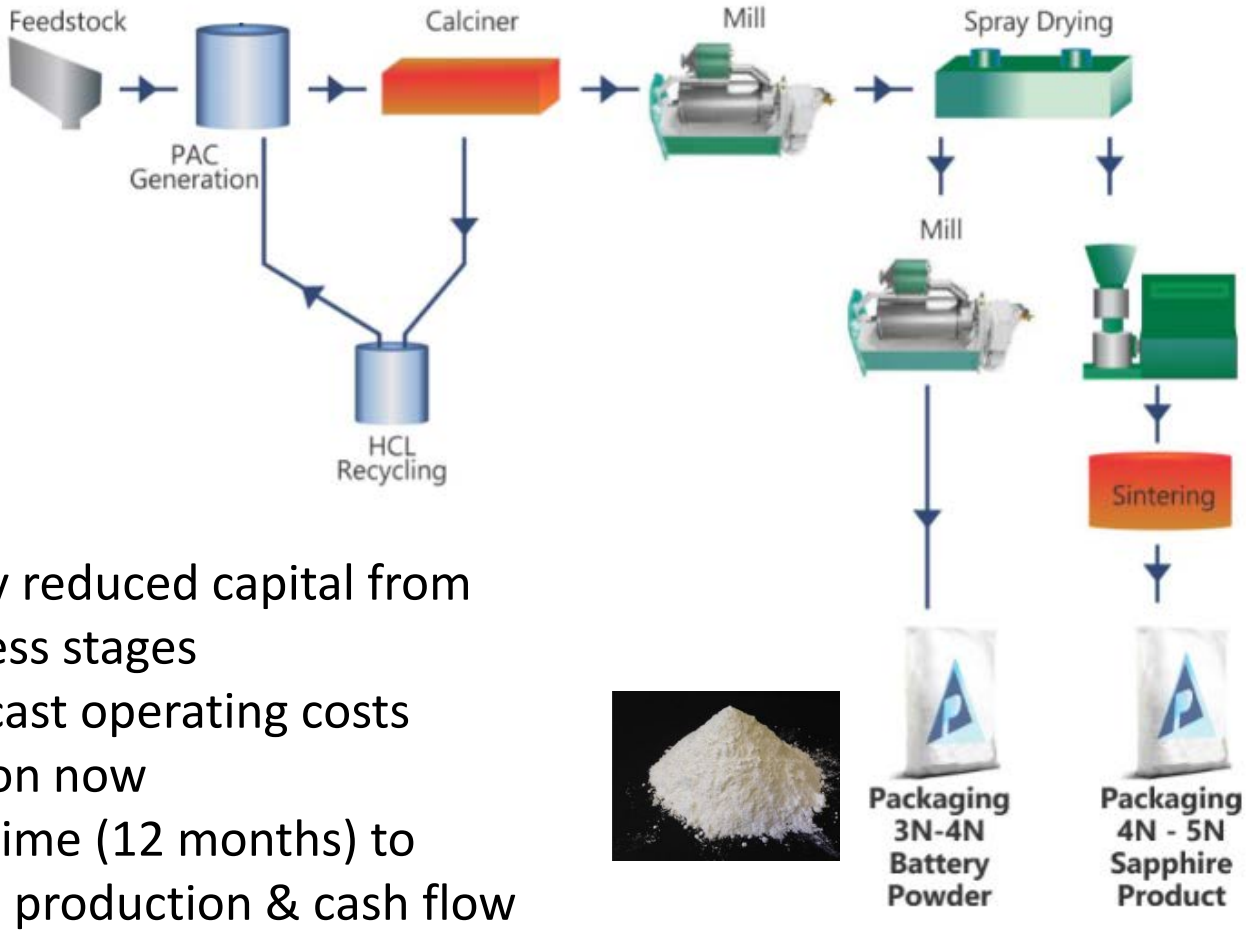
Kaolin Based HPA Manufacturing Process

Capital intensive and complex



Polar's HPA Manufacturing Process

Simple cheaper process



- Significantly reduced capital from fewer process stages
- Lower forecast operating costs
- In production now
- Short lead time (12 months) to commercial production & cash flow
- Low scale-up risk

Polar's Unique IP is Patented

Polar's proprietary HPA process is protected by 2 patents

- The patents are granted in the USA
- Patent applications have been lodged in other jurisdictions and are pending
- Patent protection significantly mitigates risk of competition

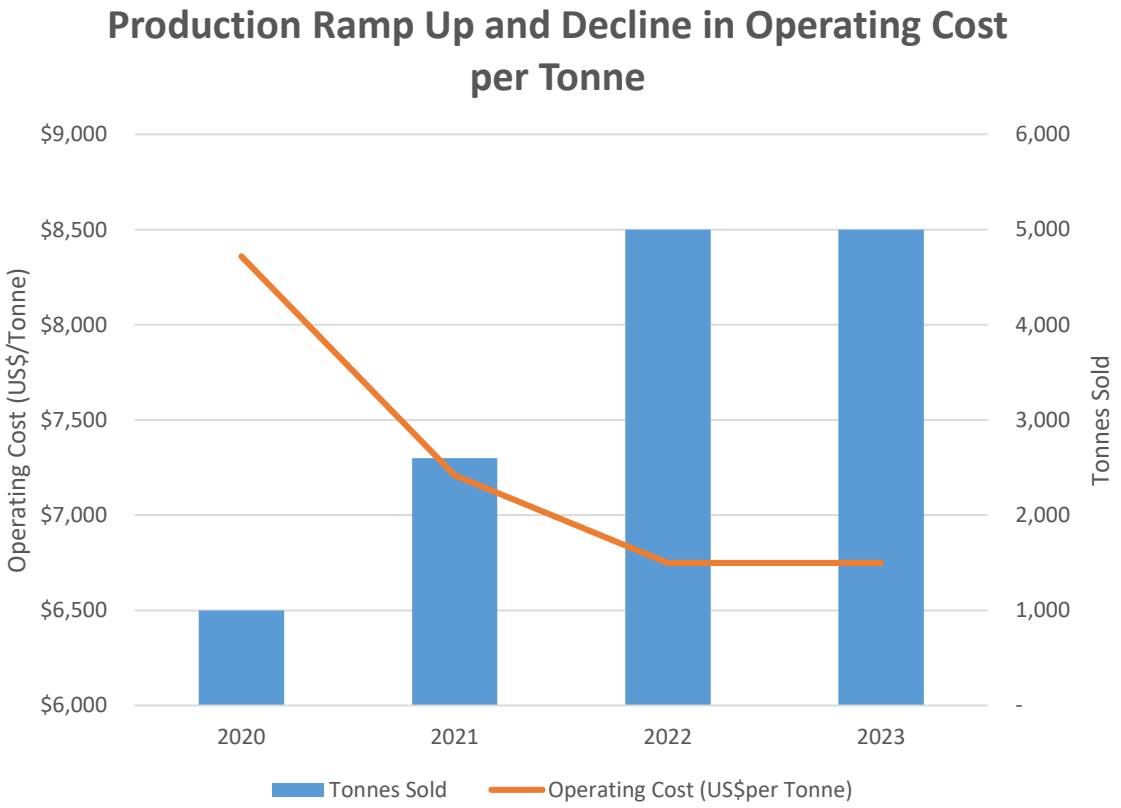
The Transaction Timeline

The indicative transaction timeline is:

- Sign non-Binding Heads of Agreement ✓
- Sign Binding Agreement ✓
- Due Diligence ✓
- Roadshow and Capital Structure — June
- Transaction approvals inc. ASX — July
- Shareholder meeting — Aug
- Transaction Completion — Aug

Sapphire Crystal Boule made from Polar HPA

Strategy Post Transaction



Note: Potential expansion and cost reduction are current expectations only and may change with market conditions

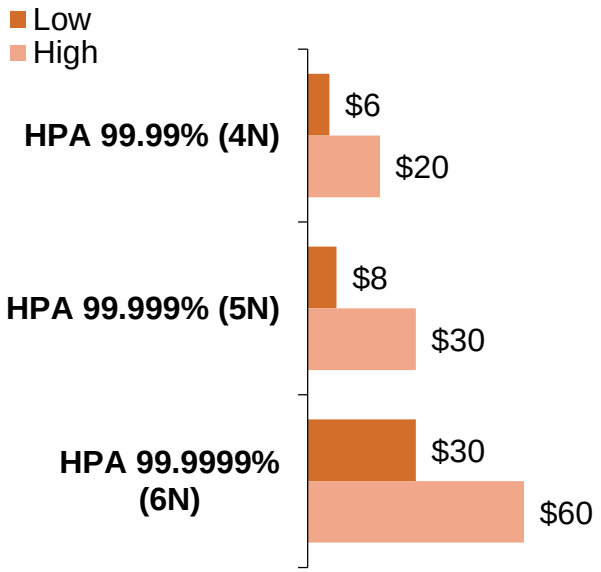
- **Forecast is based on continued expansion of production**
- **Sales volumes are uncertain and may not achieve expectations**

Financial Projections

HPA prices can vary significantly by purity, geography, and customer; Polar is using conservative price assumptions

Pure Alumina is using a conservative price of $20/kg

HPA Price Range by Purity Level (USD $/KG)



Polar – Impact of Pricing per 1,000t of HPA Production

	PRICE	EBITDA
$	10.00	$3.25m
$	15.00	$8.25m
$	**20.00**	**$13.25m**
$	25.00	$18.25m
$	30.00	$23.25m

1. All figures in USD

Source; Polar Sapphire sales and market analysis

Experienced Board

Tom Eadie – Chairman
- 20+ years as Geologist and mining executive

Scott Nichol – Managing Director
- Founder and creator of Polar Sapphire Technology
- 10+ years experience in C-suite roles in manufacturing and solar energy

Martin McFarlane – Non-Executive Director
- 25+ years of resources experience, 8+ years in battery materials
- B.Eng, B.Bus

Wayne Maddever – Non-Executive Director
- Experienced director and manager of technology start ups, Polar founding Director
- pH.D in Metallurgical and Materials Science

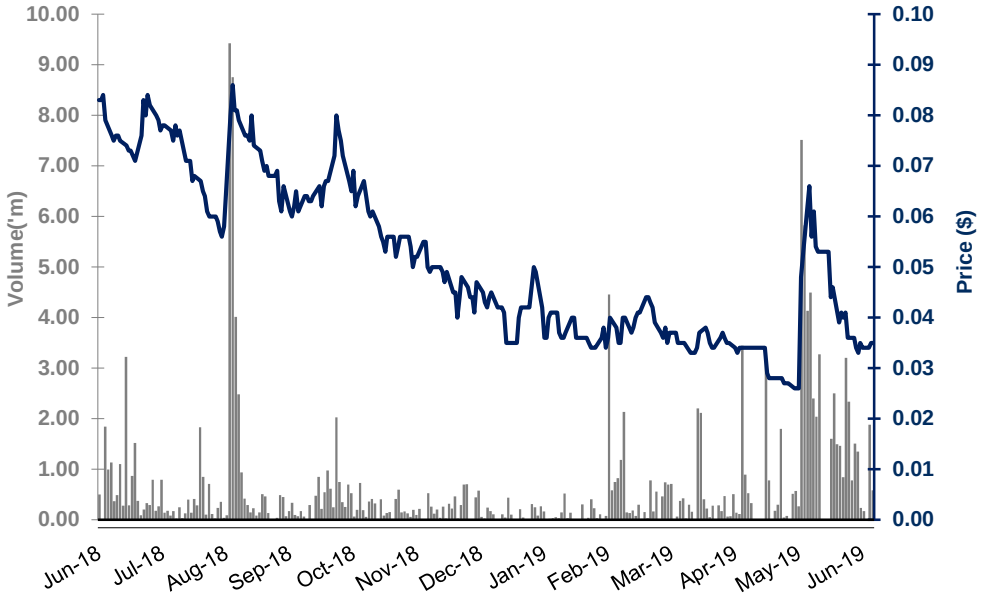
Robert Boston – Non-Executive Director
- 15+ years of mining experience and experienced lawyer
- B.Comm, B.LLB, Grad Dip App.Fin, Dip Man

Tom Rand – Non-Executive Director
- Partner at Arctern Ventures, largest investor in Polar.
- Sits on the board of a number of cleantech companies

Corporate Snapshot

ASX Code: PUA	
Ordinary Shares	221.8m
Listed Options	52.2m
Unlisted Options	29.2m
Market cap (@$0.037)	$8.2m
52 week high-low (A$)	$0.096-$0.026
Cash (12 June 2019)	$1.7m

Share Price Performance and Volume to 12 June



Top Shareholders - 12 June 2019	%
Tolga Kumova	**7.2%**
Thea Management Pty Ltd (Chairman)	**4.1%**
Robert Hallas	**2.0%**
BNP Paribas	**1.6%**
Andrew Brown	**1.4%**
Board and Management (ex Chairman)	**1.9%**
Top 20	**32.4%**

PUA Shareholders Post $30m Capital Raising (at indicative 3.5¢ per share)	%
Existing PUA shareholders	**13.7%**
Existing Polar Sapphire shareholders	**28.4%**
New Shareholders	**57.9%**

A share consolidation may be considered at the time of the capital raising and subsequent shareholder meeting

Polar Sapphire – Capital Structure

Existing shareholdings of Polar Sapphire prior to the proposed acquisition by Pure Alumina

Shareholder	Total Common Shares	Issued Fully Diluted %
Scott Nichol (founder, CEO)	1,800,000	37.0%
Daniel Smith (founder, COO)	100,000	2.1%
YiYi Ventures (private company)	166,666	3.4%
ArcTern Fund I	2,166,666	44.5%
ArcTern SPV VI, L.P.	506,952	10.4%
Others	124,999	2.6%
Total - Shares	4,865,283	100%

- All current shareholders in Polar Sapphire will remain significant shareholders in Pure Alumina
- Supportive shareholder base with high level of knowledge about technology and operations

Intended Use of Proceeds

Intended Use of Funds	Amount
Cash to Polar Shareholders	
VC Preferred Shareholders	$6.5m
Current Management	$2.15m
Other Shareholders	$3.35m
Capex for 1000t per Year Plant	$15m
General Working Capital	$3m
Total	**$30m**

Investment Highlights

1. One of the world's highest quality, lowest cost HPA suppliers
2. CapEx substantially lower than other potential HPA suppliers – near term cash flow positive
3. Rapid market growth and order backlog
4. Compelling valuation and lower risk proposition vs industry peers

Appendix

PURE ALUMINA

Manufacturing Process and Products

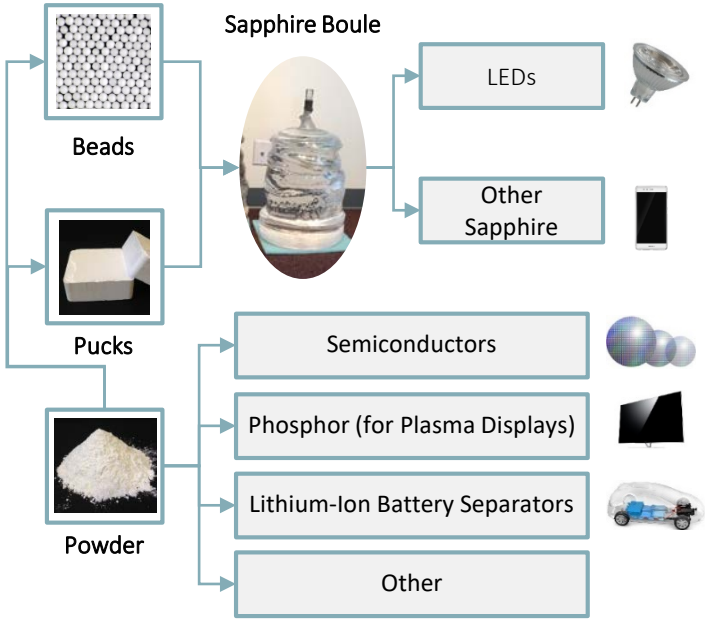
Polar Sapphire's unique HPA production process is protected by patents and custom-made equipment

Polar HPA Manufacturing Process

1. Dissolve aluminum/ore in HCl acid to make PAC
2. Heat and calcinate PAC into alumina powder
3. Mill powder
4. Spray dry powder
5. Press powder into pucks
6. Sinter pucks

- 2 patents granted in US
- Patents pending in China and Canada
- Patents cover manufacturing process
- All equipment is custom-made, and process cannot be replicated with standard equipment

Polar HPA Products and Applications



Execution Plan

Polar Sapphire will initially focus on the large and growing market for HPA in sapphire production (for LEDs and other applications)

Sapphire Market (LEDs and Other Applications)

- Secure letters of intent (LOIs) or contracts with 2-3 potential customers for at least 1 MT/day
- Customers will be offered discounted price on initial orders, incentivizing them to confirm yield benefits at scale and qualify Polar Sapphire HPA with end-users (after which full price will be charged)
- Continue to grow customer pipeline and work with existing companies in pipeline to convert from testing to commercial orders
- Build commercial-scale factory (5,000 MT/year) to satisfy demand, beginning with 3 lines and ramping up to 15 lines, with expansion beyond this based on demand

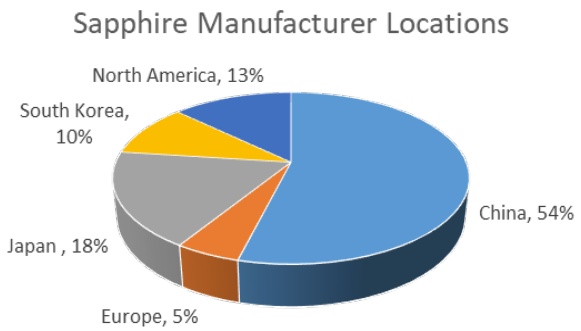
Lithium-Ion Battery Separators

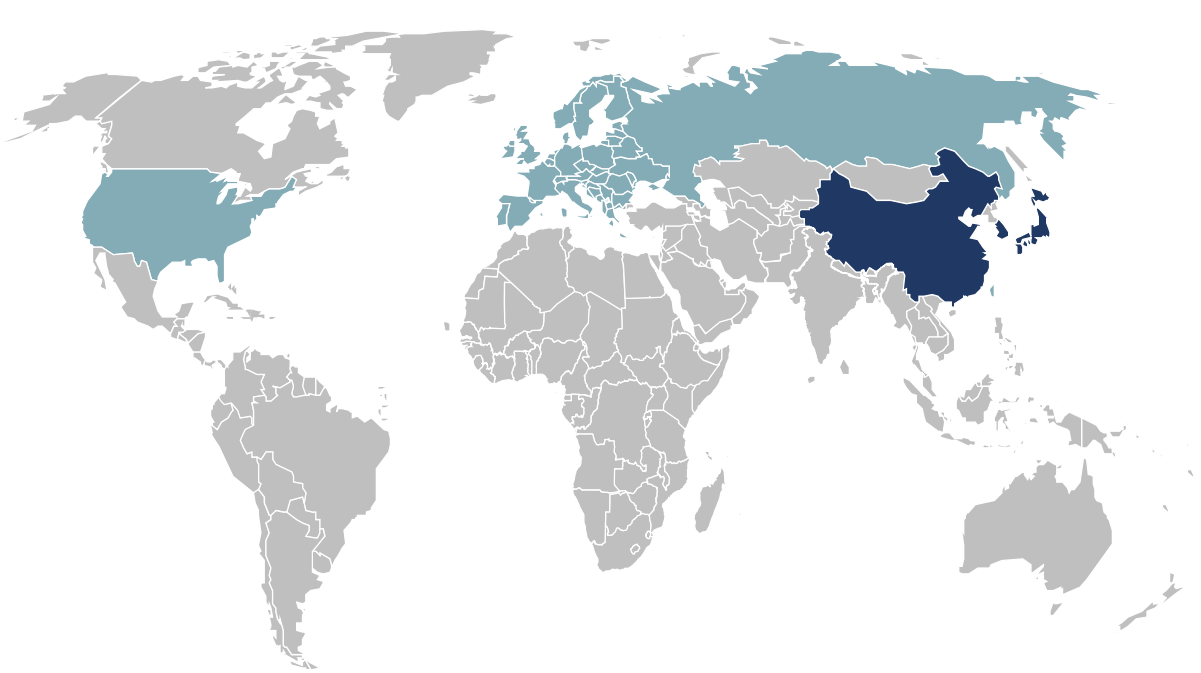
- Research into the development of battery grade HPA for use in lithium ion battery separators is underway
- Technical assistance agreement signed with major separator manufacturer to fast track the development process
- Discussions with separator manufacturers are underway, with initial samples for testing currently being prepared
- Potential to secure grant funding from Canadian government sources to fund R&D

Customer Pipeline

Estimated to be ~70 sapphire manufacturers (main customers) globally, with the majority located in China

- Estimated to be ~70 sapphire manufacturers globally
- Most sapphire manufacturers are located in Asia (China, South Korea, and Japan); 50% est. to be in China
- Other manufacturing locations include Taiwan, Europe, and US



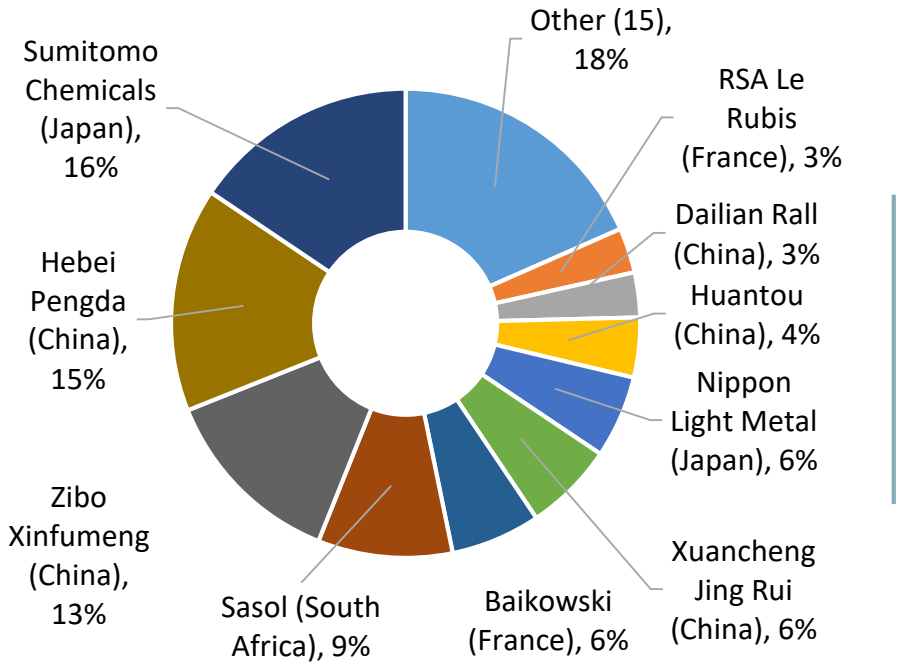


Source: Benchmark Minerals; **Polar Sapphire Analysis**

Competition – Current HPA Producers

There are ~25 HPA producers globally, with the majority of production in Asia

HPA Producers
(Market Share by Volume, Global, 2015)

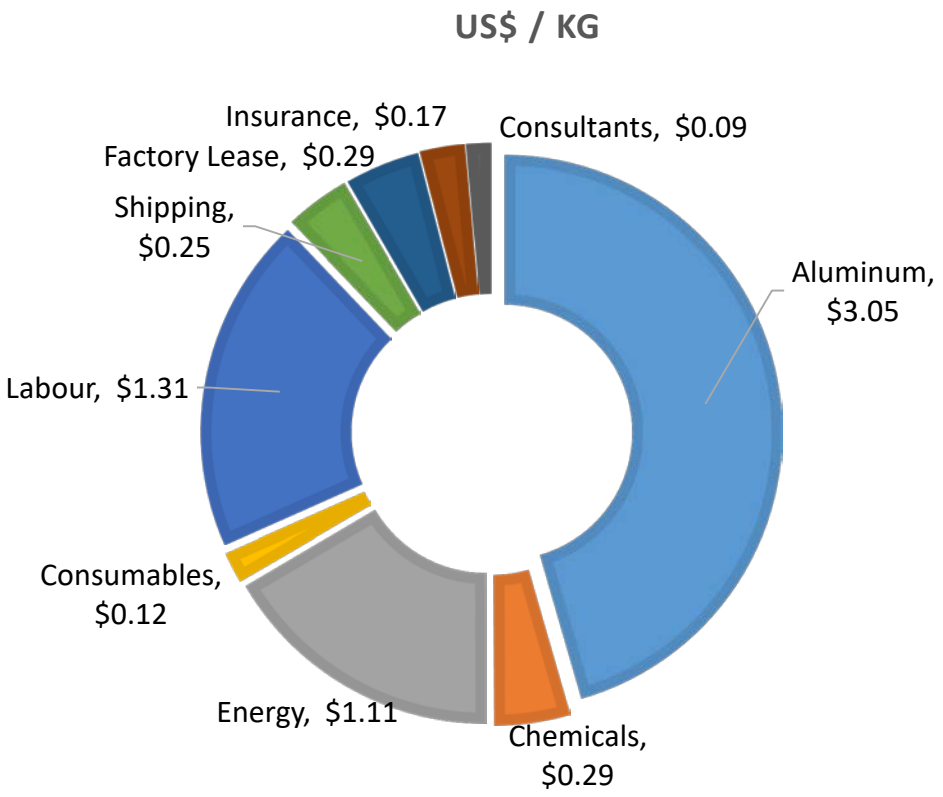


HPA Producers (Tons/Year, Global, 2015)

Company	Country	Tons/Year
Sumitomo Chemicals	Japan	3,020
Hebei Pengda	China	3,000
Zibo Xinfumeng	China	2,500
Sasol	South Africa	1,800
Xuancheng Jing Rui	China	1,200
Baikowski	France	1,200
Nippon Light Metal	Japan	1,100
Huantou	China	800
RSA Le Rubis	France	600
Dailian Rall	China	600
Other (15)	N/A	3,570

Source: Technavio

Polar's HPA – Production Cost



Source: Polar Sapphire Analysis

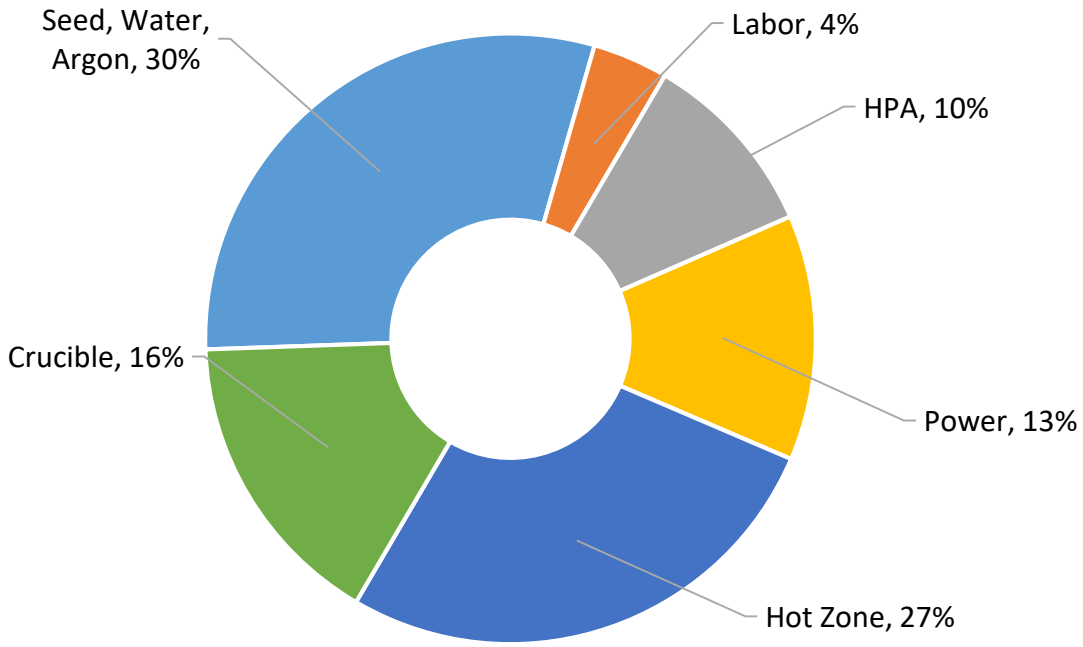
Total estimated cost of production of US$6.70/kg is based on:

- results achieved by Polar Sapphire from operating their Pilot line
- consumables, chemicals, energy costs, lease and labor based on rates in Ontario, Canada
- based on 3,000 tpa HPA production – assumes US$36m capital investment to achieve this capacity
- depreciation estimated at $0.98 USD/kg based on Polar Sapphire estimate
- aluminum prices based on purchases made, cost may vary depending on supplier, purity, volume ordered and market conditions

Sapphire Boule Production Cost

HPA represents ~10% of the total sapphire boule production cost

Sapphire Boule Production Cost Breakdown



Polar Technology Solves Orbite Issues

- Calcining step is a major challenge for all HPA companies that use a hydrochloric acid-based process
- Orbite has not resolved calcining yet and this contributed to their bankruptcy issues
- Polar developed and proved its own calcining technology at its pilot plant, eliminating scale up risk
- Polar's proprietary HPA process has much lower initial and total capex than Orbite's