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HPA Marketing Program

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## Hill End poised to capitalise on surge in demand for high purity alumina

Marketing discussions reveal high purity alumina's (HPA) use in lithium batteries and synthetic sapphire for high-technology is growing rapidly, creating the ideal environment for Hill End's Yendon HPA project

### Key Points

- Discussions with manufacturers of lithium battery separators highlight the huge increases they are making in their production capacity
- Some are in the process of increasing their production by ten times current levels
- Discussions also reveal that around 70% of the new capacity involves making separators which are coated with high-purity alumina, more than double the current percentage
- The combination of these two factors is expected to result in additional demand for HPA equal to many times the 8,000tpa which Hill End aims to produce at its Yendon HPA project in Victoria (*see ASX release dated 14 June 2018*)\*
- HPA demand also set to rise sharply on the back of its role in the production of synthetic sapphire, which has a rapidly growing number of high-technology applications
- Strong consumer interest in Hill End's planned development of a commercial-scale demonstration plant to enable it to tailor its products to meet customer requirements

Hill End Gold (ASX: HEG) is pleased to report on the highly favourable findings of its recent round of global marketing discussions for the high purity alumina which will be produced at its Yendon HPA Project in Victoria.

Company representatives attended the China International Optoelectronics Expo in Shenzhen and the North American Battery Show in Detroit. They also held meetings in China and the US with battery separator manufacturers and synthetic sapphire growers.

The key conclusions drawn from these conferences and meetings were:

- Lithium battery separator manufacturers are investing heavily in new production capacity. This will see them increase production by 5 to 10 times their current levels. The timing of the increases will be staged over the next five years in line with each company's expectation of the growth in the electric vehicle market.
- Compounding the HPA demand growth rate from new battery separator production capacity will be the fact that 70% of the new capacity is being set up to be coated with HPA. This compares with less than 30% today and will be driven by the improved safety and performance offered by the technology.
- Of particular importance for Hill End is that this increase in separator production, combined with the higher percentage which will be HPA-coated, will result in new HPA demand which is many times the planned 8,000tpa of HPA that will be produced at the Yendon HPA project. By way of example, one Chinese battery separator plant under construction, which was visited by HEG representatives, will require 16,000tpa of HPA.
- Hill End is now in the process of negotiating a "Technical Assistance" agreement with one of China's largest separator manufacturers. Having a close technical relationship with such a firm will provide significant benefits for streamlining the process of understanding the issues important for their processes and the marketing of Hill End's HPA product.
- Lithium batteries for home and grid scale energy storage systems are becoming increasingly important to manage the variable generation capacities of renewable energy systems further driving demand for HPA coated separators.

Separator manufacturers showed strong interest in Hill End's Yendon HPA project, with Company representatives receiving requests from three manufacturers for samples to undertake initial testing to determine how Yendon's product would work in their process.

A key issue for the separator market is the physical properties of the HPA. Hill End will be undertaking the test work to produce a product that meets the physical requirements and envision being in a position to supply test samples early next year.

### Synthetic Sapphire

Demand for synthetic sapphire is still growing strongly on the back of the LED market. Demand from the optical industries is also increasing significantly for laser lenses and scientific equipment.



20 inch Sapphire boule to be cut and polished for space research lens

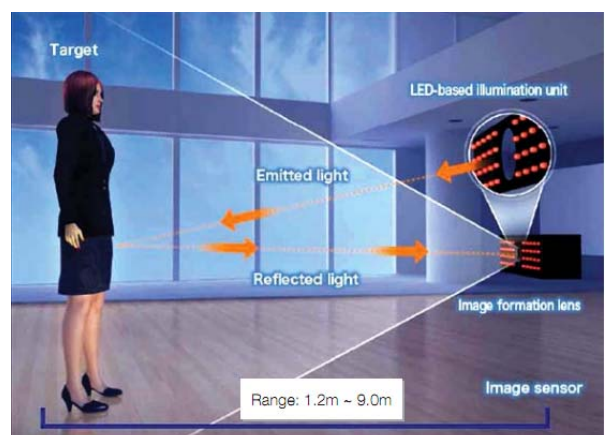
A potential new area of growth for the sapphire market is in “Time of Flight” (ToF) applications. Time of Flight technology provides very accurate 3D imaging by measuring the time taken for light to travel from a sensor to an object and back. The use of light for this technology is relatively new, but is being taken up very quickly in a number of areas:

- LiDAR applications, that detect objects in the vicinity of a sensor, such as in cars and autonomous driving vehicles.
- Gesture applications, where bodily movements direct commands, such as hand gestures to control gaming consoles, computers and home automation.
- Face recognition technology, such as the iPhoneX and Vivo



Sapphire has two significant uses in this technology:

- Infra-red light is used to minimize the impact of background light. Sapphire has the best optical performance for this wavelength of light
- The lenses of ToF sensors need to be free from imperfections and damage. Scratch resistant sapphire significantly reduces the risk of incorrect readings caused by a damaged lens



In conclusion, the main findings from Hill End's latest marketing efforts are:

- There are significant expansions underway in the production of HPA-coated battery separators;
- Growth in the uses for synthetic sapphire is continuing, with its unique physical and optical qualities making it ideal for new technologies;
- There is significant interest in Hill End's Yendon HPA project to meet the growth in demand for HPA;
- Hill End's strategy of developing a demonstration plant was very welcome. As the process path hasn't been proven at a commercial scale, HPA buyers see significant value in showing the project is scalable and to have commercial volumes available to the market.

Hill End Managing Director Martin McFarlane said that it was clear that the additional HPA produced by our Yendon project would be needed to meet the growing demand from the lithium battery and sapphire markets.

"The extremely strong response we have received from HPA customers confirms our view that Yendon has an outstanding future based on its world-class resource and demand for the end product," Mr McFarlane said.

Martin McFarlane  
Managing Director

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**\* PFS Risks and Assumptions**

Refer to announcement titled, "PFS Results," dated 14 June 2018. HEG confirms that all material assumptions and risks underpinning the pre-feasibility study continue to apply and have not materially changed.

Risk includes, Resource, Technology, Market, Permitting and Financing Risk. HEGL currently does not have sufficient funds to construct and commission the Yendon HPA project. Due to the strong economic results from the PFS, HEGL believes there are reasonable grounds to expect that sufficient funding will be available to finance the A\$271M capital development cost of the project. A number of funding sources may be available to HEGL, including but not limited to: access to debt finance facilities; access to equity funding from capital markets; and funding from other sources such as potential off-take agreements, equipment suppliers and / or government business development financing. Securing funding is not normally contemplated at the PFS stage of a project. HEGL's funding requirements depend on numerous factors, including the completion of a Definitive Feasibility Study.