



## Greenvale Energy Limited Update Alpha Project MDL/330

**ASX Release  
29 June 2017**

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### Key Points

- Review of the Company's test work data on the Alpha torbanite oil shale shows a bitumen-based product mix is potentially the best economic option for development.
- Alpha oil shale is a viable indigenous source of bitumen, potentially a replacement for imported heavy crude oils in the Australian bitumen market.
- The spent shale, after retorting is potentially marketable as an activated carbon product.
- New Scoping study planned to be undertaken to review an open cut mining operation with development options concentrating on bitumen with activated carbon and fuel oil as additional products.
- New Digital Terrain Model and a programme of infill drilling is being designed to upgrade the resource from an Exploration Target to a JORC 2012 Standard Reserve.

### Background

The Alpha deposit is located approximately 62km south of Alpha, a small farming town in Central Queensland and has been held by the Company's subsidiary Alpha Resource Pty Ltd since 1979.

Research in the company's technical records show that the original objective of developing the Alpha oil shale on a relatively small scale, targeting the production of gasoline and diesel fuel products on-site for consumption in the local area was uneconomic. Accordingly, new directions for marketable products were investigated.

The 1987 Coal and Carbon Industries (CCI) of Melbourne study commissioned by Alpha used a (then) new type of retort technology and the samples of torbanite processed provided mass balance data with a product mix of 59% Asphaltines (bitumen) and 40% fuels (Petrol, diesel and kerosene)

The above figures suggested that a bitumen-based product mix was a better value-added combination rather than a solely a fuel-based product mix; the latter being the traditional option for most oil shale ventures in the 19th Century and 20th Century

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Subsequently, additional studies, in particular, CSIRO (1988), Madre (1990) and Centre for Applied Energy Research, Lexington, USA (1994) focused on an open cut mining operation with production of around 200,000 tonnes per annum of oil shale with bitumen-dominated final product mix plus the potential use of spent shale as an activated carbon. The latter is a significant value-added product that could add substantially to the potential revenue stream.

Work on the project was effectively suspended in the late 1990s due to market conditions and the relative remoteness of the project, which made transport, costs prohibitive. The Alpha project area was subsequently reclassified from an Exploration licence to Mineral Development licence (MDL) that recognises the resource potential under more favourable economic conditions.

### Resource Studies

Further to the Company's announcement (refer to announcement dated 9 January 2017 and March 2017 Quarterly activities report), the ground GPS survey undertaken by the Company in January and February, 2017 met its objectives of identifying:

- the details of proximal permanent survey benchmarks that could be used for future surveying programs and
- surface features that demonstrate significant error in the old survey information that required correction.

Although the tie-in of the modern survey and historical survey proved to be more difficult than envisaged a new Digital Terrain Model (DTM), updated topographic map were established that can be used for future resource modelling.

Survey information is likely to be insufficient to provide a Resource statement but the accurate relocation of the historical drill-holes will allow the design of a new systematic in-fill drill program to prove up the deposit to a JORC standard. A new deposit model will be used for the intended scoping and utilisation studies

### Scoping and Utilisation Studies

The review of the Company's historical data shows that the Alpha torbanite (the richest oil shale known) can be refined to 59% asphaltines (bitumen) and 40% fuels (petrol, diesel and kerosene). The 1987 Coal and Carbon Industries (CCI) of Melbourne study commissioned by Alpha provided mass balance data with a product mix of:

- 14.3% petroleum,
- 7.3% kerosene,
- 19.5% diesel and
- 58.9% asphaltines.

Subsequently, additional research and development projects were undertaken on the Alpha oil shale to determine its properties at the Center of Applied Energy Research (CAER) at University of Kentucky. Lexington (USA), Northlake Industries (Utah. USA), CSIRO (Lucas Heights) and the University of Wollongong. In particular, CSIRO (1988 Oil yields)) Madre (1990 Open Cut Study), and CAER (1994 Activated carbon) focused on an open cut mining operation with production of around 200,000 tonnes per annum, with bitumen-dominated product mix and the potential use of spent shale as activated carbon. The latter would potentially provide a significant value-added product and a substantial addition to the revenue stream.

Studies at the CSIRO showed that oil from Alpha torbanite has a significant fraction that could be a source of commercial bitumen. The study commissioned by Alpha showed retorting using CCI technology produced 2.5 barrels of bitumen per tonne of torbanite, as noted above approximately 59% of the total products. These figures show that torbanite is probably much better shale for bitumen production than other Australian Tertiary shales

The Activated carbon studies undertaken at the CAER, University of Kentucky USA showed the Alpha torbanite spent shale has comparable adsorption properties to commercial activated carbons. Alpha torbanite spent shale adsorbed less nitrogen oxide and ammonia than commercial activated carbons but adsorbed more hydrogen sulphide. The test work calculations showed that for each tonne of average grade torbanite the residue obtained after pyrolysis and steam pyrolysis constitutes 23% of the original torbanite. Yielding approximately 230 kgs of activated carbon per tonne of torbanite.

The unique quality of Alpha oil shale therefore has the potential to be used in diverse applications such as:

- a source of bitumen
- a source of activated carbon
- a chemical reductant (replacing fuel oil) in smelting (including nickel processing)
- a source of oil products, petroleum/diesel/ kerosene

Consequently, it is proposed to undertake a desktop scoping study that can examine these utilisation options in detail and encompass:

- resource modelling with the new topography and DTM
- overall pit design, dump and drainage design options and potential mining schedule
- analysis of mining options and costs
- concentrate on the direct use of the rock as an industrial material and as a source of bitumen.

In addition, studies will be undertaken to examine the potential of bitumen derived from the Alpha oil shale in the Central Queensland infrastructure development regional economy in the future and the use and sale of activated carbon products.

## **Market Research 2017**

A brief review of the Australian bitumen industry shows that Australia has a road network of 800,000 kms of which about 310,000 kms is surfaced and more than 90% of the surfaced roads are sprayed seal roads (bituminous binded).

There are around 120 asphalt (bitumen) plants across Australia ranging from small plants of 30 to 40 tonnes per hour capacity to new large 300 to 400 tonnes per hour plants.

The prices for bitumen have corrected moderately following the drop-in oil prices. The prices for Class 170 bitumen in Australia have dipped from AUD 1,100 per tonne to AUD 900 per tonne in the last 2 years.

As seen from Figure 1 below, bitumen sales in Australia has witnessed a decline in the recent past and stood at 468 Million Litres (ML) in 2014-15. However, the trend is expected to reverse as Australian government has planned a number of infrastructure projects in the next 2-3 years.

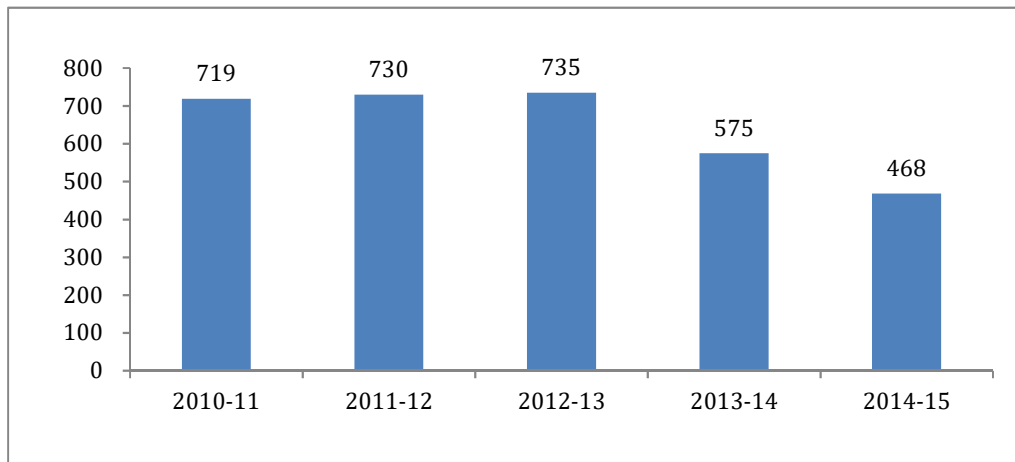


Figure 1: Bitumen Sales Australia

*Source: Viva Energy, BREE (Australia), VicRoads, Australian Petroleum Statistics*

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#### **Competent Person Statement**

The information in this announcement is based on and fairly represents information and supporting documentation prepared by Mr Michael Povey, C.Eng M.Sc a Competent Person who is a Member of The Australasian Institute of Mining and Metallurgy and a Non-Executive director of Greenvale Energy Limited. Mr Povey accessed archived data, technical information and reports (internal and external) on test work and studies on the Alpha Oil shale, its properties and exploitation that was undertaken by the Company between the period 1979 to 1997.

Mr. Povey consents to the inclusion in this announcement of the matters based on his information in the form and context in which it appears.