Greenvale Energy Limited

Update on Alpha Resources Activities

ASX Release

29 April 2019

Highlights

- SRK continue to review radio frequency microwave simulations and re-assessing estimated production levels focussed on the lower seam.

- SRK has independently determined a Petroleum Resource Management System (PRMS, 2007) un-risked in situ Prospective Resource for the Alpha deposit.

- SRK has estimated the potential extractable oil for the Alpha Deposit lower seam based on a field development plan comprising proposed well paths intersecting the lower seam. The recoverable oil estimate ranges from a low of 9.2 MMBls to a high of 21.6 MMBls with a best estimate of 15.4 MMBls of extractable oil.

- The next step is to look at a Contingent Resource estimation by gaining an understanding of the lower seam torbanite and cannel coal oil extractability.

Greenvale Energy Limited (ASX: GRV) is pleased to provide the following update on its activities for the Alpha Project

Overview

The Alpha Oil Shale Project is located about 50 km south of the town of Alpha, Queensland. Hutton (1996) recognised the Alpha oil shale deposit as one of the smaller deposits with respect to total resources, but the very high yields from the torbanite compensate for this. On a weight for weight basis, one tonne of Alpha torbanite produces at least four times the volume of oil from one tonne of Rundle or Stuart oil shale and at least seven times the oil from one tonne of Julia Creek oil shale. One tonne of cannel coal produces approximately the same volume of oil as one tonne of Rundle or Stuart oil shale and slightly more oil than one tonne of Julia Creek oil shale.

The Alpha Oil Shale deposit consists of two seams: an upper seam of cannel coal and a lower seam of cannel coal containing a lens of torbanite. Alpha deposit consists of an upper cannel coal seam with an average thickness of 1.12 m and lower cannel coal seam with a torbanite lens, with an average thickness of up 1.9 m. The torbanite has high oil shale yield resulting from the accumulation of algal remains. Cannel coal is another type of oil shale derived from the accumulation of plant remains and the source of the oil is from preserved spores, plant resin and cuticles.

In situ production has the potential to significantly lower production costs as it will mean there is no need to mine the shale.

SRK is assessing the applicability of in situ Radio Frequency (RF) microwave stimulation to produce oil from the lower seam comprising cannel coal and the Alpha Torbanite. The suitability of the RF stimulation to produce hydrocarbons from the torbanite is assessed in the literature however the applicability of RF extraction from the cannel coal is not established.

SRK has reviewed the technology from historical reports and the process looks promising to produce oil at a low cost. SRK has scanned and captured all the available historic project data, assessed the available magnetic data and identified the key well logs, SRK understands from the reports that the exploration already completed is sufficient to define the basic resource potential at the Alpha oil shale project. Further additions are possible however the extent of the defined torbanite appears localised within MDL330. Other torbanite bodies may be located by regional exploration. The continuity of the torbanite (telalginite) layer in the cannel coal varies in thickness however it comprises a mappable layer based on the available data.

SRK has independently determined a Petroleum Resource Management System (PRMS, 2007) unrisked in situ Prospective Resource for the Alpha deposit. The current estimates of oil shale associated with the Alpha deposit are presented in Table 1. From the table about half the oil extractable by Fischer Assay is derived from torbanite and about half from Cannel coal and the torbanite mainly occurs in the shallower buried part of the deposit.

Table 1: Low, Mid (most likely) and High estimated in situ oil volumes, and overburden depths of the Alpha Project Cannel Coal and Torbanite within MDL330 as at 20 March 2018

Depth of overburden (m)·	Area·(km^2)		Lower Seam			Upper Seam Mid (Bbls)
	Lower	Upper	Oil Mid (Bbls)	Cannel coal Mid (Bbls)	Torbanite Mid (Bbls)	
0-25	2.76	0.00	15,263,688	3,845,353	11,418,334	0
25-50	2.85	1.63	10,396,342	7,311,048	3,085,293	1,806,633
50-70	2.00	0.23	3,466,120	3,190,833	275,288	496,983
75-100	1.10	0.16	1,921,683	1,921,683	0	94,479

Lower Seam			Upper Seam (Bbls)	Estimated volumes		
Oil Mid (Bbls)	Cannel coal (Bbls)	Torbanite (Bbls)		Low (MMBbls)	Mid (MMBbl)s	High (MMBbls)
31,047,832	16,268,917	14,778,915	2,395,095	25.1	33.4	50.2
Estimated in situ Total Mid Resource MDL330			33,442,928	Bbls		

Note: In situ - No losses or recovery factors applied - Source: SRK

Much historical pyrolysis data is available for oil shales and this information looks applicable to the Alpha deposit. Hydrous pyrolysis experiments using Green River shale have demonstrated products much more like natural petroleum than produced by conventional shale oil retorting. Slower heating rates and increased pressure generate more petroleum-like shale oil. Slow generation over a 12-month period requires very little RF energy input once the initial heating of the kerogen has been achieved, usually in the first one to three months. Burnham (2003) reported the effect of heating rate and pressure on oil yields showing that slower heating at higher pressures increased Fischer oil yields significantly.

Raw oil shale has very little permeability, both because it is a fine-grained rock and because organic matter (kerogen) to some extent is a pore filling material. Consequently, external reactants or heating fluids cannot penetrate very far. However, the low permeability is not a significant constraint for escape of generated product. Under normal high temperature retorting, the gas and oil vapours, which have a volume much greater than the kerogen from which they are formed, escape readily through the porosity generated by the kerogen conversion. Under natural petroleum generation conditions, oil and gas are in a single fluid phase, and the excess volume generated is too small to expel much of the generated fluid. However, the additional porosity formed is greater than can be withstood by the lithostatic overburden, so the rock compacts and expels the fluid. If the permeability is insufficient to expel the oil and gas at the rate it is expelled, the rock fractures and releases the product via high-permeability cracks (Burnham, 2003).

Bridges et al (1988) described the net energy recoveries for the in situ dielectric heating of oil shale. They estimated net energy recovery factors of 0.3 to 0.5 for commercial RF in situ heating. Because energy is used to run the RF process the net energy recovery factor also needs to be considered. Based on all the available data SRK considers a net energy recovery of 0.5 is applicable to insitu production. High recoveries where liberated gas may potentially be used to power the microwave generation in the most efficient recovery process, could mean recoveries up to 0.7 are achievable.

SRK has reviewed the Alpha Deposit mapping for the in situ production plan. The topography and drill holes covering the Alpha deposit are shown on Figure 1. A proposed field development plan (FDP) is presented in Figure 1. The measured oil yields from the Alpha deposit lower seam are shown in Figure 2. Modified Fischer assays for 145 ply samples of torbanite from 28 holes gave values ranging from 200 to 650 litres per tonne (l/tonne) with an average of 420 l/tonne. The average yield is almost 3 barrels of oil per tonne of shale.

The lower seam structure contours showing depth of burial to the top of the lower seam increasing to the southwest in MDL 330 are shown in Figure 3.

A proposed lateral well FDP to determine the production that can potentially be achieved from the defined Resource is shown in Figure 4 and Figure 5. Figure 4 shows the lower seam isopach (m) and Figure 5 the oil yield based on Fisher assays (l/tonne).

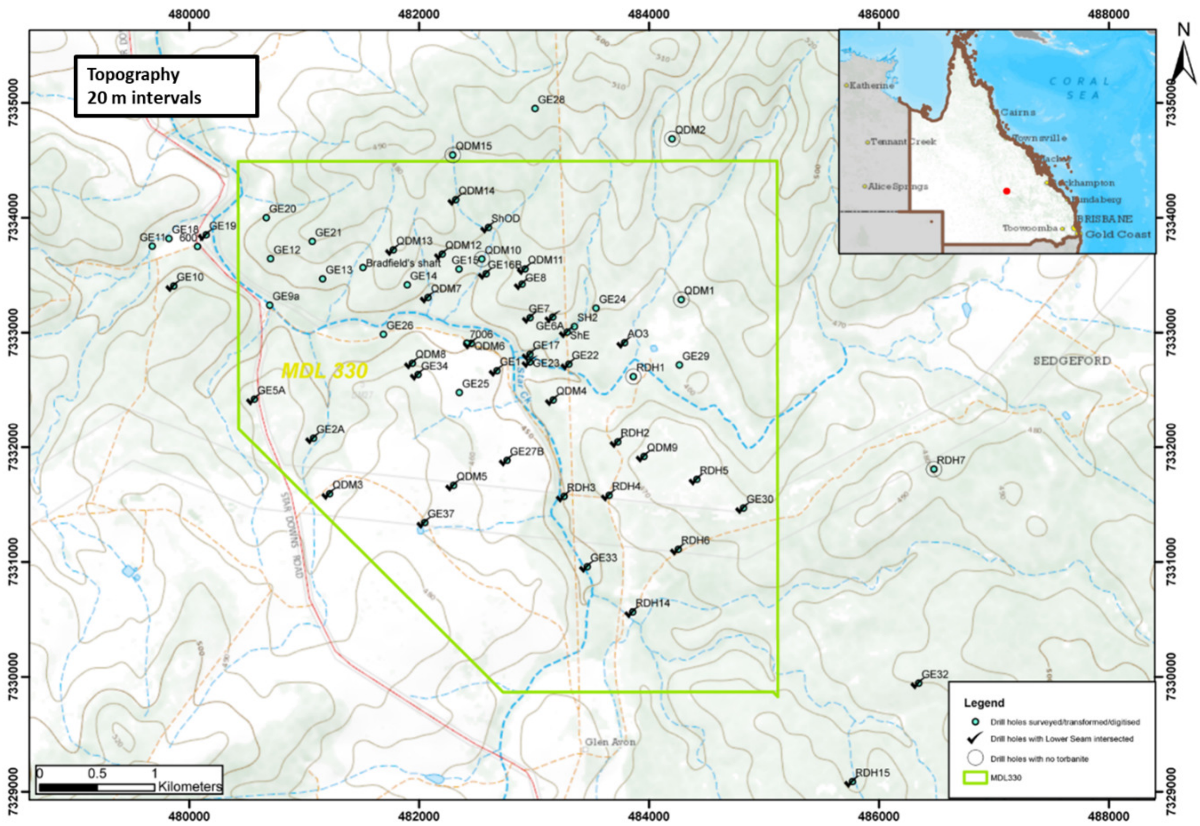

Figure 1: **Topographic data covering the Alpha torbanite deposit**

Source: SRK

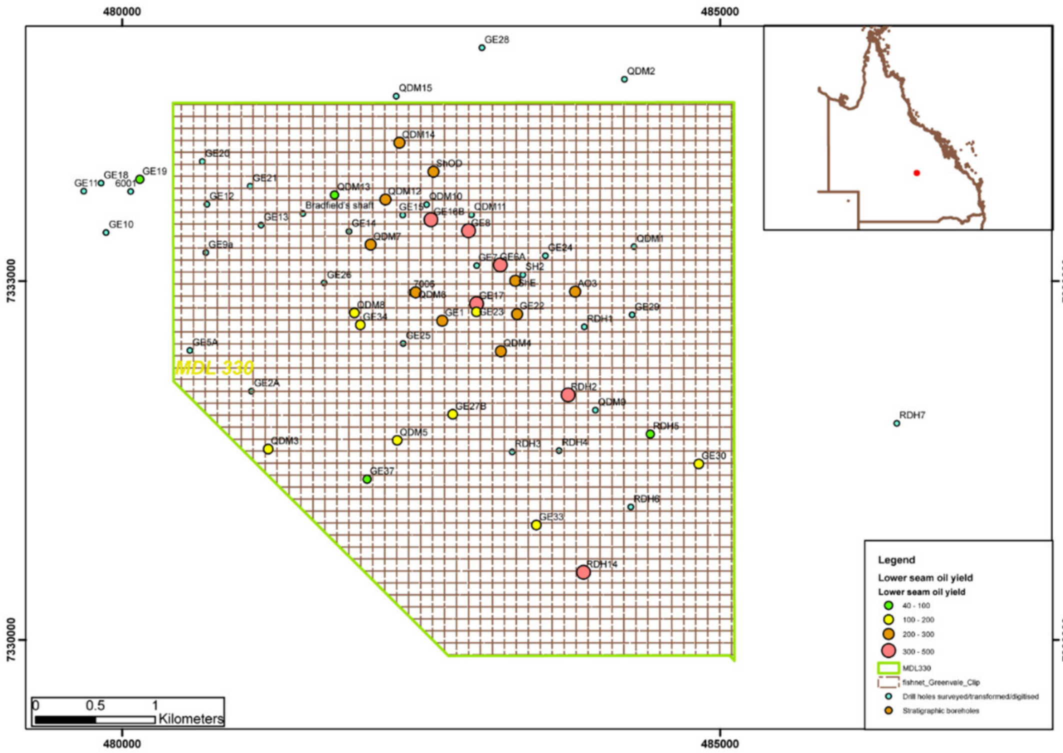

Figure 2: Measured oil yields from drillholes in the Alpha torbanite deposit lower seam
Source: SRK

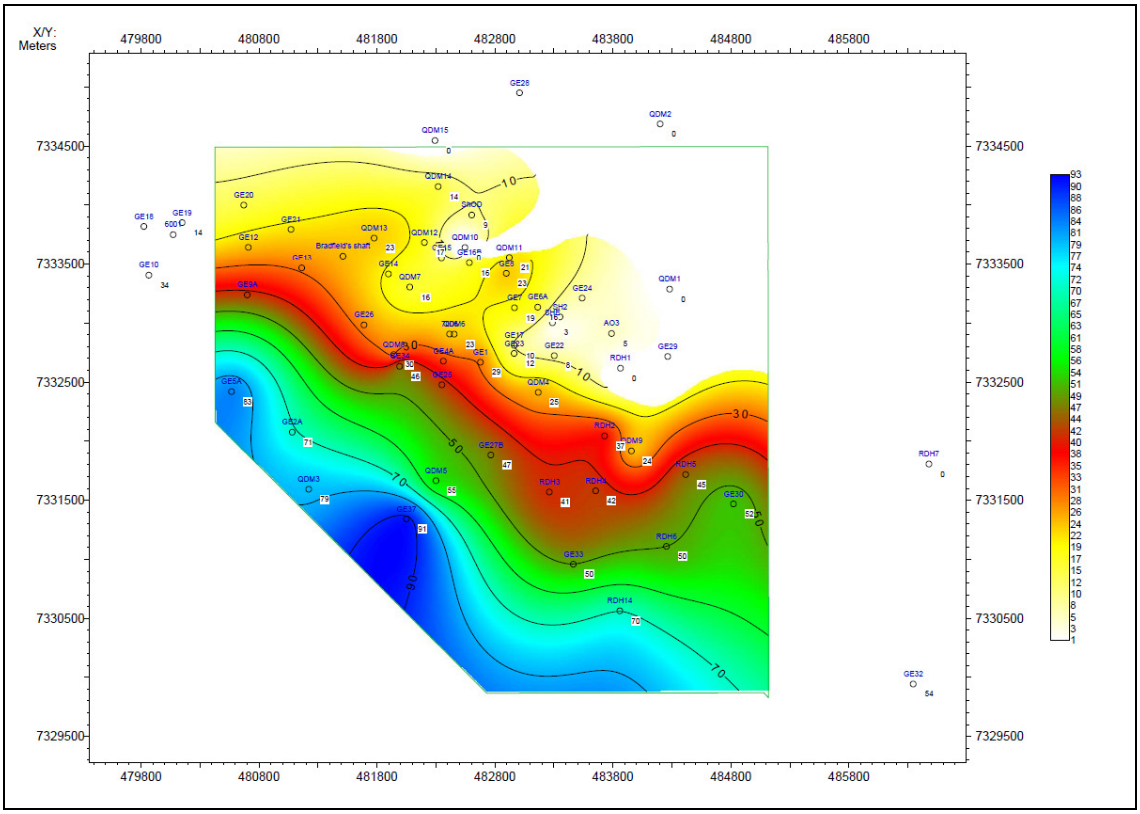

Figure 3: The lower seam structure contours showing depth of burial to the top of the lower seam in MDL 330
Source SRK

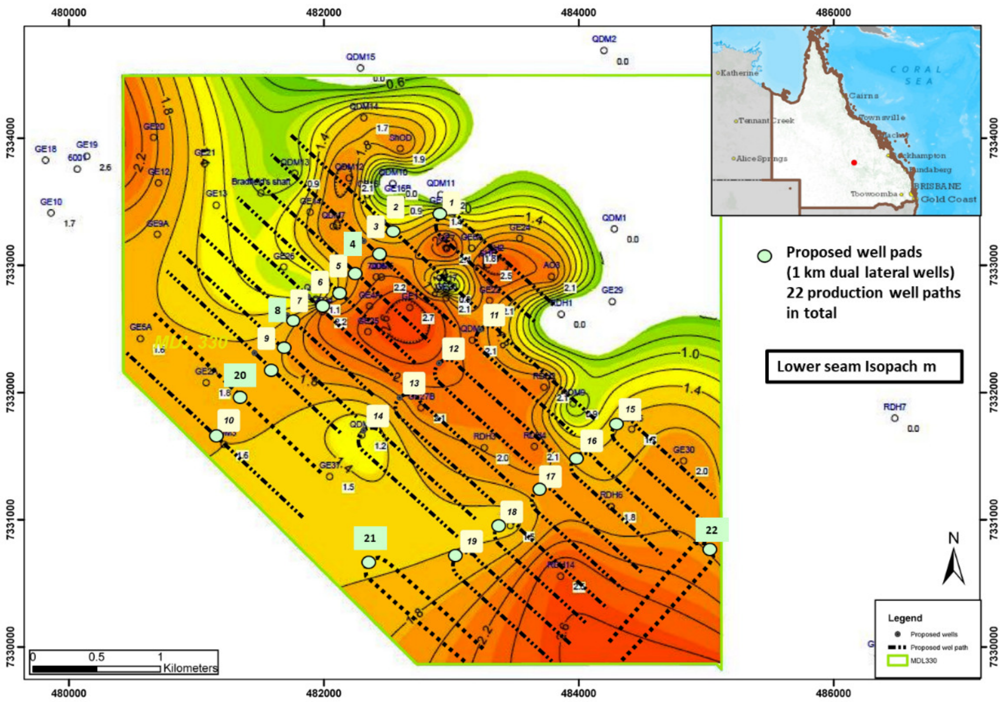

Figure 4: **FDP proposed wells (22 in total) overlain on a lower seam isopach map**
Source: SRK

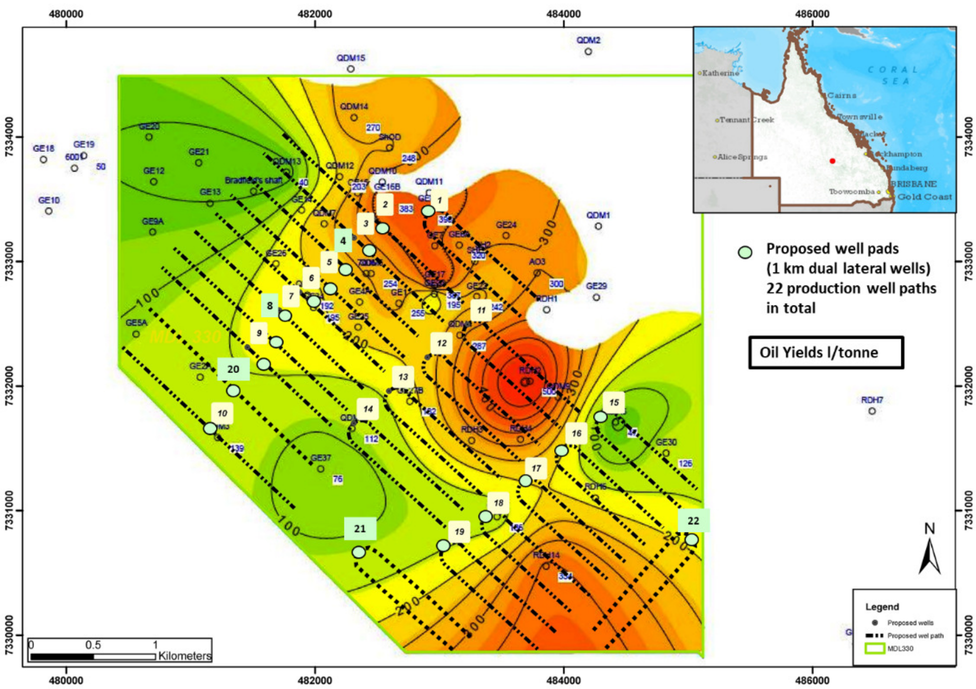

Figure 5: **Proposed FDP to review the potential for extractable oil resources in MDL330 overlain on oil yield map (l/tonne)**
Source: SRK

Based on the proposed FDP SRK has estimated the potential extractable oil for the Alpha Deposit lower seam for each of the proposed well paths intersecting the lower seam (Table 2).

Table 2: Oil Resource Estimates for the 22 proposed FDP well paths
Source SRK

Well ID	Length	EUR drainage	Area m^2	Thickness m	Relative density g/cc	Oil yield L/tonne	OOIP Bbls	OOIP MMbbls	Estimated Recoverable Oil MMBbls		
									Low	Best	High
1	2000	200	400,000	1.9	1.4	310	2,074,631.1	2.07	0.62	**1.04**	1.45
2	2000	200	400,000	2.0	1.4	280	1,972,484.6	1.97	0.59	**0.99**	1.38
3	2000	200	400,000	1.9	1.4	250	1,673,089.6	1.67	0.50	**0.84**	1.17
4	2000	200	400,000	2.2	1.4	230	1,782,280.7	1.78	0.53	**0.89**	1.25
5	2000	200	400,000	2.0	1.4	220	1,549,809.3	1.55	0.46	**0.77**	1.08
6	2000	200	400,000	2.1	1.4	200	1,479,363.4	1.48	0.44	**0.74**	1.04
7	2000	200	400,000	1.7	1.4	190	1,137,700.9	1.14	0.34	**0.57**	0.80
8	2000	200	400,000	1.6	1.4	170	958,063.9	0.96	0.29	**0.48**	0.67
9	2000	200	400,000	1.7	1.4	160	958,063.9	0.96	0.29	**0.48**	0.67
10	2000	200	400,000	1.6	1.4	130	732,637.1	0.73	0.22	**0.37**	0.51
11	2000	200	400,000	2.0	1.4	390	2,747,389.3	2.75	0.82	**1.37**	1.92
12	2000	200	400,000	2.1	1.4	340	2,514,917.9	2.51	0.75	**1.26**	1.76
13	2000	200	400,000	2.0	1.4	280	1,972,484.6	1.97	0.59	**0.99**	1.38
14	2000	200	400,000	1.5	1.4	180	951,019.4	0.95	0.29	**0.48**	0.67
15	2000	200	400,000	2.0	1.4	110	774,904.7	0.77	0.23	**0.39**	0.54
16	2000	200	400,000	1.8	1.4	140	887,618.1	0.89	0.27	**0.44**	0.62
17	2000	200	400,000	2.2	1.4	260	2,014,752.1	2.01	0.60	**1.01**	1.41
18	2000	200	400,000	2.2	1.4	300	2,324,714.0	2.32	0.70	**1.16**	1.63
19	2000	200	400,000	2.2	1.4	300	2,324,714.0	2.32	0.70	**1.16**	1.63
20	2000	200	400,000	2.0	1.4	120	845,350.5	0.85	0.25	**0.42**	0.59
21	2000	200	400,000	1.8	1.4	200	1,268,025.8	1.27	0.38	**0.63**	0.89
22	2000	200	400,000	2.4	1.4	300	2,536,051.6	2.54	0.76	**1.27**	1.78

The total potential production from the plan is shown in Table 3. SRK not that the original oil in place is based on kerogen content, the oil not being present in liquid form until heated. The likely characteristics of the lateral well FDP should enable most of the in situ potential hydrocarbons to be drained via a reasonable number of lateral wells (currently estimated at 22).

Table 3: Total potential production from the proposed FDP Alpha Deposit lower seam MDL 330

	OOIP Bbls	OOIP MMbbls	Estimated Recoverable Oil MMBbls		
			Low	Best	High
Total Production	30,830,638.7	30.8	9.2	**15.4**	21.6

OOIP – original oil in place (in the form of kerogen); MMBL Millions of barrels

Source SRK

Forward Program

The following lists the forward requirements for the Alpha Project:

- Access establishment
- Local environmental issues assessment
- Sampling and testing to establish microwave oil yields
- Pilot testing for oil yield and preferred well path orientations
- Final microwave stimulation layout
- Production Infrastructure and site logistics planning

To fully assess the proposed FDP, SRK will need an understanding of the lower seam torbanite and cannel coal oil extractability. As no samples are currently available this will require a field reconnaissance and sampling program from the available outcrop. In the event the access old outcrops are no longer exposed a shallow drill hole to retrieve suitable test material may be necessary.

The program will require sampling of torbanite and cannel coal to confirm the production characteristics and production potential of microwave digestion and understand how the production will compare to Fischer assays and historic measured oil recoveries. This work should enable estimation of Contingent Resources.

Some gas is liberated in the RF process, but this could be used to generate electricity to power the microwave heating antennae. The requirement for heating and stimulation of the kerogen will then be assessed by a field production trial to enable oil Reserves to be estimated.

References

Bridges, J.E. and Sresty, G.C., 1988. Update on Radio-Frequency In Situ Extraction of Shale Oil. Colorado School of Mines Quarterly. 83:4. pp35-43. *https://catalog.hathitrust.org/Record/003578997.*

Burnham, A. K., 2003. Slow Radio-Frequency Processing of Large Oil Shale Volumes to Produce Petroleum-like Shale Oil U.S. Department of Energy Lawrence Livermore National Laboratory.

Hutton, A C, 1995. The Alpha Oil Shale Resource, report prepared for Alpha Resources Pty Ltd.

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Competent Person Statement

The information in this announcement is based on and fairly represents information and supporting documentation prepared by Dr Bruce McConachie a Competent Person who is a Member of The Australasian Institute of Mining and Metallurgy, the Society of Petroleum Engineers and the American Association of Petroleum Geologists. Dr McConachie consents to the inclusion in this annual report of the matters based on his information in the form and context in which it appears.