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## UPDATE ON CUADRILLA SHALE GAS EXPLORATION

Over the past week there have been a number of articles in the UK media regarding the operations at Cuadrilla's exploration wells at Preston New Road ("PNR") near Blackpool UK. We take this opportunity to comment on the PNR operations and to put into perspective comments that have been made in various media articles.

### **First Natural Gas Flow from the Preston New Road Site**

As previously reported hydraulic fracturing commenced on PNR-1 on 15 October 2018. On 2 November 2018 natural gas was present in the water being returned to the surface from the shale rock for recycling as part of the hydraulic fracturing process. This gas flow at such an early stage of water flow-back, and with only a relatively small amount of the shale having been fractured, is very encouraging. This is not part of a comprehensive testing program to establish gas flow rates, which will occur at a later date after which the exploration and drilling results will be reported.

### **A J Lucas Chairman Phil Arnall said:**

*"The PNR well in the lower Bowland is the first horizontal well drilled through shale to be hydraulically fractured in the UK. We are 2 weeks into the testing phase that is expected to continue through until early 2019. It is a complex process involving up to 45 individual frack stages for each of the 2 horizontal wells which allows for the specific characteristics and performance of the shale to be assessed across each stage. This information will be valuable in establishing the parameters for the next phase of commercialisation."*

### **A note on Induced Seismicity**

The hydraulic fracturing process is the injection of water, sand with a small amount of a non-hazardous friction reducer (Polyacrylimide) under pressure to cause small fractures in the shale rock. Once the shale is fractured, the sand is embedded to hold open the tiny fractures and allow natural gas to escape from the shale into the well bore.

The British Geological Survey ("BGS") operates a network of over 100 seismograph stations across the UK to independently monitor seismicity occurring above a level of 2.0 ML on the Richter Scale. In the past 100 days the BGS has recorded 9 seismic events above 2.0 that have occurred in the UK. Rarely is a seismic activity of 2.0 ML felt at surface and there is no risk of damage to person or property.

As part of its regulatory process Cuadrilla has monitored the seismic activity that occurs naturally (background seismicity) at PNR, which occurs in the region of 1.5 ML. Cuadrilla also measures the micro-seismicity which occurs during and after the hydraulic fracture process. By injecting water under pressure to fracture a rock formation micro seismic activity will always occur.



Under government regulations where seismic activity during the fracturing process exceeds a threshold of 0.5 ML on the Richter scale Cuadrilla is required to suspend fracturing and monitor seismic activity for 18 hours. To date Cuadrilla has been required to pause the fracture process on two occasions, at 0.76 ML and 1.1 ML, significantly below the seismicity that occurs naturally.

Cuadrilla considers the threshold of 0.5 ML is to be very conservative. UK Regulators have made clear that Cuadrilla is required to operate in line with current thresholds but have also noted that current thresholds can over time be reviewed in line with operating experience.

Every reasonable caution will be taken to avoid triggering alerts under the traffic light system. However, given the extremely low level at which these thresholds have been set, there may well be further occasions during this process when micro-seismic events occur that are well below the levels that could possibly cause harm or property damage but that do exceed the 0.5ML limit. In such instances Cuadrilla will act in accordance with UK regulatory requirements and pause operations.

#### **BOWLAND JOINT VENTURE**

<b>COMPANY</b>	<b>%</b>	<b>LUCAS %</b>
Cuadrilla Resources Limited*	51.25	24.29
AJ Lucas Group	23.75	23.75
Spirit Energy	25.00	-
<b>TOTAL</b>	<b>100.00</b>	<b>48.04</b>

\*Lucas owns a 47.4% shareholding in Cuadrilla Resources Limited

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