



### **Questions from PNR Live 8<sup>th</sup> December 2017**

**Q: What happened to the first well on the Preston New Road site? Is it abandoned? Has there been a cement bond log done of this well and the second one? What are the results? There is no information on your site of the condition of this well and if it is leaking around the casing on to the site. Have the HSE or Lancashire County Council been on and inspected the wells? Can we have a log, date, time and name of the inspectors?**

We are in the process of drilling two exploration wells at the Preston New Road site. The upper sections of both wells have been drilled to a vertical depth of approximately 1.5km each. One of the two wells has then subsequently been extended to a vertical depth of approximately 2.5km deep into the shale rock. We have been and are currently taking samples of shale rock from that well (the PNR 1 well) Once shale rock sampling and logging has been completed in the vertical section of the PNR 1 well we will plug the lower section of that well with cement and then drill the PNR1 horizontal well from the upper vertical section. When the PNR1 horizontal well has been drilled, we will, in turn, drill the PNR2 horizontal well from the 1.5km deep PNR2 vertical hole already drilled.

No wells have been abandoned on the PNR site and there is no leak from either of the two wells. . The Health and Safety Executive (HSE) regulates the safety of the operations regarding any exploratory well we drill. It has visited site and is satisfied with progress to date and the safety of the wells. The HSE regulations also require an independent and competent person to examine the well's design and construction to ensure that measures are in place to control major hazards to people from well-related activities and accidents.

**Q: Is the new seismic survey 2D or 3D? And why do you need it given that you already have a one?**

A: We intend to conduct a geophysical survey on land adjacent to our Preston New Road exploration site, using a single articulated hydrostatic vehicle (AHV). The equipment used during the survey, which is likely to take only a few days to complete, creates sound waves which travel into the ground and are recorded in monitor's downhole generating a one dimensional model.

By measuring the time taken for sound waves to return to surface we can build an accurate picture of the subsurface beneath the exploration site. This, together with data from our 3D seismic survey of the Fylde conducted in 2012, will be used in positioning the site's first two horizontal exploration wells to be drilled into the shale rock some 2km below the surface.

**Q: From the work you have done so far, is there a strong indication the flow rates will be commercially viable?**

A: Once we have completed drilling our first two exploratory wells, which will then be hydraulically fractured, at Preston New Road we will assess the flow of gas which will tell us whether those wells are commercially viable.

**Q: You've told us about the methods to ensure the safety of the people on site, how are you monitoring the impact on the environment?**

A: Cuadrilla's commitment to environmental monitoring and compliance with the UK's robust regulation is very important to us, and as part of the planning application process we completed the most comprehensive Environmental Impact Assessments ever carried out for operations of this kind.

Mitigations that Cuadrilla has put in place include ground and surface water monitoring; the use of a protective, impermeable membrane covering the entire enclosed site at Preston New Road; wastewater is sealed in tankers and transferred to waste centres for disposal; and we monitor noise, air and traffic levels to ensure they remain within approved limits – these results are available in the public domain via the Environment Agency website and Cuadrilla's ePortal.

**Q: Which contractors have been helping with the drilling and early field development design phases?**

A: During the drilling operations at Preston New Road, DrillTec are our main rig contractor and we have used a number of other Lancashire and UK contractors.

**Q: What kind of pressure gradients are you recording in areas where you are drilling? Would you characterize the rock as "over pressurized"? What does this tell you about potential flow rates?**

A: We do not disclose well result data of this nature at this stage of an exploration well

**Q: Have intelligent 3D design processes (such as BIM) been used?**

A: We have collected data and 3D modelled with advanced technologies suitable to the sub surface. The 2012 geophysical survey processed to pre-stack time and depth migrations, and advanced post stack attribute volumes are generated internally by Cuadrilla's geological and geophysical team.

**Q: In case injection of water induces earthquakes the earthquakes are most likely the result of reactivation of nearby pre-existing faults by upsetting the subsurface pressure regimes that keep the faults closed, do you agree?**

A: It is hypothesised that increased fluid pressure inside pre-existing faults can reduce effective normal stress on the fault, allowing the fault to slip. This is documented in the Clarke et al 2014 paper regarding the Preese Hall seismic events. Since the Preese Hall well the UK Government requires real time seismic monitoring before and during hydraulic fracturing and a suspension of pumping if a seismic event greater than 0.5 on the Richter scale (which is well below the level that could be felt at surface much less cause damage) is recorded.

**Q: When drilling the horizontals, will you continue to core (in order to design the frac) or will you just drill?**

A: No, we will not be coring when we are drilling the horizontals at Preston New Road. We are only taking core samples during the drilling of the PNR1 vertical well.