Lancashire
Standing up for your countryside in Lancashire, Greater Manchester and Merseyside

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working locally and nationally for a beautiful and living countryside

Response of CPRE Lancashire to the Environment Agency's consultation on the application of Cuadrilla Bowland Limited for a sixth variation of its Environmental Permit (ref. no. EPR/AB3101MW/V006) relating to operations at its Preston New Road (PNR) well site.

CPRE Lancashire urges that this application be refused; in arriving at that recommendation, we have been influenced by the following broad considerations:

- The Climate Change Act 2008 which requires the government to ensure that the net UK carbon account for the year 2050 is at least 80% lower than the total UK greenhouse gas (GHG) emissions in 1990. The Act also established the independent Climate Change Committee (CCC) to monitor the government's performance in relation to the carbon budgets specified by the CCC as necessary if the target is to be achieved. It remains unclear how the government will achieve its promise to conform to the outstanding carbon budgets.
- The legislation enacted in June 2019 which sets a new target requiring the UK to bring all GHG emissions to net zero by 2050.
- The following statement made by Sir James Bevan, Chief Executive of the Environment Agency, when he addressed the Aldersgate Group in London on 25 June 2019

> "At Harvard Business School they teach you that success in any organisation comes down to following a simple principle, which is this: 'The main thing is to make sure that the Main Thing really is the main thing.' I'll be honest: I've been Chief Executive of the Environment Agency for over three and a half years now, and it's taken me a while to realise what the Main Thing is. And the answer, which I now say to myself every day, is this: it's the climate emergency, stupid."

Having in mind the urgent need to minimise GHG emissions, we now address the specifics of this application:

1. The variation seeks permission to use nitrogen lift technology to initiate hydrocarbon gas flow from borehole PNR-2. The technology has been widely used in the US to extend the productive life of a well. Typically, when the well is initially hydraulically fractured, there is a strong flow of hydrocarbon gas which returns flowback fluid to the surface. In due course (the length of time depending on the quality of the source formation) in order to maintain the

hydrocarbon gas flow rate at an economic level, it is necessary to hydraulically fracture the rock again, but with each repetition the maximum hydrocarbon gas flow rate achieved diminishes. Eventually, the pressure at the bottom of the well is insufficient to force up to the surface the column of fluid in the borehole, and a nitrogen lift is necessary to restart the hydrocarbon gas flow. The downside is that a nitrogen lift is associated with the release of significant amount of GHGs into the atmosphere, but in the US, with its permissive attitude to environmental protection, that has not been a problem for the shale gas industry there. We are unaware of the use of nitrogen lift technology in the exploration for shale gas anywhere in the UK.

2. The motivation for this application has its origin in Cuadrilla's experiences in carrying out hydraulic fracture of its PNR-1/1z well. The red threshold of the Traffic Light System (TLS) was exceeded on several occasions. The most intense surface tremor, which registered a TLS response of 1.5 M_L, occurred on 11 December 2018; this tremor, and an earlier one registering 1.1 M_L, were sufficiently intense to be felt by local residents. At the time, the Oil and Gas Authority (OGA) gave assurances that these tremors were not a matter of concern and that they were consistent with the Hydraulic Fracture Plan (HFP) which it had approved. In addition, a further major difficulty was that the hydrocarbon gas flow following hydraulic fracture was too low to maintain ignition of the flare and that propane had to be added to the gas flow in an attempt to maintain ignition. Despite this, Cuadrilla maintains that the flow rate of natural gas from PRN-1/1z is encouraging.

3. However, we regard the OGA assurances as unjustified because, at the time they were given, the microseismic data on which Cuadrilla were relying had not been disclosed even to the OGA on the grounds of commercial confidentiality. Further, no attempt has ever been made to explain why these seismic events had occurred, nor to address the potential for harm to the borehole at depth where the energy responsible for the surface tremors had been released. Francis Egan, CEO of Cuadrilla, has stated that exploratory hydraulic fracturing would not be commercially viable unless the red TLS threshold is raised, a demand at odds with the fact that in 2011 a TLS event of magnitude 2.3 M_L at Cuadrilla's Preese Hall vertical well was sufficient to ovalise 160 feet of the borehole at a depth of about 8500 feet, causing the well to be abandoned. The government has said that it does not intend to change the TLS thresholds.

4. It would seem that Cuadrilla's analysis of the microseismic data failed to provide an accurate description of the geology of the relevant formations. A sound understanding of the geology is essential to the successful implementation of the HFP. There are unaccountable differences between the various geologies which have been reported for the site, the latest and most serious being that the Millstone Grit formation does not extend all the way over the Upper Bowland Shale formation so that both wells enter directly into that formation and pass through a major fault and some lesser, but still significant, faults. This configuration renders the integrity of the wells highly

vulnerable in the event of movement of one or more of these implicated faults.

5. The HFP for PNR-1/1z approved by the OGA required microseismic monitoring of the penetration of hydraulic fracture fluid in real-time during the hydraulic fracture process, so that known faults could be avoided (the hydraulic fracture process would be stopped in the event of the hydraulic fracture fluid front approaching a fault or a boundary of the target formation, taking account of the resolution/uncertainty of the monitoring technology). That there have been an unexpected number of surface tremors detected of sufficient intensity to give a red TLS response is evidence that either the real-time monitoring data for the penetration of the hydraulic fracture fluid have not been correctly analysed, or that there are several significant faults (some possibly highly stressed) which have not been detected and which were inadvertently penetrated by hydraulic fracture fluid. At the time of their devising, Cuadrilla had no reservations about the TLS limits. However, since the events described in par. 2, Cuadrilla has sought to follow a new strategy rather than resolve its issues relating to accurate analysis of the microseismic data generated both before and after hydraulic fracture.

6. Before we comment on the new strategy, which is predicated on a nitrogen lift, we wish it to be noted that the OGA-approved HFP for the PNR-2 well specifies in considerable detail the use of microseismic technology to ensure that the hydraulic fracture fluid remains within the boundaries of the target formations and does not reach any known faults. There is no mention of the use of a nitrogen lift, a fact which alone warrants refusal of this application.

7. When in October 2016 Cuadrilla was given planning permission for its PNR well site, the number of additives to the down hole fluids was minimal and Cuadrilla anticipated operating according to the HFP. However, following the events described in par. 2, Cuadrilla has applied for and been granted permission to use up to approximately forty additives intended to modify the composition of the drilling muds and to increase the density and viscosity of the hydraulic fracture fluid; the most recent variation was approved in February 2019. We find it surprising that Cuadrilla did not recognise earlier that its new *modus operandi*, in the context of the low flow of hydrocarbon gas experienced with PNR-1/1z, made it probable that a nitrogen lift would be necessary; permission for a nitrogen lift should have been included in the application for the fifth variation of the Permit.

8. We reject Cuadrilla's claim that the amount of GHG emission resulting from the anticipated nitrogen lift is acceptable because it would be negligible in comparison to the total UK GHG emissions. The justification for the exploitation of shale gas is that it has a lower GHG emission than do alternative fossil fuels and can serve as a transitional fuel pending the development of sustainable energy sources. Thus, the relevant metric is the extent of the GHG emission resulting from the nitrogen lift relative to the amount of useful natural gas

produced. There is also an overwhelmingly strong argument in favour of rejecting any technology which has a larger GHG footprint than a viable alternative procedure, as is the case here, namely the HFP.

9. We believe it is essential that the Environmental Permit should be consistent with the OGA-approved HFP, and that the microseismic data should be competently analysed, firstly so as to establish the boundaries of the relevant formations and the locations of significant faults, and secondly so as to locate in real-time the position of the hydraulic fluid front as it penetrates the target formation, as required by the HFP. To quote the HFP

> "Monitoring the extent of fracture growth using a real-time downhole microseismic array. If, during hydraulic fracturing, monitoring data indicates possible fault interactions with a preferential flow pathway or an unexpected seismic response is detected, Cuadrilla, as a prudent operator, will adjust or terminate the pumping of fracturing fluid and the pumping schedule would be modified as necessary."

10. If it is found that the fault structure of the formation is so complex that faults cannot be avoided, or that the amount of trapped natural gas is uneconomically small, then it should be accepted that production is not possible and the well be abandoned. An initial nitrogen lift should not be an option.

11. For all these reasons, we urge this application be refused.

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Chair
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