

# **SCOTTISH GOVERNMENT CONSULTATION ON UNCONVENTIONAL OIL AND GAS EXTRACTION**

Concerned Communities of Falkirk (CCoF) are a group formed of residents from various communities in the Falkirk area. Our group formed in early 2013 in response to a planning application by Dart Energy, to drill for coal bed methane at Letham Moss, Falkirk. At the time this application was the first for commercial production of unconventional gas in the UK (16 test wells have already been drilled in our area over the past 20 years). The application was the subject of a Public Inquiry in 2014 (now sisted). CCoF presented evidence at the public inquiry and our legal team represented 9 of Falkirk's Community Councils and the West Fife & Coastal Villages Community Councils Forum. We still do not know the outcome of the public inquiry.

## **Q1: What are your views on the potential social, community and health impacts of an unconventional oil and gas industry in Scotland?**

### **Social and Community Impacts**

We believe that the UOG industry would have many negative impacts on local communities if it were allowed to operate in Scotland. We are concerned about potential health impacts – particularly on the health of our children, air pollution, contamination of our environment, increased traffic, noise and light pollution from 24 hour drilling, impacts on our local farmers and our food security, visual impacts, impacts on tourism and other sustainable industries. The community assets that we wish to protect are set out in our Community Charter<sup>1</sup> which has been adopted by several Falkirk Community Councils. Residents have agreed that these assets are fundamental to the present and future health of our communities and are at risk from UOG development.

Falkirk has a long industrial past and like many other towns across the central belt it has faced challenges to overcome its image as a run-down post industrial town. In 2001 large redundancies from the BP plant highlighted the fact that Falkirk's economy was over-reliant on the oil, gas and petrochemical industries, and the "My Future's in Falkirk" plan<sup>2</sup> was developed in an attempt to diversify the economy. Falkirk is now growing, thriving and making its mark as a tourist destination with the arrival of the Falkirk Wheel, Kelpies and visionary Greenspace Initiative<sup>3</sup>. Falkirk benefits from excellent transport links and with house prices high in Edinburgh the area is convenient for commuters and proving attractive as an area to live, with many new houses being built in recent years by a range of developers. This is encouraging families to remain locally or move into the area. Local residents are proud of what has been achieved. We agree with Falkirk Councillor David Alexander's evidence presented at the Dart Energy Public Inquiry<sup>4</sup> that a UOG industry would be "regressive, and detrimental to the area".

The threat of UOG places communities under great strain. This has implications of various kinds. There is a risk of social division – e.g. friction between neighbouring

farmers/landowners/householders – some of whom may accept the industry and others who don't.

We can speak from our experience of living in an area where UOG has been proposed and where there is still uncertainty regarding the outcome. This is a very stressful situation which has lasted for 5 years. This puts strain on health and wellbeing of those who are aware of the situation. If the Dart Energy planning application was to be approved this would go against the expressed wishes of Falkirk and Stirling councils, many local residents and 9 of the Falkirk Community councils. This would lead to further stress and feelings of disempowerment.

Communities threatened with UOG face a number of hurdles obtaining information about what is proposed. Firstly, under the current system, applications are advertised in low-key ways e.g. through local newspapers alongside small developments such as residential alterations. Many people are simply unaware of what is proposed for their area. Secondly there is a difficulty in obtaining unbiased, independent information about such applications. Residents fear that industry will put profits above the health and wellbeing of the community.

From our experience in Falkirk, relatively small, incremental applications for coal bed methane extraction were approved (often under delegated powers) over a period of more than 20 years, at a time when the potential impacts were even less well known and understood than they are now. This resulted in the industry growing gradually without the community being aware, or fully consulted.

In our experience full-field development plans are not made available to the public and individual planning applications are considered separately. It is therefore difficult for the public to understand the full implications or scale of potential development. This was the case with Dart Energy's coal bed methane plans<sup>5</sup>. At INEOS public meetings in 2015, their representatives appeared reluctant to discuss the potential scale or likely numbers of wells.

The introduction of a UOG industry could lead the area into a downward spiral with people less likely to want to live there, house prices falling and householders having difficulties obtaining insurance. In practical terms people might find it difficult to move because they can't sell their house, or they may have family or other commitments or lack financial means to move out of the area. Those who remain may feel anxious about the industry but feel trapped.

If the industry goes ahead in Scotland, communities will have to research/oppose a stream of planning applications. CCoF had to work hard to investigating the issues around coal bed methane, contacting experts and becoming well-informed. CCoF also had to raise almost £80,000 in a short space of time to engage legal representation for the Dart Energy Public Inquiry. All this has created an enormous strain on individuals and communities over a period of almost five years. This kind of situation takes a considerable toll.

A recent paper which focuses on the Lancashire community experience concludes that a form of collective trauma has been experienced already at the exploratory stage of UOG development. Some aspects of the experience described in the paper resonate with us.<sup>6</sup> The potential human and community cost if the industry proceeds is genuinely disturbing.

## **Social and environmental justice**

The Health Protection Scotland<sup>7</sup> (HPS) study p.94 looks at research in the American context which uncovers perceptions that economic benefits accrue to some groups, such as 'landowners, workers or UOG companies and that others in the community have the inconvenience of UOG development, without the benefits (Ladd, 2013, Brasier et al, 2011, Wynveen, 2011)'. In the Falkirk context this is exacerbated by the extreme wealth of the man who owns INEOS, and those who work in powerful roles in the company, compared with the compromised environment and more modest lives of many people living in and around Grangemouth.

Recent reports (28<sup>th</sup> May) indicate that INEOS owner Jim Ratcliffe has recently bought a box at the royal Albert Hall for a record £2.7 million<sup>8</sup>. On 7th May it was reported that two others, described as his 'lieutenants' have also become billionaires (John Reece and Andy Currie)<sup>9</sup>. Meantime, it also recently came to light that INEOS has refused to pay for the kind of security deemed necessary for national security at Grangemouth<sup>10, 11</sup>. For people in the area, there are local and personal dimensions to a complex situation. Following a difficult period in 2013, and a pay freeze, a history of poor relations between INEOS and workers also continues<sup>12</sup>. Mr Ratcliffe now has vast power, and has been dubbed 'the new king of Scotland'<sup>13</sup>.

Meantime, people in the Falkirk area face the possibility of living in an increasingly industrialised environment.

## **Cumulative Impacts**

Development of UOG on the scale proposed cannot be contemplated without first taking into account the cumulative impact of pre-existing industries.

The INEOS site at Grangemouth, the likely destination for locally-fracked gas, is the largest industrial site in Scotland and already presents a significant negative environmental impact on the communities of Grangemouth, Bo'ness and beyond. Years of poor air quality combined with high noise levels and light pollution have been allowed to continue despite regulatory oversight. Any improvements are frequently swallowed up by either expansion of existing industrial sites or proposals for new development.

The existing petrochemical industries are not alone in causing negative environmental impact. The Port of Grangemouth and its container depot is Scotland's largest port, and draws in vast numbers of HGV traffic movements to service the import and export needs

of the Scottish economy. These HGV traffic movements are another source of poor air quality and noise. The ASDA distribution centre also pulls in large numbers of HGV traffic movements daily, a further contributor to poor air quality and noise. Nearby there are also various companies storing and processing an array of hazardous chemicals - yet another environmental risk to the surrounding communities.

NPF3 indicates preferences to further develop and expand on the current industrial footprint at Grangemouth, development of power generation facilities including a CCS power station, creation of a major distribution hub within the Port of Grangemouth all encompassed within the designated Grangemouth Enterprise Zone.

The community of Grangemouth held a public meeting on April 13th 2017 to discuss UOG development. The cumulative impacts of having to host the UOG industry were raised as a concern, both in relation to the environmental and human health risks and to the quality of life within the community as a whole. With regards to environmental and human health, many people felt that there was not enough information about how this would be monitored, if at all. It was pointed out that there was no baseline data available. Most felt that their community would be worse off if UOG industry was active in their area.

### **Traffic Impacts**

The Ricardo transport report<sup>14</sup> (p68) refers to the Dart Energy planning application for coalbed methane production at Letham Moss, Falkirk as one of its case studies. This is the most relevant of the case studies used, since it is in an area likely to be targeted by any future UOG proposals.

It is disappointing that the information in this case study appears to have been taken solely from Dart's Environmental Statement<sup>15</sup> (ES) (Section 12.32) and does not consider the additional evidence presented at the public inquiry. The limitations of Dart's ES were raised by CCoF at the public inquiry (see CCoF closing submissions<sup>5</sup>, Section 30). Specifically, Dart's ES did not assess the increase in HGV movements separately within their ES, despite the fact that the increase in number of HGVs is vital in assessing whether Rule 1 or Rule 2 of the IEA guidelines apply (Ricardo report, Section 3.10).

Dart Energy's consultants (RPS Transport) themselves acknowledged this limitation of the ES and attempted to address it in their hearing statement submitted to the public inquiry<sup>16</sup>.

At the public inquiry CCoF presented an estimate<sup>17</sup> of HGV movements along one of the rural roads used as an access route to the development area (Moss Rd) and showed that at the peak of development an increase of 260% in HGV movements could be experienced (part of this road is used by National Cycle Route 76).

We question the findings in the Ricardo Transport (p61) report which states that "peak traffic movements were estimated to be up to around 430 movements per week". Dart's

Environmental Statement (Section 12.32) estimated 158 vehicle movements daily (1,106 weekly) at the maximum progression of the coal bed methane development. This is equivalent to approximately one vehicle movement every 3 minutes during working hours, and the majority of these vehicles are likely to be HGVs. In the case of the Dart application, many of the sites would share the same access roads – narrow, rural roads used by runners, cyclists, walkers, horse-riders and families. These figures relate to a single planning application for 22 wells. On this basis we believe that traffic impacts associated with UOG development in our area would be significant, and would adversely affect our access to the countryside and our active travel plans, in addition to contributing to air pollution in the area and increasing the risk of road accidents.

The HPS Health Impact Assessment notes that: ‘Transport-related air pollution is a well-documented health risk. Negative impacts are experienced mostly by older people and people with cardiac and respiratory problems’; other research also suggests the impact of traffic on rural communities may have negative health impacts because of ‘community severance’, and another study shows that residential road traffic noise increases the risks of depressive symptoms (HPS, section 3.4.5, p.95).

## **Noise and Light**

Noise and light from 24-hour drilling and additional noise from HGV movements are a concern for local residents. There may be cumulative impacts where other sources of noise exist e.g. motorways. The potential for sleep disturbance and subsequent impacts on health are a concern, and in our view not fully accounted for as yet.

## **Health**

In recent years evidence has emerged about the numerous potential health impacts of the UOG industry. Much of this evidence has come to light in the past few years, since the publication of the Independent Expert Scientific Panel report of 2014<sup>18</sup>. Evidence has continued to appear since the HPS Study was completed in 2016.

Potential UOG-related hazards include: air pollution (fugitive methane, volatile organic compounds, oxides of nitrogen, particulate matter, silica, sulphur dioxide, hydrogen sulphide, polycyclic aromatic hydrocarbons, ground-level ozone), BTEX chemicals, radioactivity, endocrine disruptors, soil contamination, water contamination, noise and light pollution, stress and mental health impacts, increased traffic leading to potential accidents, loss of greenspace.

Among the most comprehensive sources of information is the Physicians for Social Responsibility (PSR) “Compendium of Scientific, Medical and Media Findings Demonstrating Risks and Harms of Fracking”<sup>19</sup>. This compendium is regularly updated and is now in its fourth edition (Nov 17, 2016).

In the UK, Medact have produced a report which independently reviews the literature available up to 2015<sup>20</sup>.

## **Health Protection Scotland Impact Assessment**

The Health Protection Scotland health impact assessment was tightly focused (see further comments below) and its terminology, some of which is defined at 3.2.5. (p.55), requires careful attention. Terms are outlined at HPS, 3.2.5, p.55, discussed at 5.5.1, used in Section 6, 'Conclusions', pp.142-9, and in 'Summary'. But the terms, which need to be clearly explained for lay people, are not explained in Summary, the document most likely to be read by public and media, nor carried over into the simplified 'educational' documents made readily accessible to the public.<sup>21</sup>

The report highlights many knowledge gaps (on which we will comment shortly), but nevertheless draws a number of conclusions, including that there is 'sufficient' evidence to determine that a number of airborne and waterborne environmental hazards would be likely to occur as a result of UOG operations. There is also 'sufficient' evidence that there were certain risks to UOG workers' health. In the terminology of the report, 'sufficient evidence' means an unequivocal link has been shown between UOG activities and hazard or health risk. We appreciate the difficulty in demonstrating firm links where many factors may be at play, so it would appear that, in this context, 'sufficient' evidence is very strong.

In addition, there is 'limited' evidence of risk from other studies. Among our concerns are air quality and airborne hazards. The HPS study reports 'there was 'limited' evidence to suggest that UOG-related activities resulted in airborne hazards, at exposure levels in residential areas close to UOG wells and infrastructure, that could pose a risk to health' (p.68). However, the reasons for the research being deemed 'limited' need to be understood. The HPS study makes use of a very cautiously-selected body of research, and reveals in the section examining Airborne Hazards (pp.64-68), that, astonishingly, 'there were no epidemiological studies identified that specifically investigated airborne hazards from UOG activity' (p.64). In the absence of fully focused research, evidence from 'other types of hazard and risk assessment study' was considered in this part of the assessment.

Of ten studies looked at, seven reported 'airborne hazards at exposure levels that might lead to health risks'. This might be thought to suggest evidence for concern. The HPS assessment comments, of one study, that: 'It seems reasonable to hypothesise that people living in homes near well sites would experience the pattern of exposure observed by Esswein and colleagues, especially in areas where setback distances permit closer proximity of wells to homes' (p.67). However, overall research included by HPS generally focused either on spatial coverage or temporal coverage and has limitations. HPS state it is difficult to draw absolute conclusions from the various studies. The HPS assessment points out various problems faced by researchers, including the

difficulty of assessing the combined impacts of exposure to different UOG-related sources. The term 'limited' is explained:

'By "limited" it is meant that a positive association has been observed between the specified UOG-related airborne hazards and increased health risks but that the results from the limited number of available studies that used appropriate exposure assessment and sources apportionment methods were inconsistent' (p.68).

The assessment observes that further studies are needed.

In relation to some other important topics, such as Reproductive and Developmental Health (pp.82-5), and Childhood Cancer (pp.85-6), the HPS study concludes there is 'Inadequate Evidence'. But again, this conclusion should be understood within context. On Reproductive and Developmental Health, again, the methodology adopted by the assessment, and the early stages of research in the field, mean only a small number of studies were closely examined. The HPS assessment notes that the studies 'were of reasonable quality', but that each had certain weaknesses. In the case of one 'relatively strong study' on a relevant topic, 'further studies using more robust study designs' (p.84) are needed to confirm findings.

On Childhood Cancer, there was 'inadequate' evidence, but only one study was evaluated - an extremely slim body of evidence. That study finds no increased incidence of cancers, but HPS notes that it was flawed because of the inadequate timescale of the study (p.85); there could be a considerable time lag between exposure and development of cancer. HPS do not point to the need for further studies. However, perhaps to do so would highlight an uncomfortable truth: that people currently living close to UOG may be seen (if we are to be cynical) as human guinea-pigs. These people may be living with risk. They might be fine in future, or they might develop cancers. We may not know the outcomes for decades, and even then it will remain difficult to be certain of causes of disease.

A recent Ferret report<sup>22</sup> from Pennsylvania highlights that some people residing there in proximity to UOG developments feel they are living with significant risk. These include the mother of a child who developed significant symptoms, and was found by toxicologists to have benzene in her body, 'just below the safety limit' (although according to our understanding, questions might be raised about whether there is an actual 'safety limit' with benzene). According to the American Cancer Society, benzene is linked with leukaemia and other cancers.

We understand the situation might be in some respects different in Scotland, but we suggest there is no cause to be sanguine. **We note the above in order to highlight what we take strongly from the HPS assessment: that there is still too little research to conclude that UOG is safe. However, there are already indications of possible or likely hazard or health risk. We would argue that this means a need for extreme caution, because the stakes are very high.**

In its Summary, the HPS report concludes that some evidence was 'inadequate'. Apparently "*There were relatively few epidemiological studies available on the topic. The*

*small quantity of material available was of variable quality and was characterised by contradictory and inconsistent findings.”* This needs to be understood in the context of an industry which is still relatively new and where research is still ongoing, but where the potential harms could be considerable.

There are some limitations of the HPS report.

**a) It is generic, not specific.** The report is: ‘a “generic” rather than a local community perspective and was not expected to predict the scale of potential impacts on any specific communities in Scotland. This is frustrating because HPS notes: the ‘locations with highest potential for having UOG resources’ are in the area of Central Scotland known in geological terms as the ‘Midland Valley’. INEOS has local UOG licenses, Grangemouth headquarters, and wants to extract shale gas locally. The HPS industry workshop suggested clustering development in one area; we worry this means Falkirk (HPS 2.3.2.2, p44). We do not want to be a ‘sacrifice zone’ any more than we are already.

**b) Falkirk Public Inquiry Documents do not seem to have been considered.** It is frustrating that the HPS report ‘screened out’ grey literature, including planning applications. (Section 2.2.2, p35). It did not appear to review Falkirk Public Inquiry documents, despite request by Broad Alliance.

**c) Study is of shale fracking, little on coal bed methane** HPS, 3.5., p.101; p.103.

**d) Limited time and research capacity.** The HPS research was conducted over a few months, with papers screened by a single researcher, and 35% appraised independently by a second. See HPS, 3.2.4.2, p.53. HPS Table 3 lists studies up to 2014. Major studies of UOG impacts in New York took much longer to compile and are regularly updated<sup>19,23</sup>.

**e) The methodological approach excludes much literature and emerging evidence of various kinds which may provide a fuller picture.**

**f) Research has continued to appear since the HPS report was produced.**

What follows are brief notes on some issues we consider of particular significance:

### **Cumulative impacts**

Cumulative impacts were raised at the workshop for community groups held with HPS, but do not seem to have been pursued in any detail. We understand that in some other parts of the world, cumulative impacts would be taken into account in Health Impacts Assessment. We feel strongly that such impacts should be taken into account here.

At public meetings, INEOS representatives said there might be around six chemicals in a single 'frack', but this would vary according to individual needs (numbers mentioned by industry seem to vary). How would the public know what was being used in each individual 'frack'? What about 'cocktails' of chemicals - blends with impacts unknown? We consider this a risky prospect. See HPS, 3.3.2, p.57. Yet the HPS reports states it is unable to assess this, or cumulative impacts involving exposure to several hazards: HPS, 3.5., p.102.

In Falkirk, there are a range of sources of hazard and risk (mentioned elsewhere in this document), so these are significant issues for us.

## Knowledge gaps

The HPS report makes reference in many places to the gaps in knowledge relating to the impacts of the UOG industry. It notes the lack of baseline studies "*A recurring theme is the lack of pre-drilling baseline data.*" (HPS p73)

Even in the conventional oil and gas industry which is well-established in Scotland, there is a relative lack of research. "*There is a relative lack of research studies on health hazards in the oil and gas industry. This is ascribed by researchers to the lack of access to worksites, characteristics of the workforce and illness onset latency, factors that make epidemiological study particularly challenging (Witter et al., 2014).*" (HPS, p78).

We are particularly concerned about potential long-term impacts of the UOG industry, which is a relatively new industry even in the US. Although the evidence is not yet established the stakes are very high.

The HPS report states that "Finally, the UOG industry may not have been operating for an adequate period of time to enable the detection of long-term health outcomes." (HPS 5.4.3) These health outcomes could include cancer.

Dr Madelon Finkel, an American peer-reviewer of the first draft of the HPS assessment, stated in her feedback that it should point out that 'unconventional gas development essentially began in earnest after 2007 in the US which is too short a period of time to establish strength of association between exposure(s) and health outcomes'. She also notes that the body of evidence to date does show evidence of harm, and – importantly – that much drilling has been in rural areas in the USA, and that the situation could be different in Scotland, which is of course much smaller, with the shale and coal bed methane located in densely populated areas.<sup>24</sup>

We argue that there is **insufficient evidence in existence so far to suggest that UOG extraction is safe. Also, new research emerging tends to suggest grounds for serious concern.** The cautious HPS study suggests need for more empirical research (HPS, 3.5, p.101, p.103), and its conclusions emphasise the limitations of evidence (HPS, 5.4.3., p.135).

Recently, the revised US EPA document looking at possible water pollution from fracking, reversed previous conclusions, now stating that there have been instances of water contamination.<sup>25</sup> The science does not appear to be settled, and there are many pressures from industry and other quarters.

Professor Andrew Watterson's article, 'Fracking and public health: research update', first published in advance online publication, 22 November 2016, summarises 18 papers published in 2016, of which only 3 had been cited when the Scottish (HPS) UOG health review appeared.<sup>26</sup>

A large literature review done in the UK and published near the end of 2016 indicates many gaps in our knowledge.<sup>27</sup>

Not all gaps are fully identified as such by the HPS study. Dr Ian Fairlie, an expert with international experience, has commented on gaps in the study in relation to the study of radiation and radioactive contamination<sup>28</sup>.

Radiation and radioactive contamination are serious matters for even the well-established oil and gas industry, as suggested for instance, in a paper produced by the United States Geological Survey<sup>29</sup>. Yet while the conventional oil and gas sector has been active for a relatively long time in the UK, there is little attempt in the HPS study to harness knowledge of risk from that sector.

### **Baseline health studies**

No baseline health studies have been done so far, although there has been drilling for coal bed methane in the Falkirk area. The HPS report (Section 6.3) recommends local health impact assessments (HIA) are considered for all proposed UOG developments, irrespective of scale, either as part of EIA requirements, or separately. We note that no local HIA was done for the Dart coal bed methane application, or any of the previous 16 pilot wells. In the event of the moratorium being lifted CCoF would demand that an HIA is carried out in the Falkirk area before any decision is made on whether to proceed. This HIA should take into account the cumulative impact of existing industries in the area.

### **Precautionary principle/mitigation**

Reference is made in the HPS assessment to the Precautionary Principle and 'mitigation'. We are concerned about the use and meanings of these terms.

Precautionary Principle is discussed at HPS Section 1.6.pp.31-2. It is pointed out that there are a number of interpretations, with 'considerable variation in how it is applied in practice'. The HPS report suggests that if UGE were to be permitted, a 'precautionary

approach' would be advisable. However, we are unhappy about any excessive watering-down of what is meant here. The assessment points out (p.32) that the final judgement on whether or not to permit UOG development is not just a scientific question, but that it is 'a societal issue, involving choice'. The Precautionary Principle is usefully addressed by Canadian researchers Philips and Goldberg, who discuss the 'right of future generations to a clean and healthy environment'.<sup>30</sup>

In addition to this, for UOG to go ahead, we would highlight the need for 'social license', in the sense of a community essentially agreeing willingly to accept development.

The HPS report addresses 'Mitigation' variously at Section 1.6.pp.31-2, Section 4, pp.106-27, section 5.4.5., pp.136-7. and 6.3, pp.146-8. The HPS assessment notes it was not asked to make recommendations, but does make comments about possible ways forward.

Although the HPS report suggests the need for a precautionary approach, it suggests as one possibility the commencing of UG extraction, accompanied by mitigation and community engagement – see HPS, 5.5.3, p.140. We would find this unacceptable, as insufficient protection. We do not understand how engaging a community is going to help, if there are unknown and continuing possible risks to health. Local people might have the opportunity to know more about the possible hazards and risks. However, being told or updated about possible harm would not actually protect us or necessarily help with peace of mind.

At 5.4.5, pp.136-7 the assessment mentions other industries which are allowed to proceed despite elements of hazard and uncertainty. These include e.g. incineration of waste. From our point of view, this is not very reassuring. Incineration can be controversial and potentially polluting.<sup>31</sup>

It is also suggested by HPS that regulatory measures are applied to 'other dangerous industries (e.g. the chemical industry, nuclear power generation') (p.136) and a question is raised about whether, essentially, control of UOG activities is any more likely to fail. This we find an unsatisfactory approach, although, interestingly, it does implicitly accept that UOG and the chemical industry are both dangerous. Firstly, Falkirk already lives with the chemical industry, so to introduce UOG as well would be to add unacceptable load of hazard and possible risk to an already burdened community. Secondly, it might be argued that the chemical industry is not, in fact, successfully regulated. The INEOS record on safety is not unblemished.

## **Unresolved issues**

Too much uncertainty remains. Some of our concerns independently echo those of peer-reviewers of the HPS study, notably the comment by Dr Madelon Finkel about the need to make clear the 'long-term potential for adverse health impacts'. Dr Finkel, who has studied the US situation, states that in Scotland: 'It must be made clear that a guarantee of absolute safety is not possible'.<sup>32</sup>

## **Difficulty proving links between health impacts and the industry**

A major problem for communities faced with UOG would be the difficulties of proving what causes any future health problems. For instance, long-term exposure to air pollution contributes to cardiopulmonary disease and lung 'cancer' (HPS, 3.3.3., p.62), and people living near UOG might be exposed more than others to airborne pollutants. However, it would be extremely difficult to prove absolutely. This is the sort of problem that would lie ahead. Similarly, causes of cancer can be extremely difficult to establish.

## **Access to information**

Local residents do not have easy access to information regarding health impacts of current industries in Forth Valley, before UOG extraction adds further pollution.

Our experience so far in relation to industry has not been reassuring. At Falkirk Public Inquiry, our QC, Sir Crispin Agnew, pointed to Dart Energy's failure to provide all the information on which it relied.<sup>33</sup>

Then, too, which chemicals are to be used in fracking, for instance? An INEOS film available to the public gives little information<sup>34</sup>. In Australia, there is reportedly disquiet about chemicals and lack of information available to the public.<sup>35</sup> We are told by industry and others that things would be different in UK, including in Scotland (see HPS, 2.2.1a. p.39). However, our experience with the Dart Energy application leaves us unconvinced. What about numbers of wells? Again, little firm information has been made available to the public so far.<sup>36</sup>

Our past experience has been that information is difficult to access and track. There has been UG drilling in the Falkirk area since 1993. Several different companies have been involved: Hillfarm Coal Co. Ltd, Coal Bed Methane Ltd, Composite Energy Ltd, and Dart Energy Ltd. Furthermore, Dart Energy was not one single company, but various: Dart Energy Forth Valley and other associated companies such as Dart Energy Scotland, Dart Energy UK and Dart Energy International.

So fragmented did information appear to be about local past UG developments, the Reporter conducting the 2014 Public Inquiry in Falkirk requested a document which would give an overview of the history. One was compiled by Ian Cowan (from legal team for CCoF), working with John Milne (Planning Officer, Falkirk Council) and Claudius Vaulkner (Dart Energy).<sup>37</sup> It highlights permissions still ongoing, some for long-term drilling although this was a pre-commercial, 'test' development. After the early applications, the majority of permissions to drill were granted under 'Delegated Powers', with decision made by one Planning Officer rather than by a Committee. It seems that 16 wells were drilled (sometimes vertical drilling, but also some laterals, and with some wells drilled more than once). Evidence from the Falkirk archives shows there was early 'fracking' of vertical wells (not the more recent kind of hydraulic fracturing). Some

applications mention 'stimulation', a word widely taken to mean some form of fracturing, though this may not have taken place. Discussion at the Public Inquiry, about direction of laterals, shows there was potential for confusion based on paper evidence.<sup>38</sup> One lateral (for which permission had apparently been granted, on paper) had not been drilled in reality, according to Mr Goold (hence there should be no risk). This situation was confusing. Should the public have to rely on the verbal evidence of drilling companies to ascertain what exactly has been drilled and where? When a CCoF member asked to view all the old applications, it involved a time-consuming process, applying to see files not available online, asking a planning officer to copy materials etc. Some historical material was passed to at least one CCoF Expert Witness (Professor David Smythe), who made use of it in the Public Inquiry. The exercise of information-gathering was essential in order to establish full information, but was extremely laborious.

The key point is that for ordinary residents so far it has proved time-consuming and challenging to gain access to some information impacting on our future, and with the possibility of many applications ahead, we remain doubtful that the future would be greatly better.

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<sup>1</sup> Community Charter, [http://faug.org.uk/community\\_charter.pdf](http://faug.org.uk/community_charter.pdf)

<sup>2</sup> My future's in Falkirk, <http://www.falkirk.gov.uk/news/publications/mfif.aspx>

<sup>3</sup> Falkirk Greenspace, <https://www.falkirk.gov.uk/services/environment/environmental-policy/docs/green-network/Falkirk%20Greenspace%20-%20A%20Strategy%20for%20our%20Green%20Network.pdf>

<sup>4</sup> Cllr D. Alexander, Precognition on Behalf of Concerned Communities of Falkirk, DPEA Appeal Refs: PPA-240-2032 & PPA-390-2029, <http://faug.org.uk/sites/default/files/%287%29%20David%20Alexander%20%28IS3%29%20-%20CCoF%20Precognition.pdf>

<sup>5</sup> Concerned Communities, Closing submissions, DPEA Appeal Refs: PPA-240-2032 & PPA-390-2029 <http://faug.org.uk/sites/default/files/CCoF%20Submission%20etc.pdf>

<sup>6</sup> Short, D. and Szolucha, A. (2017) 'Fracking Lancashire: The planning process, social harm and collective trauma' Geoforum, March 2017 [online]: <http://www.sciencedirect.com/science/article/pii/S0016718517300519#b0250>

<sup>7</sup> Health Protection Scotland (2016), A Health Impact Assessment of Unconventional Oil and Gas in Scotland <http://www.hps.scot.nhs.uk/resourcedocument.aspx?resourceid=3101>

<sup>8</sup> <https://www.thetimes.co.uk/article/billionaire-jim-ratliffe-sells-his-box-at-the-royal-albert-hall-for-2-7m-f7q5z9zhj>

<sup>9</sup> <https://www.thetimes.co.uk/article/ineos-manufactures-two-more-billionaires-czjcsqbrm>

<sup>10</sup> [http://www.heraldscotland.com/news/15284729.INEOS\\_refused\\_to\\_pay\\_for\\_anti\\_terror\\_measures\\_at\\_its\\_Grangemouth\\_plant\\_government\\_files\\_reveal/](http://www.heraldscotland.com/news/15284729.INEOS_refused_to_pay_for_anti_terror_measures_at_its_Grangemouth_plant_government_files_reveal/)

<sup>11</sup> <http://www.independent.co.uk/news/uk/home-news/ineos-grangemouth-national-security-counter-terrorism-mi5-leaked-government-documents-a7735496.html>

<sup>12</sup> <http://www.bbc.co.uk/news/uk-scotland-scotland-business-39531037>

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- <sup>13</sup> <http://www.ibtimes.co.uk/new-king-scotland-jim-ratcliffe-english-tycoon-wholl-soon-control-vast-chunks-north-sea-oil-1615206>
- <sup>14</sup> Ricardo Energy & Environment, Understanding and Mitigating Community Impacts from Transportation, <http://www.gov.scot/Publications/2016/11/5865>
- <sup>15</sup> Dart Energy (2012), Environmental Statement, Proposed Development for Coal Bed Methane Production <http://edevelopment.falkirk.gov.uk/online/applicationDetails.do?activeTab=documents&keyVal=M9I1L9HC4X000>
- <sup>16</sup> Hearing Statement of David Archibald – Transport, DPEA Appeal Refs: PPA-240-2032 & PPA-390-2029 <http://www.dpea.scotland.gov.uk/CaseDetails.aspx?id=94326>
- <sup>17</sup> Additional points raised by CCoF at Hearing Session 1 (Roads and Traffic), DPEA Appeal Refs: PPA-240-2032 & PPA-390-2029 <http://www.faug.org.uk/sites/default/files/public-inquiry-road-traffic.pdf>
- <sup>18</sup> Independent Expert Scientific Panel – report on Unconventional Oil and Gas, July 2014 <http://www.gov.scot/Resource/0045/00456579.pdf>
- <sup>19</sup> Physicians for Social Responsibility, Compendium of Scientific, Medical and Media Findings Demonstrating Risks and Harms of Fracking, <http://concernedhealthny.org/compendium/>
- <sup>20</sup> Medact, Health & Fracking (2015) [https://www.medact.org/wp-content/uploads/2015/04/medact\\_fracking-report\\_WEB4.pdf](https://www.medact.org/wp-content/uploads/2015/04/medact_fracking-report_WEB4.pdf)
- <sup>21</sup> Scottish government materials for the public about fracking include ‘Talk Fracking’ slides, which perhaps for reasons of space are necessarily simplified. <http://www.talkingfracking.scot/talk-about-it/>
- <sup>22</sup> 24<sup>th</sup> May 2017, <https://theferret.scot/dont-scotland-fracking-warning-pennsylvania/>
- <sup>23</sup> New York State Dept. of Health, “A Public Health Review of High Volume Hydraulic Fracturing for Shale Gas Development” , Dec 2014, [https://www.health.ny.gov/press/reports/docs/high\\_volume\\_hydraulic\\_fracturing.pdf](https://www.health.ny.gov/press/reports/docs/high_volume_hydraulic_fracturing.pdf)
- <sup>24</sup> Comments by peer reviewer Madelon Finkel, in HPS assessment, Peer-reviewers comments on initial draft report, p.15 <http://www.hps.scot.nhs.uk/resourcedocument.aspx?resourceid=3104>
- <sup>25</sup> Revised US EPA report on water contamination: <https://cfpub.epa.gov/ncea/hfstudy/recordisplay.cfm?deid=332990>
- <sup>26</sup> Watterson, A. (2016) ‘Fracking and public health: research update’ *SGR Newsletter* no.45; advance online publication: 22 November 2016, summarises 18 health-related papers published in 2016: <http://www.sgr.org.uk/resources/fracking-and-public-health-research-update>
- <sup>27</sup> Saunders, P.J., McCoy, D., Goldstein, R. et al. (2016) ‘A review of the public health impacts of unconventional natural gas development’ *Environ Geochem Health* Dec 5. [Epub ahead of print]; <https://link.springer.com/article/10.1007%2Fs10653-016-9898-x>
- <sup>28</sup> Comments by Dr Ian Fairlie at 6 May 2017: <http://www.ianfairlie.org/news/comments-november-2016-report-health-impact-unconventional-oil-gas-scotland-health-protection-scotland-hps/>

We understand that Dr Ian Fairlie also comments on the Radioactive Dangers of Fracking in a paper soon to be published online at: [http://www.nuclearpolicy.info/docs/events/280314/IF\\_radioactive\\_dangers\\_of\\_fracking.pdf](http://www.nuclearpolicy.info/docs/events/280314/IF_radioactive_dangers_of_fracking.pdf)

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<sup>29</sup> United States Geological Survey, *Naturally Occurring Radioactive Materials(NORM) in Produced Water and Oil-Field Equipment – An Issue for the Energy Industry*, USGS Fact Sheet FS–142–99, 1999, Denver, CO, United States of America. <https://pubs.usgs.gov/fs/fs-0142-99/fs-0142-99.pdf>

<sup>30</sup> Goldberg, M. and Phillips, S. (2013) 'Natural Gas Development: Extracting Externalities – Towards Precaution-Based Decision-Making' *MCGILL INTERNATIONAL JOURNAL OF SUSTAINABLE DEVELOPMENT LAW AND POLICY* (JSDLP), 2013, Vol. 8, Issue 2, pp.151-204, notably pp.156-62 for discussion of precautionary principle:  
[http://www.medicine.mcgill.ca/epidemiology/goldberg/Philips%20and%20Goldberg%20-%20Fracking-%20JSDLP\\_2013\\_Volume\\_8\\_Issue\\_2\\_151\\_204.pdf](http://www.medicine.mcgill.ca/epidemiology/goldberg/Philips%20and%20Goldberg%20-%20Fracking-%20JSDLP_2013_Volume_8_Issue_2_151_204.pdf)

<sup>31</sup> Newspaper reports of controversial incineration:  
[http://www.heraldscotland.com/news/13151880.Bid\\_to\\_restart\\_Scotland\\_s\\_dirtiest\\_waste\\_incinerator/](http://www.heraldscotland.com/news/13151880.Bid_to_restart_Scotland_s_dirtiest_waste_incinerator/)  
[http://www.heraldscotland.com/news/13036609.The\\_burning\\_issue\\_Revealed\\_the\\_plans\\_to\\_build\\_a\\_new\\_wave\\_of\\_the\\_waste\\_incinerators\\_that\\_have\\_communities\\_up\\_in\\_arms/](http://www.heraldscotland.com/news/13036609.The_burning_issue_Revealed_the_plans_to_build_a_new_wave_of_the_waste_incinerators_that_have_communities_up_in_arms/)

<sup>32</sup> Madelon Finkel commenting as peer-reviewer on the HPS assessment:  
<http://www.hps.scot.nhs.uk/resourcedocument.aspx?resourceid=3104>, p.20.

<sup>33</sup> CCOF closing statement, sections 18 -24: <http://www.faug.org.uk/inquiry>

<sup>34</sup> Ineos film which mentions chemicals: <http://www.ineos.com/businesses/ineos-shale/films--literature/>

<sup>35</sup> Australia media report on lack of clarity about chemicals used in UOG:  
<http://www.sunshinecoastdaily.com.au/news/Public-still-in-the-dark-on-CSG-chemicals/2910993/>

<sup>36</sup> Numbers of wells are not usually mentioned in industry literature:  
<http://www.ineos.com/globalassets/ineos-group/businesses/ineos-upstream/ineos-shale-brochures/vision-shale-v12.pdf>

<sup>37</sup> ' PLANNING HISTORY AT AIRTH – FALKIRK COUNCIL'  
<http://www.dpea.scotland.gov.uk/CaseDetails.aspx?id=94326>

<sup>38</sup> See DPEA site, Goold rebuttal document, point 3.4.2.  
<http://www.dpea.scotland.gov.uk/CaseDetails.aspx?id=94326>

**Q2: What are your views on the community benefit schemes that could apply, were an unconventional oil and gas industry to be developed in Scotland?**

We are very sceptical about the benefits promised to communities. As stated in the consultation document (p36), the payments are voluntary on the part of the operator, and are therefore not guaranteed. Payments for exploratory (test) wells have been included in the UKOOG Shale Community Engagement Charter<sup>39</sup>, however INEOS have previously stated in the press that they do not intend to make up-front payments for exploration wells. INEOS Director Tom Crotty told The Telegraph<sup>40</sup> “*We want to share the benefits but there is also sharing of the risk. So if you drill and there is nothing there, there is no gas and there is no money.*” There is therefore a possibility that communities may face disruption during test drilling and see no benefit whatsoever.

It is unclear if community payments would be made in relation to coal-bed methane extraction. The payment suggested for exploratory wells appears to only apply to wells where hydraulic fracturing takes place<sup>39,39</sup>.

INEOS have stated that they will pay 6% of revenues to communities – with 4% going to land and homeowners in the immediate vicinity, and 2% to the wider community<sup>41</sup>. We note that these payments are dependent on the profits declared by the company, and these profits are linked to the price of oil. Fracking is an expensive extraction technique, and when the price of oil is low, profit margins are small and the operator may struggle to break even<sup>42</sup>. 6% of nothing is nothing.

It is not clear to communities how any payments would be administered. What exactly defines the ‘immediate vicinity’ of a well and what defines the ‘wider community’? Such payments have the potential to cause divisions and resentment within communities, with some people receiving payments, and their neighbours receiving less, or nothing at all.

House prices are likely to drop in areas where UOG extraction is taking place<sup>43,44</sup>., possibly by up to 10% Homeowners may also face higher insurance premiums or difficulties obtaining insurance<sup>45</sup>.

In our opinion no community payments can compensate for the negative impacts of the UOG industry.

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<sup>39</sup> UKOOG Community Engagement Charter <http://www.ukoog.org.uk/community/benefits>

<sup>40</sup> “Fracking: communities may miss out on cash payments”, The Telegraph, 10 March 2015 <http://www.telegraph.co.uk/news/earth/energy/fracking/11462840/Fracking-communities-may-miss-out-on-cash-payments.html>

<sup>41</sup> Community and the INEOS Promise, <http://www.ineos.com/globalassets/ineos-group/businesses/ineos-upstream/ineos-shale-brochures/community-promise-shale-v12.pdf>

<sup>42</sup> Plummeting oil price casts shadow over fracking’s future, The Guardian, 6<sup>th</sup> January 2015 <https://www.theguardian.com/environment/2015/jan/06/oil-price-casts-shadow-over-frackings-future>

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<sup>43</sup> Fracking could cut house prices 10%, say experts, The Ferret, 8<sup>th</sup> Dec 2015,  
<https://theferret.scot/fracking-property-prices-scotland/>

<sup>44</sup> Draft Shale Gas Rural Economy Impacts Paper, DEFRA, July 2015,  
[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/440791/draft-shale-gas-rural-economy-impact-report.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/440791/draft-shale-gas-rural-economy-impact-report.pdf)

<sup>45</sup> Insurance unlikely to cover fracking damage, farmers warned, Farmers Weekly, 2<sup>nd</sup> June 2016,  
<http://www.fwi.co.uk/business/insurance-unlikely-to-cover-fracking-damage-farmers-warned.htm>

### **Q3: What are your views on the potential impact of unconventional oil and gas industry on Scotland's economy and manufacturing sector?**

We believe that the UOG industry would have a negative impact on Scotland's economy.

#### **Economic Impacts**

The Economic Impact Assessment carried out by KPMG<sup>46</sup> has concluded that the economic benefit to Scotland's economy would be small:

*"According to our estimates, the UOG industry could represent, on average, 0.1% of Scottish GDP (2015) in our Central scenario and 0.3% in our High scenario which is not a large contribution to the Scottish economy."*

The KPMG analysis assumes that a well could produce around 3.16bcf over its lifetime – a figure based on the lower end of production data from US Marcellus and Utica shales. However this figure has been questioned by Prof Roy Thompson of the University of Edinburgh, raising doubts as to whether or not the industry would be commercially viable in Scotland<sup>47</sup>. Unconventional oil and gas is expensive to extract and profitability is tied to oil prices – potentially leading to a boom and bust situation and greater economic instability.

We are surprised by the estimate of number of wells, particularly for coal bed methane. The KPMG study suggests 2 pads, each with 15 wells (p20). We would like to draw attention to the fact that the Dart Energy commercial coal bed methane application, currently awaiting a decision by the Scottish Government, is for 22 wells at 14 sites and 16 pilot wells have already been drilled near Airth. Dart Energy admitted at the public inquiry that they intended to submit further planning applications if the initial one was approved.

The KPMG report does not analyse possible negative impacts on a range of other industries such as tourism, the food and drinks and whisky industries and agriculture.

#### **Scotland's food and drink**

The food and drinks industry is very important to Scotland, employing around 115,400 people<sup>48</sup>. Around 35,000 jobs are supported by the Scotch Whisky industry alone (including cereal supply, machinery and packaging providers etc) with around 10,000 of these jobs directly within the whisky industry<sup>49</sup>. Bottled water is also an important part of the industry, with Highland Spring bottling 120 million litres per annum<sup>50</sup> at their site in Lennoxton, which lies in UOG licence area PEDL 162. The food and drinks industry contributes around £14 billion to the Scottish economy and is a key growth sector with exports increasing significantly in recent years<sup>51</sup>.

The success of the Scottish food and drinks industry is largely dependent on Scotland's 'brand'. In 2015 the Scottish Government made the decision to ban GM crops in order to "protect and further enhance our clean, green status"<sup>52</sup>.

Throughout the world, fracking is seen as a controversial industry, associated with pollution and water contamination. Bans or moratoriums are in place in many countries<sup>53</sup>. We believe that the introduction of a UOG industry in Scotland could damage Scotland's clean, green brand and negatively affect the food and drinks industries. This potential negative impact has not been considered as part of the economic impact assessment.

It is important to point out that negative impacts could occur even if the UOG industry is very strictly regulated and monitored, because of the perceived risk of pollution and contamination.

## **Agriculture**

Local farmers in the Falkirk area have expressed concerns about the UOG industry. Some have knowledge/experience of the test coal bed methane wells that have been drilled in the Airth area since 1993. There are concerns about land being broken up to accommodate drilling sites and access roads, destruction of drainage systems to accommodate underground services, and possible contamination of soil making it unproductive<sup>54</sup>. Some farmers are concerned about the market for their crops, if UOG extraction is allowed to go ahead in their area.

Anecdotal evidence from farmers in the Airth area suggests land adjacent to a coal bed methane test well was unproductive for some years afterwards.

Many farmers use boreholes to obtain water for crop irrigation. This raises concerns about the potential for water contamination and the safety of the crops grown.

The Bamberger and Oswald study<sup>55</sup> looks at the effects of pollution, caused by the UOG industry, on animal health. In one incident, 17 cows died within an hour of direct exposure to fracking fluid. In other cases, animals that were exposed to polluted water produced stillborn young, young with congenital defects, or failed to breed at all.

It may be very difficult for farmers to prove a direct link between pollution on their land, and the UOG industry – particularly if there is no baseline data.

## **Tourism**

Tourism is a major industry in Scotland and is thriving in the Falkirk area with growth figures from 2014 to 2015 the highest in mainland Scotland. Tourism attracted £105.7 million into the Falkirk local economy in 2015 – an increase of 45% since 2009. The sector provided 1920 full-time equivalent jobs in the Falkirk area in 2015<sup>56</sup>.

Falkirk has worked hard to raise its profile as a tourist destination and the Falkirk Area Tourism Strategy<sup>57</sup> (p7) recognises the challenges of overcoming negative perceptions of Falkirk as an industrial area. The introduction of a UOG industry in Falkirk would be a backwards step - potentially damaging tourism and putting sustainable jobs at risk.

## Manufacturing

A likely possible destination for locally-produced shale gas is as a raw material for the petrochemicals industry. The ethane component of shale gas is used to manufacture ethylene – primarily used in the manufacture of plastics. INEOS currently have a contract to import ethane from the US so any locally-produced ethane gas will not be replacing imports while this contract is still in place.

Plastic pollution is recognised as a huge problem worldwide. There is an urgent need to focus on sustainable alternatives, recycling and reducing the production of plastics from non-renewable feedstock. This is a necessary step in our transition away from dependence on fossil fuels, has the potential to provide a large number of sustainable jobs, and is in line with the Scottish Government's Circular Economy Strategy<sup>58</sup>.

## Health costs

There could be impacts to public and worker health associated with the UOG industry, as discussed in our answer to Question 1. There are many gaps in our current knowledge. The KPMG report briefly mentions health-related costs and states "*However, for the majority, any undesirable impacts would only occur from exposure to very high concentrations of the substance which is something that could be controlled and hence the risk could be limited/mitigated with robust regulation.*" (KPMG, p37). This is an oversimplification of the situation and does not take into account the findings of the HPS Health Impact Assessment, recent research in relation to UOG, or current evidence regarding the impacts of endocrine disrupting chemicals at low levels. It also does not consider possible mental health impacts.

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<sup>46</sup> Economic Impact Assessment and Scenario Development of Unconventional Oil and Gas in Scotland, KPMG, Oct 2016, <http://www.gov.scot/Publications/2016/11/9393>

<sup>47</sup> Scotland's geology will not allow for successful fracking, says academic, The Times, 11 Feb 2017, <https://www.thetimes.co.uk/edition/scotland/scotland-s-geology-will-not-allow-for-successful-fracking-says-academic-55db6tzjm>

<sup>48</sup> Scottish Government, Food and drink <https://beta.gov.scot/policies/food-and-drink/>

<sup>49</sup> Scotch Whisky Briefing 2013, <https://web.archive.org/web/20130507123559/http://www.scotch-whisky.org.uk/news-media/media-press/publications/publication/2039/scotch-whisky-briefing-2013/>

<sup>50</sup> Highland Spring Group, <http://www.highlandspringgroup.com/about-us/our-sites/>

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- <sup>51</sup> Food and drink exports from Scotland hit record high, BBC, 19<sup>th</sup> March 2017, <http://www.bbc.co.uk/news/uk-scotland-scotland-business-39314636>
- <sup>52</sup> Scottish Government, GM crop ban, 2015, <https://news.gov.scot/news/gm-crop-ban>
- <sup>53</sup> Keep Tap water Safe, List of Bans Worldwide, <https://keeptapwatersafe.org/global-bans-on-fracking/>
- <sup>54</sup> Leslie Dick, Precognition on Behalf of Concerned Communities of Falkirk, DPEA Appeal Refs: PPA-240-2032 & PPA-390-2029  
<http://faug.org.uk/sites/default/files/%2811%29%20Leslie%20Dick%20%28IS3%29%20-%20CCoF%20Precognition.pdf>
- <sup>55</sup> M. Bamberger, R. Oswald (2012) “Impacts of gas drilling on human and animal health”, New Solutions, Vol. 22(1) 51-77, [http://psehealthyenergy.org/data/Bamberger\\_Oswald\\_NS22\\_in\\_press.pdf](http://psehealthyenergy.org/data/Bamberger_Oswald_NS22_in_press.pdf)
- <sup>56</sup> Jobs boost as tourists put Falkirk on the map, Visit Falkirk, 13 Jan 2017, <http://www.visitfalkirk.com/news/jobs-boost-as-tourists-put-falkirk-on-the-map/>
- <sup>57</sup> Tourism Falkirk 2020, Falkirk Area Tourism Strategy 2015-2020, <http://www.scottishtourismalliance.co.uk/uploads/Destinations/Tourism%20Falkirk%202020%20%28Mar%202015%29.pdf>
- <sup>58</sup> Scottish Government, Making Things Last – A Circular Economy Strategy for Scotland  
<http://www.gov.scot/Publications/2016/02/1761/1>

#### **Q4: What are your views on the potential role of unconventional oil and gas in Scotland's energy mix?**

KPMG's report for the Scottish Government forecasts that UOG could begin the flow of product by around 2026 and reach peak production by around 2044. Given the Scottish Government's goal for half of all the country's energy needs to be met by renewable sources by 2030 and its 2050 decarbonisation target<sup>59</sup>, we believe that there is no role for unconventional gas in Scotland's energy mix.

Furthermore, INEOS have stated that they intend to use the shale gas they produce in Scotland as a feedstock for the petrochemicals industry or as an energy source at their own manufacturing sites<sup>60</sup>.

There is a danger that pursuing UOG in Scotland could be detrimental to the renewables industry due to the (mistaken) perception of an abundant, cheap supply of gas. It is our view that the time, money and effort involved in supporting a UOG industry in Scotland would be better invested in long-term, renewable energy solutions.

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<sup>59</sup> Scottish Government, Scottish Energy Strategy: the Future of Energy in Scotland, Scottish Government, January 2017, <http://www.gov.scot/Resource/0051/00513466.pdf>

<sup>60</sup> 'INEOS and Our Vision for Shale Gas', INEOS Upstream, Downloaded May 29 2017, <http://www.ineos.com/globalassets/ineos-group/businesses/ineos-upstream/ineos-shale-brochures/vision-shale-v12.pdf>

## **Q5: What are your views on the potential environmental impacts of an unconventional oil and gas industry in Scotland?**

This question asks us to comment on environmental impacts, however, the Scottish Government did not commission research to look at the broad range of environmental impacts that may occur in the Scottish context (research topics focused on climate impacts, seismicity and decommissioning). This lack of research is a serious concern.

### **Environmental impacts**

The PSR Compendium of Evidence<sup>19</sup> contains up-to-date information regarding environmental impacts associated with UOG. These include:

- Air pollution (direct emissions to air, and fugitive emissions)
- Impacts on the water environment (water contamination, water use, waste disposal)
- Radioactive releases
- Impacts relating to waste treatment and disposal
- Seismic activity
- Impacts on soil quality
- Impacts from fracking infrastructure
- Noise and light pollution
- Visual impacts

Our key concerns are described in more detail below.

### **Air pollution**

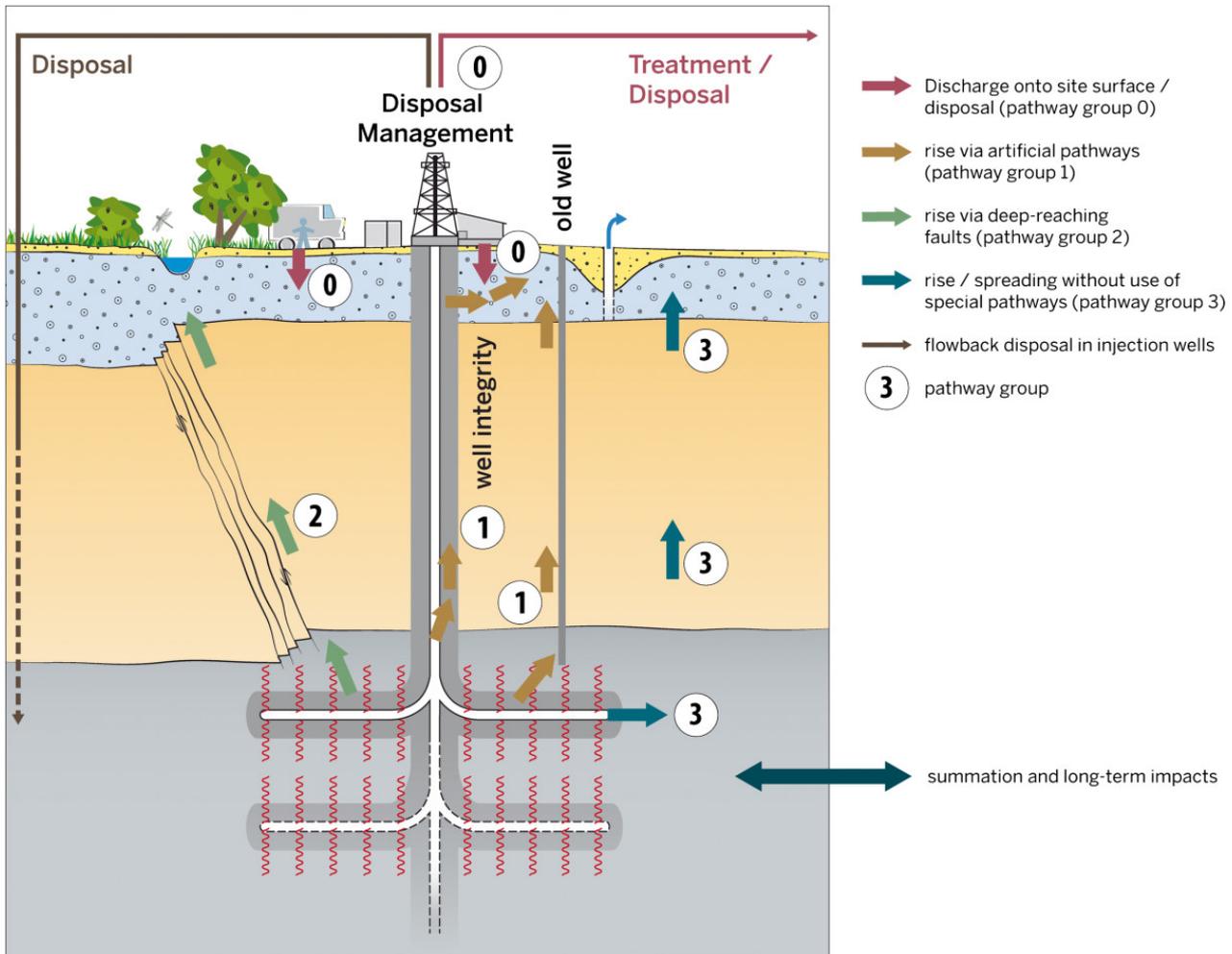
Air pollution is a key area of concern. Increased levels of benzene, toluene and other volatile organic compounds, oxides of nitrogen, particulate matter, silica dust, formaldehyde and ground-level ozone are all associated with drilling and fracking operations. All have the potential to adversely affect health. Endocrine disrupting chemicals can cause damage at extremely low levels.

Infrastructure associated with fracking, such as compressor stations, water treatment facilities, dehydrators and pipelines all contribute to air pollution.

The Health Protection Scotland report concludes there is 'sufficient' (i.e. unequivocal) evidence that a number of airborne and waterborne hazards are likely to occur as a result of UOG operations.

## Problems associated with geology/hydrogeology

The Health Protection Scotland report (p60) includes a useful diagram from a paper by A. Bergmann et al.<sup>61</sup> showing some potential water-related impact pathways. We have reproduced the diagram below.



The Health Protection Scotland report states (p59):

*“Bergmann et al., (2014) identified four different water-related impact pathways (Figure 7). These include: discharge of pollutants directly at ground surface during handling of HF fluids or flowback; pollutant discharges and migration along production wells or wells from legacy activities of other types of exploration; movements of pollutants along geological faults; and lastly, movements that depend on geological and hydrogeological conditions (which may result in the rise and the lateral spreading through geological strata e.g. via an aquifer).”*

There is the potential for air and water contamination by any of the above pathways.

Numerous cases of water contamination have been documented in the US<sup>19</sup>. Water contamination and fugitive emissions are frequently associated with failures in well integrity (pathway 1 in the diagram). However, an investigation from the USA (Llewellyn

et al, May 2015), indicates that fracking fluids and gas may be able to travel large distances along bedrock fractures<sup>62</sup>.

Given the densely-faulted nature of the Midland Valley of Scotland, and the number of old mine workings, an understanding of the geology and hydrogeology of this area is essential – in particular in relation to the potential pathways for fugitive emissions and migration of chemicals over large distances.

**Evidence on geology and hydrogeology formed an important part of the Public Inquiry into Dart Energy’s proposals for Coal Bed Methane extraction. We request that the evidence from this inquiry is studied in detail.**

In April 2013 Falkirk Council appointed AMEC to carry out an independent review of aspects of Dart Energy’s proposed development, relating to the geological and hydrogeological environment and the assessment of environmental effects. AMEC produced six technical notes over a period of several months and held a number of technical exchanges with Dart Energy and their consultants, RPS. The AMEC review ended in November 2013 and concluded that two key issues remained unresolved, namely the possibilities of the proposed development drawing water from more than the coal seams, and also encouraging methane migration and promoting fugitive emissions.

Falkirk Council subsequently recommended refusal of planning permission on the basis that Dart Energy had failed to demonstrate that there would be no significant adverse environmental impacts<sup>63</sup>.

AMEC’s lead technical reviewer on the project, Dr Shaun Salmon, presented evidence at the Public Inquiry as a witness for Falkirk Council. In summarising the AMEC review he states<sup>64</sup>: “...the RPS decision not to adopt a conservative approach to the impact assessment was problematic, especially the failure to reappraise the geology, faulting and mine workings in the area in sufficient detail, and to accept that, for the purposes of the assessment, faults should have been considered as potential pathways for dewatering and fugitive gas emission effects.”

At the public inquiry Dr Salmon also noted that the proposed development could lead to dewatering of mine workings in the vicinity, giving rise to further fugitive emissions of methane (Falkirk Council Closing Submission<sup>63</sup>, 6.6).

Prof. David Smythe gave evidence on behalf of Concerned Communities of Falkirk. Prof. Smythe’s evidence discussed the potential for faults in the proposed development area (PDA) to act as conduits for the upward migration of fluids and fugitive methane<sup>65</sup>. He states: “the numerous normal faults in the PDA are more likely to act as conduits for fluid flow and fugitive methane than to be barriers to flow. Furthermore, the conduit only has to extend in a vertical sense for 500 m to connect the target coals to the Secondary A aquifer of the Passage Formation. Within the latter, further upward migration will be probable, and once any such fluids reach the Lower Coal Measures there is an additional easy route for upward migrating fluids provided by the old mine shafts”.

At the public inquiry Dart Energy’s witness, Mr Goold, accepted that drilling could continue across a fault, and if the coal seam was ‘lost’ on the other side of the fault then

drilling would continue for up to 12 hours in the hope of finding it again, before a commercial decision would be made on whether or not to proceed.

Dart Energy's witness stated that fugitive emissions were not likely, due to the development of a pressure gradient created during the dewatering process at the well head<sup>66</sup>. However, concerns were raised by both AMEC and CCoF regarding disruption of this pressure gradient (for example by blocked laterals or cessation of dewatering)<sup>64, 67</sup>.

A report commissioned by the Queensland Department of Natural Resources and Mines<sup>68</sup> is relevant to this discussion. This report explains that free gas can potentially migrate large distances (up to 10km): *“Towards the margins of the gas field - the pressure gradient is minimal and, if the gas has desorbed, the buoyancy forces may dominate. This can drive the gas vertically and laterally away from the gas field if a pathway exists (fugitive gas). Fractures or high permeability zones along a low dipping geological formation can easily provide such a pathway in the up-dip direction.”*

It should be noted that in Dart's proposed PDA the up-dip of the coal seams are such that Dart Energy's target seams – the Upper Limestone and Limestone Coal formations – come close to the surface beneath the communities of Cowie and Plean, around 2-3 km to the west of the wellheads. Here, there are extensive abandoned mine workings, and the end of one of Dart's proposed horizontal boreholes came within a few hundred metres of these.

**We believe UOG extraction has the potential to cause significant environmental impacts given the complex geology/hydrogeology and extensive abandoned mine workings in the Midland Valley. No study was commissioned by the Scottish Government to look at geology and hydrogeology and we consider this to be a serious omission.**

## **Waste disposal**

The disposal of wastes associated with UOG present a major problem. Flowback water contains chemicals used during the fracking process, and naturally occurring chemicals from the shale, including naturally occurring radioactive materials (NORMS) and high levels of salt. It is not clear how this waste will be treated and disposed of. The treated abstracted water from the Airth pilot coal bed methane wells was released into the River Forth. This raises concerns regarding potential accumulation of contaminants on the seabed, and impacts on both humans and wildlife.

## **Radioactive waste**

There are issues in the UK relating to the disposal of waste, which could pose a threat to health. “Strategy for the Management of Naturally Occurring Radioactive Material (NORM) Waste in the United Kingdom”, produced by DECC and the Scottish Government in July 2014 outlines some issues:<sup>69</sup>

Notably Annex B notes the following areas of uncertainty, with accompanying cause for concern (we have emboldened what seem to be important points)

B.18 The "unconventional" gas industry, which includes extraction of shale gas and coal bed methane, is still in its infancy in the UK and therefore **it is difficult to predict with any confidence, at this stage, how much NORM waste will be generated or what its characteristics will be until more exploratory drilling and analysis is undertaken.**

B.19 We anticipate the quantities of solid waste generated will be consistent with the onshore oil and gas industry and can be managed using the same treatment and disposal routes.

B.20 There is also a large uncertainty regarding the quantity and radiological characteristics of liquid waste (known as flow back waters) that will be generated from shale gas extraction that uses hydraulic fracturing. The radiological characteristics will be greatly influenced by the specific geology that is being exploited. **Evidence from the US and preliminary results from exploration activities in the UK suggests that the concentrations of natural radionuclides in the liquids will be higher than those found in "conventional" produced waters.**

B.21 The quantities of liquid NORM waste generated will depend on the number of shale gas extraction wells **and whether or not there is any possibility of re-using the flow back water.** It is very likely that some on-site or bespoke treatment facilities will be required to manage this water. The oil and gas industry is currently looking at the capacity for treatment and disposal facilities as part of its planning for shale gas.

See also Annex A, section A.52:

A.52 It is clear that some of the longest journeys taken by NORM wastes in the UK are from Scottish sources to disposal facilities in England. This is inefficient and potentially increases the vulnerability of valuable Scottish business sectors to changes in the availability of disposal resources. However, it is not clear that the gaps in disposal provision in Scotland are caused by the planning system, rather than by the **reluctance of providers in coming forward with proposals to develop capacity.**

As far as we know, there is still no clear plan for the disposal of radioactive flowback waters from the onshore industry.

There have been reports from 2016, based on email evidence, that INEOS propose dumping fracking waste water in the sea <sup>70</sup>

## Seismicity

The BGS report<sup>71</sup> commissioned by the Scottish Government states that Scotland, and the Midland Valley in particular, has low levels of earthquake activity. However it acknowledges that more data are likely to be required to improve the understanding of the hazard from induced earthquakes and the successful implementation of regulatory measures (Summary and Section 6).

Section 3.4 of the BGS report discusses the earthquakes induced by hydraulic fracturing near Blackpool in 2011. In total, 58 earthquakes were linked to fluid injection during fracking at this time. The largest occurred on 1<sup>st</sup> April 2011 and had magnitude of 2.3 ML. There is, however, no mention in the BGS report of the well casing damage that occurred at this time at the Preese Hall site<sup>72</sup>. It is important to note that although an earthquake may be unnoticeable, or trivial, at the surface, it can damage underground workings. This is a concern to residents in the Midland Valley who live in the vicinity of sensitive infrastructure such as the industrial complex at Grangemouth (refinery, chemical works and associated pipelines).

Section 4.3 discusses regulation in the UK and explains the DECC ‘traffic light’ system for the cessation of hydraulic fracturing operations. The threshold is set at 0.5 ML and the report states that “*An event of this magnitude is unlikely to be felt and does not pose any seismic hazard. It would only be detected by sensitive monitoring equipment in the vicinity of the epicentre.*” Section 5.1 states that “*A dense network of monitoring stations is essential for reliable detection and discrimination of induced seismic events, and to allay public concern*”. The report goes on to explain (Section 5.4) that the seismic monitoring network in Scotland is currently not capable of detecting earthquakes with magnitude 0.5 ML or below, even in areas where there is a high density of monitoring stations. Clearly a more sensitive monitoring network is required if the unconventional oil and gas industry is to proceed. Who would be responsible for paying for, installing and monitoring this network? Presumably this would be required to establish accurate baseline levels for seismic activity before fracking begins.

We are concerned that the DECC ‘traffic light’ system may not be sufficient to prevent a significant seismic event happening. A recent paper studying fault activation by hydraulic fracturing in Canada has found that seismic activity can occur for months after the injection of fracking fluids has stopped. The largest seismic event in the study occurred several weeks after injection along a fault<sup>73</sup>.

The BGS report acknowledges that “*The identified area of potential UOG development coincides with areas of high-density coal-mining in the Midland Valley.*” and states that mining was the source of approximately 25% of all earthquakes recorded in the UK in the 1980s and 1990s (Section 2.5.2). Many areas in the Midland Valley are designated “Development High Risk Areas” by the Coal Authority<sup>74</sup>. These areas have the “*potential for instability or a degree of risk to the surface from the legacy of coal mining operations*”.

We are concerned that any induced seismicity (either a single event or a sequence of smaller events) could lead to disturbance of old mine-workings which may, in turn, induce further seismic events. This is a concern for communities as many former mine workings are in densely populated areas. The report does not address this issue in any detail but states “*In addition to natural fracturing and bedding planes between sedimentary units, the formations are also affected by other discontinuities including faulting and mine workings. Much of the Central Belt is undermined where coal-bearing strata are present*”.

(see Jones, 2004; Gillespie et al., 2013), leaving voids, collapsed workings or packed waste in the sub-surface space previously occupied by the coal. . . The presence and extent of mine workings should therefore be factored into detailed studies on UOG potential.” (Section 2.4.3)

### **Lack of baseline data**

A recurring theme throughout the Scottish Government commissioned research studies is the lack of baseline data. This is necessary to determine if impacts from UOG extraction occur.

It is frustrating to read the HPS Health Impact assessment statement that: ‘The lack of an operational UOG industry in Scotland has meant that there is no locally generated evidence available to assess either the competence of local industry to operate UOG activities to best practice standards, or to assess the effectiveness of the existing planning and regulatory regimes in Scotland’ (HPS, section 5.4.5, p.137). It is true that the 16 or so existing coalbed methane wells near Airth / Letham / Stenhousemuir / Larbert are not what might be called full-field development. However, coal bed extraction has taken place in the area since 1993, lasting some 20 years until the moratorium ended activity.

We note that no baseline data was collected before pilot coal bed methane extraction first began. There was opportunity for base-line studies and ongoing monitoring to be done, for a recognised regulatory body to be closely involved at every stage, for water to be tested by them (rather than by industry), for soil to be sampled, for the health of local residents to be monitored (the wells are close to human habitations). None of this happened, and a chance was lost. There was no requirement for SEPA to carry out independent monitoring because of the small scale of the pilot operation. This seems an absurd situation for an operation that was intended as a pilot before development on a larger scale.

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<sup>61</sup> Bergmann, A. et al. 2014. Potential water-related environmental risks of hydraulic fracturing employed in exploration and exploitation of unconventional natural gas reservoirs in Germany. *Environmental Sciences Europe*, 26, (10) <https://enveurope.springeropen.com/articles/10.1186/2190-4715-26-10>

<sup>62</sup> Llewellyn et al, “Evaluating a groundwater supply contamination incident attributed to Marcellus Shale gas development”, Proc. Natl. Acad. Sci. 2015 [www.pnas.org/cgi/doi/10.1073/pnas.1420279112](http://www.pnas.org/cgi/doi/10.1073/pnas.1420279112)

<sup>63</sup> Falkirk Council, Closing submission, DPEA Appeal Refs: PPA-240-2032 & PPA-390-2029, <http://www.dpea.scotland.gov.uk/CaseDetails.aspx?id=94326>

<sup>64</sup> S. Salmon, Precognition on Behalf of Falkirk Council, DPEA Appeal Refs: PPA-240-2032 & PPA-390-2029, <http://www.dpea.scotland.gov.uk/CaseDetails.aspx?id=94326>

<sup>65</sup> D. Smyth, Precognition on Behalf of Concerned Communities of Falkirk, DPEA Appeal Refs: PPA-240-2032 & PPA-390-2029, <http://faug.org.uk/sites/default/files/%283%29%20Prof%20David%20K%20Smythe%20%28IS1%29%20-%20CCoF%20Precognition.pdf>

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<sup>66</sup> D. Goold, Geological Precognition Statement, DPEA Appeal Refs: PPA-240-2032 & PPA-390-2029, <http://www.dpea.scotland.gov.uk/CaseDetails.aspx?id=94326>

<sup>67</sup> Concerned Communities, Closing submissions, Sections 42-44, DPEA Appeal Refs: PPA-240-2032 & PPA-390-2029 <http://faug.org.uk/sites/default/files/CCoF%20Submission%20etc.pdf>

<sup>68</sup> CSG Compliance Unit, Department of Natural Resources and Mines, "Potential effects of free gas on bore water supply from CSG development", March 2016 <http://notatanycost.com.au/wp-content/uploads/2014/02/KCB-Gassy-Bore-Final-Report.pdf>

<sup>69</sup> "Strategy for the Management of Naturally Occurring Radioactive Material (NORM) Waste in the United Kingdom". Produced by DECC and the Scottish Government, July 2014 <http://www.gov.scot/Publications/2014/07/5552/0>

Annex B: <http://www.gov.scot/Publications/2014/07/5552/7>

Annex A, section A.52: <http://www.gov.scot/Publications/2014/07/5552/6>

<sup>70</sup> Report in Guardian of Ineos plans for waste water: <https://www.theguardian.com/environment/2016/jun/15/uk-fracking-firm-plans-dump-wastewater-in-sea-ineos>

<sup>71</sup> British Geological Survey (2016), Understanding and Monitoring Induced Seismic Activity, <http://www.gov.scot/Publications/2016/11/5969>

<sup>72</sup> Fracking company Cuadrilla halts operations at Lancashire drilling site, The Guardian, 13<sup>th</sup> March 2013, <https://www.theguardian.com/environment/2013/mar/13/fracking-cuadrilla-halts-operations-lancashire>

<sup>73</sup> Xuewei Bao, David W. Eaton, "Fault activation by hydraulic fracturing in western Canada" *Science*, 17 Nov 2016, <http://science.sciencemag.org/content/early/2016/11/18/science.aag2583>

<sup>74</sup> Coal Authority Interactive Map Viewer <http://mapapps2.bgs.ac.uk/coalauthority/home.html>

## **Q6: What are your views on the potential climate change impacts of unconventional oil and gas industry in Scotland?**

An unconventional oil and gas (UOG) industry in Scotland would make it more difficult for our country to meet its ambitious greenhouse gas emission targets. According to the study from the Committee on Climate Change (CCC), which was commissioned by the Scottish Government, *“The compatibility of unconventional oil and gas extraction with emissions targets depends on whether these additional emissions can be offset by increased emissions reductions elsewhere in the economy”*<sup>75</sup>.

We cannot afford to depend on increased reductions in emissions “elsewhere in the economy” – from where exactly? We are justifiably proud of the progress we have made in Scotland to reduce our greenhouse gas emissions, and the Scottish Government calls itself a “progressive leader on climate action” so UOG would be a backwards step for our country and our government<sup>76</sup>.

Methane has a Global Warming Potential (GWP) more than 80 times that of Carbon Dioxide, when averaged over a 20-year period following emission. According to the Environmental Defense Fund, using data from the Intergovernmental Panel on Climate Change (IPCC), *“about 25% of the manmade global warming we’re experiencing today is caused by methane emissions”* and *“the largest source of industrial emissions is the oil and gas industry”*<sup>77</sup>. In a 2015 review paper, Robert Howarth, a professor at Cornell University in New York, concluded that, despite shale gas often being promoted as a bridge fuel by supporters of UOG, *“When methane emissions are included, the greenhouse gas footprint of shale gas is significantly larger than that of conventional natural gas, coal, and oil”*<sup>78</sup>. A 2016 paper from Harvard researchers revealed that U.S. methane emissions have increased by more than 30% over the 2002–2014 period and could account for 30–60% of the global growth of atmospheric methane seen in the past decade<sup>79</sup>. The authors took care not to attribute this increase to any one cause but the spike in methane emissions that the satellites recorded coincides almost perfectly with the American shale oil and gas boom<sup>80</sup>. Fugitive methane emissions from the United States can even be seen as plumes that are observable from Space and airborne measurements<sup>81</sup>.

Setting up a regulatory regime to limit the climate change impacts of an unconventional oil and gas industry in Scotland would pose significant challenges, with no guarantees that it would be effective. According to the CCC study, *“exploiting unconventional oil and gas by fracking on a significant scale is not compatible with Scottish climate targets”* unless emissions from well development, production and decommissioning are “strictly limited” through strengthening of the regulatory system, with “full coverage of greenhouse gas emissions” to include infrastructure before the point of grid injection through to delivery to end users; use of emission-limiting technology; a monitoring regime that

“catches potentially significant methane releases early”; and proper decommissioning of wells at the end of their lives, with the producer liable for emissions thereafter.

There are a number of pathways for the release of fugitive methane as discussed in our answer to Question 5, including via faults and old mine workings. There is no evidence to suggest that even the strictest regulatory regime will be able to monitor all possible pathways (see Question 7).

If Scotland wants to maintain its global leadership on climate change we must play our part in keeping the temperature of the Earth well below 2°C compared to the pre-industrial baseline. To do so we must ban Unconventional Oil and Gas Extraction in Scotland, setting an example for other nations.

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<sup>75</sup> ‘Unconventional Oil and Gas: Compatibility with Scottish Greenhouse Gas Emissions Targets’, Committee on Climate Change, November 8, 2016, <http://www.gov.scot/Publications/2016/11/1380>

<sup>76</sup> Scottish Government, ‘Draft Climate Change Plan The draft third report on policies and proposals 2017-2032’, January 2017, <http://www.gov.scot/Resource/0051/00513102.pdf>

<sup>77</sup> ‘Methane: The other important greenhouse gas’, Environment Defense Fund website, downloaded May 27 2017, <https://www.edf.org/methane-other-important-greenhouse-gas>

<sup>78</sup> ‘Methane emissions and climatic warming risk from hydraulic fracturing and shale gas development: implications for policy’, Robert W Howarth, Energy and Emission Control Technologies 2015:3, [http://www.eeb.cornell.edu/howarth/publications/f\\_EECT-61539-perspectives-on-air-emissions-of-methane-and-climatic-warmin\\_100815\\_27470.pdf](http://www.eeb.cornell.edu/howarth/publications/f_EECT-61539-perspectives-on-air-emissions-of-methane-and-climatic-warmin_100815_27470.pdf)

<sup>79</sup> ‘A large increase in U.S. methane emissions over the past decade inferred from satellite data and surface observations’, A. J. Turner et al, Geophysical Research Letters, Volume 43, Issue 5, Pages 2218–2224, 16 March 2016, <http://onlinelibrary.wiley.com/doi/10.1002/2016GL067987/abstract>

<sup>80</sup> ‘US likely culprit of global spike in methane emissions over last decade’, The Guardian, 17 February 2016, <https://www.theguardian.com/environment/2016/feb/17/us-likely-culprit-of-global-spike-in-methane-emissions-over-last-decade>

<sup>81</sup> ‘Airborne methane remote measurements reveal heavy-tail flux distribution in Four Corners region’, C. Frankenberg et al, April 2016, <http://www.pnas.org/content/113/35/9734.full>

## **Q7: What are your views on the regulatory framework that would apply to an unconventional oil and gas industry in Scotland?**

### **Regulatory gaps**

As acknowledged in the consultation document (p52) there are gaps in the current regulatory framework, particularly in relation to air quality, decommissioning and seismic monitoring.

We are concerned that SEPA is under-resourced and lacks experience of this type of industry. There is a lack of clarity between the different bodies (SEPA, HSE, local authorities etc) regarding who is responsible for what. This is particularly concerning in relation to air quality.

A recent report<sup>82</sup> examines evidence on public health regulation of the unconventional gas industry using case studies from multiple countries. It concludes that a precautionary approach is necessary to protect public health. *'It may be that the public health risks and challenges presented by the industry outweigh any benefits and are beyond effective regulation in which case prevention becomes a major policy option.'*

According to the United Nations Environment Programme it is impossible to regulate the UOG industry into safety and unintended impacts are inevitable:

*'UG exploitation and production may have unavoidable environmental impacts. Some risks result if the technology is not used adequately, but others will occur despite proper use of technology. UG production has the potential to generate considerable GHG emissions, can strain water resources, result in water contamination, may have negative impacts on public health (through air and soil contaminants; noise pollution), on biodiversity (through land clearance), food supply (through competition for land and water resources), as well as on soil (pollution, crusting).'*<sup>83</sup>

We do not believe that even the strictest of regulatory regimes would be enough to avoid negative impacts of the UOG industry. Experience from the US shows that oil and gas wells routinely leak allowing for the migration of methane and other substances. There are inherent engineering problems that worsen with time as cement deteriorates or shrinks, developing cracks or channels<sup>84, 85</sup>. There is no reason to suspect that the situation in Scotland would be any better.

As discussed in our answer to Question 5, there is concern that methane and other substances (e.g. radon) could migrate significant distances away from the well head, either through geological pathways such as faults, or via old mine workings. This highlights the need for extensive baseline monitoring over a wide geographical area before any development begins. It also raises important questions as to the locations

where monitoring for fugitive emissions would take place during production and after wells are decommissioned.

It was clear at the Dart Energy public inquiry that SEPA was still developing its regulatory position (CCoF closing submission<sup>5</sup>, Section 36 d-e). It was not clear to what extent fugitive methane would be monitored, and by whom.

The following is an extract from a letter from SEPA to the DPEA, 24<sup>th</sup> January 2014 <sup>86</sup>:

*'2.3 In our response to the DPEA on 26 August 2013, SEPA stated that the central gas processing and water treatment facility will be regulated by SEPA under the 2012 Regulations. In our response to the DPEA on 5 December 2013, we stated that under the PPC regime we will require monitoring of fugitive methane emissions in air, however these are likely to be limited to areas around the well heads and the central gas processing facility (i.e. this is the maximum extent of fugitive methane monitoring which SEPA will be able to require of the operator).'*

*2.4 As the Reporters will appreciate, this is a novel process, and one on which SEPA is still working to develop its regulatory position. The scope of the 2012 Regulations to regulate the various aspects of process is not yet completely clear. As such, we would like to clarify that although it is our intention to regulate the central gas processing and water treatment facility and the fugitive methane emissions in the manner stated above, having reviewed our position, we are unable to state definitively at this point that we will regulate the fugitive methane emissions from the well heads. We are currently working to clarify the most appropriate means of regulating under the 2012 Regulations.'*

## **Self-regulation**

We do not believe that self-regulation by companies is an acceptable solution. In relation to the pilot coal bed methane wells at Airth, information obtained under freedom of information revealed that there were no reporting requirements between Dart and SEPA. SEPA were not sampling waste water which was being discharged into the Firth of Forth – the analysis was being carried out by Dart Energy<sup>87</sup>.

Regulators may not be aware of issues unless the operator reports them. Damage to a shale well casing which occurred during the 2011 earthquake at Preese Hall in Lancashire was not reported to DECC until six months later<sup>88</sup>

## **Regulatory failures**

There are numerous recent examples illustrating that, despite regulation, pollution incidents still occur:

- Environmental safety limits of anti-sea lice pesticides have been exceeded in 45 Scottish lochs where fish farming is taking place<sup>89</sup>.
- The Grangemouth refinery has been rated “poor” for a second year running following nine incidents that caused pollution in 2016<sup>90</sup>.
- Recent ash clouds affecting Fife<sup>91</sup>.
- Many parts of Scotland regularly breach air quality safety standards<sup>92</sup>. Air pollution has been linked to 40,000 early deaths in the UK every year.

### **Lack of robust enforcement action**

There is a lack of robust enforcement action against operators who breach regulations. Fines are not a deterrent and may be factored into operating costs. Fines imposed after a pollution incident will not prevent the incident from happening.

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<sup>82</sup> A. Watterson and W. Dinan, The U.K.'s “Dash for Gas”: A Rapid Evidence Assessment of Fracking for Shale Gas, Regulation and Public Health, , New Solutions: A journal of Environmental and Occupational Health Policy, Vol. 27(1) 68-91, 2017 <http://journals.sagepub.com/doi/pdf/10.1177/1048291117698175>

<sup>83</sup> UNEP, Gas Fracking: can we safely squeeze the rocks? Nov 2012, [https://na.unep.net/geas/archive/pdfs/GEAS\\_Nov2012\\_Fracking.pdf](https://na.unep.net/geas/archive/pdfs/GEAS_Nov2012_Fracking.pdf)

<sup>84</sup> Anthony R. Ingraffea, ‘Assessment and risk analysis of casing and cement impairment in oil and gas wells in Pennsylvania, 2000-2012’ (2014) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4121783/>

<sup>85</sup> Robert. B. Jackson ‘The Integrity of Oil and Gas Wells’ (2014) <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4121783/>

<sup>86</sup> Letter from SEPA to DPEA, 24<sup>th</sup> January 2014, DPEA Appeal Refs: PPA-240-2032 & PPA-390-2029, <http://www.dpea.scotland.gov.uk/CaseDetails.aspx?id=94326>

<sup>87</sup> SEPA Disclosure Log, Freedom of Information request F0183330, [http://apps.sepa.org.uk/disclosurelog\\_admin/uploads/F0183330%20Response%20EIR\\_Redacted.pdf](http://apps.sepa.org.uk/disclosurelog_admin/uploads/F0183330%20Response%20EIR_Redacted.pdf)

<sup>88</sup> Correspondence between DECC and Cuadrilla (2012), [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/80241/lettersCHshale.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/80241/lettersCHshale.pdf)

<sup>89</sup> Revealed: Scandal of 45 Scottish lochs trashed by pollution, Sunday Herald, 26<sup>th</sup> Feb 2017, [http://www.heraldscotland.com/news/15118242.Revealed\\_Scandal\\_of\\_45\\_Scottish\\_lochs\\_trashed\\_by\\_pollution/](http://www.heraldscotland.com/news/15118242.Revealed_Scandal_of_45_Scottish_lochs_trashed_by_pollution/)

<sup>90</sup> Ineos Grangemouth plant rated poor again for pollution, Sunday Herald, 7<sup>th</sup> May 2017, [http://www.heraldscotland.com/news/15270069.Ineos\\_Grangemouth\\_plant\\_rated\\_poor\\_again\\_over\\_pollution](http://www.heraldscotland.com/news/15270069.Ineos_Grangemouth_plant_rated_poor_again_over_pollution)

<sup>91</sup> Scottish Power ordered to stop ash clouds over Fife, STV News, 3 May 2017, <https://stv.tv/news/east-central/1387476-watchdog-demands-scottish-power-suppress-fife-ash-clouds/>

<sup>92</sup> Scotland’s Most Polluted Streets Revealed – 5 New Pollution Zones Declared, Friends of the Earth Scotland <http://www.foe-scotland.org.uk/most-polluted-streets>

**Q8: Overall, and in light of the available evidence, what do you think would be the main benefits, if any, of an unconventional oil and gas industry in Scotland?**

We do not believe that there will be any benefits from this industry.

The KPMG report states that around 1400 jobs could be created in the central scenario. This is a relatively small number when compared to the number of jobs in other sectors that could be adversely impacted (tourism, food and drink, agriculture). Many of the jobs are likely to be short-term and it is possible that expertise will be brought in from outside Scotland. The number of jobs may be less than predicted if the same drilling teams are able to move from site to site.

Cheaper fuel is often proposed as a benefit of this industry, by industry supporters. However, as stated in the consultation document, UOG is unlikely to have an impact on energy prices.

**Q9: Overall, and in light of the available evidence, what do you think would be the main risks or challenges, if any, of an unconventional oil and gas industry in Scotland?**

We think the most important risks and challenges include:

- Risks to health – especially future generations.
- Risks to children at development stage.
- Uncertainty about long-term impacts.
- Risks to mental health.
- Creation of divisions in communities
- Risks to the environment of pursuing this industry, especially in areas with complex geology, old mines and sensitive infrastructure
- INEOS getting too much power over strategic sites and infrastructure, and hence gaining increasing influence
- Damage to agriculture, food and drink industries, tourism, whisky industry
- Damage to Scotland's 'clean, green' reputation and image, which are important for the economy.
- Damage to Scotland's image and role as a leader in climate change.
- Distraction from focus on, and investment in, renewable energy. UOG could take 10 years or more to get underway and by this time we should have moved away from fossil fuels.
- Costs to local authorities – huge costs in dealing with planning applications/objections. If industry goes ahead then local authority could face large clean-up costs.
- A breakdown of trust in authorities could ensue

To elaborate briefly on a few points:

**Pressure on Local Authorities**

At the SNP Autumn Party Conference 2013 CCoF called on the Scottish Government to introduce a minimum 2km buffer zone to protect communities in Scotland. Mr Wheelhouse announced at the Conference that the Scottish Government were listening to communities and were minded to introduce buffer zones. However, the 2014 Scottish Planning Policy (SPP) introduced buffer zones with no minimum safeguard and the distance determined by industry. Councils may challenge the industry if setback is considered inappropriate i.e. application by application. However, it would be very difficult for local authorities to find the resources to do this, particularly if many planning applications are submitted in a short space of time.

PEDL 133 is one of three PEDLs currently licensed in the Central Belt. INEOS has already engaged with potentially affected communities in these areas via either a public

meeting or an exhibition in town centres. Seven of the twenty four engagement exercises have taken place in the Falkirk Council area at Airth, Bo'ness, Bonnybridge, Denny, Grangemouth, Falkirk and Larbert.

Falkirk Council has acknowledged the strain on staff, resources and budget dealing with the level of public engagement response to the Dart Energy coal bed methane application<sup>93</sup> and have raised concerns over the Council's ability to deal with more than one such application simultaneously. There are no constraints which prohibit a PEDL holder from making numerous simultaneous planning applications in a Council area. How would Councils cope if presented with such a scenario?

## **Human Rights and Access to Information**

In January 2017 CCoF participated in a meeting with the 'UN Special Rapporteur on the implications for human rights of the environmentally sound management and disposal of hazardous substances and wastes'. We are therefore aware of the international interest in Human Rights and access to information, including the Rights of the Child.<sup>94 95 96 97</sup>

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<sup>93</sup> Scottish Government, Independent Review of Underground Coal Gasification, Annex 2 pp 157-168, <http://www.gov.scot/Resource/0050/00507474.pdf>

<sup>94</sup> <http://www.ohchr.org/EN/Issues/Environment/ToxicWastes/Pages/Righttoinformation.aspx>

<sup>95</sup> <http://www.ohchr.org/EN/Issues/Environment/ToxicWastes/Pages/RightsOfTheChildHazardousSubstancesWastes.aspx>

<sup>96</sup> Scotland's Commissioner for Children & Young People, Fracking: a children's rights issue, <https://www.cypcs.org.uk/ufiles/Full-fracking-briefing.pdf>

<sup>97</sup> UN Environment, New Frontiers in Environmental Constitutionalism, <http://www.unep.org/environmentalgovernance/erl/resources/publications/new-frontiers-environmental-constitutionalism>

**Q10: If you have any other comments on the issues discussed in this consultation, please provide them here.**

There are many limitations and gaps in the Scottish Government commissioned research:

- No environmental impact assessment.
- No ecological impact assessment.
- No hydrogeological study (despite significance at Dart Public Inquiry).
- The issues of high population density in Scotland's central belt are not fully explored.
- Experience of local pollution from existing sources has not been addressed.
- Cumulative impacts are not addressed.
- Failures of regulator for existing industries have not been addressed.

**We are concerned that the information from the Dart Energy public inquiry has not been fully reviewed as part of the evidence-gathering for this consultation. We request that consideration be given to the specific local impacts and that the Dart Energy Public Inquiry documentation is carefully reviewed.**

All the public inquiry documents can be found on the DPEA website at:

<http://www.dpea.scotland.gov.uk/CaseDetails.aspx?id=94326>

Key CCoF documents are conveniently located at: <http://www.faug.org.uk/inquiry> .

(Printed copies of precognition statements, inquiry and hearing statements and closing submissions have been provided).

## **Conclusion**

The SNP Manifesto states: “*We will not allow fracking or underground coal gasification in Scotland unless it can be proved beyond any doubt that it will not harm our environment, communities or public health.*”<sup>98</sup>

The Scottish Government's own impact studies highlight significant risks from the UOG industry, and major knowledge gaps. On that basis, the government should keep its promise and ban UOG.

At the time of writing, Ireland (following the lead of France, Bulgaria and various American and Australian states) appears to be moving very close to a ban on fracking. We argue that Scotland should be doing the same<sup>99</sup> .

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<sup>98</sup> SNP Manifesto [https://www.snp.org/manifesto\\_plain\\_text\\_summary](https://www.snp.org/manifesto_plain_text_summary)

<sup>99</sup> Shale Gas Bulletin Ireland, Issue No. 104, May 15, 2017, <https://sites.google.com/site/shalegasbulletinireland/all-previous-issues/issue-no-104---may-15-2017>