

Critique of “The Case for Shale in the UK”: a Dodgy Dossier from Ineos

Introduction

This critique is written as a background briefing to help anti-fracking groups respond to Ineos, an international chemical company who wish to frack parts of the north of England and Scotland. In order to get public support for their plans, a so-called “social licence”, Ineos have gone on a PR charm offensive with the groups and political institutions that they will need to influence. This has included circulating a large amount of literature and videos in favour of fracking which purports to answer people's worries about the processes of unconventional gas development. People who want to weigh up what the Ineos PR department has to say have a lot of work to do to just getting through it, let alone checking up on its truth and accuracy. This is what this document is for. I apologise that it is so long. There is a lot to answer. If you do not find in here a response to a specific Ineos claim that concerns you, I may not have managed to cover it yet. At the end I suggest other sources of good quality and easily accessible information which you can do your own researches with.

The Ineos document reviewed with this commentary, “The Case for Shale Gas in the UK”, can be found on the internet here:

<http://www.ineos.com/globalassets/ineos-group/businesses/ineos-upstream/ineos-shale-brochures/ineos-thecaseforshalegasintheuk-20151215.pdf>

Critique of Ineos “Case for Shale Gas” - Executive Summary

The Ineos economic case is based on a price for natural gas from two and a half years ago that was twice as much as it is now. At today's natural gas prices, oil and gas companies will struggle to make a profit. Thus the promised bonanza for communities is likely to be much less.

This is highly relevant to the Ineos claims about jobs -which are inflated. Over the last few years there have been several attempts to estimate possible job creation as a result of shale gas extraction and Ineos cites the highest of all the figures which is hugely exaggerated.

Ineos claims that the UK will benefit from tax although it operates out of 5 tax havens. It claims private capital alone will put up the capital and shoulder the financial risks for developing shale gas, not the tax payer, while forgetting to mention the 'enhanced capital allowances' that it will be able to utilise to develop shale and set against its own tax bill. It also does not mention the risks to the tax payer if, as is likely, many shale gas companies go bust and tax payers end up having to pay for clearing up the mess.

Ineos argues that developing shale gas is the responsible policy response to the climate crisis when in fact it would really mean delaying urgently needed action.

It argues that chemicals are central to a green economy and quotes a study by consultants McKinsey to justify its position. However, this study is itself deeply flawed because of the unreal assumptions on which it is based.

Ineos states that we must use natural gas for several more decades ignoring the climate scientists who say specifically that natural gas has to be phased out more rapidly if humanity is to have any likely chance of avoiding more than 2 degree C global temperature increase. It also notes that carbon capture and storage (CCS) would reduce emissions but does not mention that the CCS programme in the UK has been abandoned.

In order to make their case, Ineos must prove that leakages of gas during fracking and in gas processing and distribution networks can be kept very low. They fail to do this. There is a misrepresentation of the literature about this issue and an inconvenient fact is hidden by Ineos in a footnote. The claim is made that

so called “green completions” will solve the leakage problem, but the document fails to convince that many sources of methane emissions would be covered by green completions – eg from wells that leak after they have been abandoned.

Ineos fails to prove that the coal displaced by gas will not be sold and burned somewhere else anyway.

Attempting to prove that shale gas fracking will not industrialise the countryside Ineos frames the issues by discussing the land take of a single well pad. This dodges the fact that its own literature shows there would be multiple well pads not more than 2 miles apart. It neglects to mention pipeline corridors, access roads, compressor stations plus much other infrastructure that would have to be developed.

Ineos claims that fracking will be safe based on reports written 4 or 5 years ago by organisations like the Royal Society and Royal Academy of Engineering who made assumptions on what the problems might be from an industry perspective. Since then a flood of academic literature has appeared on unconventional gas, environment and public health issues. Much of this new literature has been researched not by engineering insiders but by environmental scientists and health academics. It shows that unconventional gas field development is not safe at all.

Further to this, while we have been assured that British regulations are world standard, the actual experience over the last few years has been of a catalogue of errors and technical failures with many breaches of planning and Environment Agency conditions. This is identical to what happened in other countries like the USA and Australia. Here too local people were also assured that regulatory agencies would keep the public and environment safe but then they failed to do so.

The regulatory system in the UK is deeply flawed in part because its hands have been tied by central government policy directives and staff cutbacks in recent years. Influence has been exerted by ‘well connected’ senior officials parachuted into DEFRA, DECC and the Treasury directly from the gas industry under the influence of Lord John Browne, formerly of Cuadrilla, while he was a non executive Director at the Cabinet Office.

The Environment Agency uses a permitting system that accepts the opinion of consultants paid by gas companies to say that the risks of the processes are low. However these consultant risk assessments have no reference to peer reviewed scientific studies which show that risks are in fact much higher. The consultants’ function rather like the financial rating agencies who were paid to give AAA ratings to toxic financial assets before the financial crash of 2007-2008.

In conclusion, on multiple points the Ineos “case” is not up to date, the presentation of issues is selective and framed in a misleading way. Ineos claim that developing shale gas would be good for the economy, the climate and is not at all dangerous. However, to use a phrase that they like to repeat:

“This is NOT the case”.

An out of date document

From the date embedded in the Ineos document’s web address, it looks as if it was published on 12th December 2015. However, checking on the details, the Ineos pdf was last modified in 19 February 2016. This critique is of that version. Trying to track down the date is important because there is a lot in the Ineos “case” that is out of date. This might be because the authors did an earlier version some time ago but it is quite telling that the arguments are so superannuated. They may also do other updates – for example as a response to commentaries like this.

Shale Gas, the Economy and the Gas Price – and how the Ineos case is out of date

One of the things that is not up to date is the price for natural gas. This has importance to their economic

case and their valuation of potential UK shale reserves. According to Ineos :

“Assuming a recovery rate of 10% (and a gas price of \$8 MMBTU) the UK may have over \$1 trillion of recoverable shale gas.”

Central to the Ineos big idea is an offer to share the proceeds of shale with local communities; so how much money there will be to share is of major importance to what communities are supposed to get out of it. That depends partly on geology and partly on the gas price. If the gas is not there in sufficient quantities there will not be much to share. If the price stays low, there will not be much to share either. So the gas price is central to their deal with communities. It is therefore a little lax of them to be using a gas price of \$8 MMBTU when the gas price in the period when this document was produced, last amended and subsequently put on their web site, has only been just over half of that. Yet they have not bothered to change the text. Is this because it doesn't sound so impressive that the UK might have half a trillion dollars worth in its shale reserves and not \$1trillion at all?

In fact, if Ineos had redone the figures it would be worse than that. That's because there is a certain gas price below which the industry stands little chance of breaking even and would be setting itself and its creditors up for a loss if it went into any kind of scale production at all. It is important to understand that if Ineos went ahead, invested a lot of money in fracking but then made a big loss, there is some doubt over whether communities would get any money at all.

With a gas price staying at around the current level of just over \$4 /mmbtu , there will almost certainly be a loss. Estimates vary of the break-even price but they are all over \$4. The Oxford Institute for Energy Studies estimates a breakeven at \$7.5-15.5/mmbtu, another study by Rice University assumes \$6-7/mmbtu, Eon about \$6-10 and Centrica \$7-10.

<http://www.energypost.eu/shale-gas-really-mean-europe/>

Of course the experience of the USA is different but it is worth being aware of. Over several years the shale oil and gas sector there has mostly been cash flow negative – it has been losing money. It has only been able to continue by building up a mountain of debts. There is reason to think that it would be even worse in the UK. So why are we still having to put up with the plans of this industry? Why do the would-be frackers not throw in the towel?

One will look in vain for answers to these questions in the Ineos dossier. One supposes that Ineos and similar companies do not actually have an answer and that they are just holding on, hoping for a price recovery to rescue them. Yet there is reason to believe that gas prices in Europe will remain low for a long time. Although european chemical companies like Ineos are at a competitive disadvantage because of higher energy costs than their non european rivals, they are not only facing depletion of oil and gas supplies but they are facing gas prices that are too low here to make fracking easily profitable. Demand for gas has been falling while an infrastructure to import cheap liquified natural gas is being opened up and this will keep prices low. This is not a problem that will go away. It also means that borrowing money to provide the capital for the fracking infrastructure will be difficult. In Europe the smart money knows that the operation is not likely to break even. It is too much of a gamble.

Jobs Creation?

Without a break even price for gas many other parts of the Ineos “case” become even more questionable. For example, what are we to make of the claims about job creation if it is doubtful that the industry will even get off the ground?

In fact, even if the gas price were \$8 mmbtu , the employment creation potential suggested in the document does not look right. It is worth reviewing the job creation claims to see how the spin doctors have hyped a more sober estimation. Where does the figure of 64,000 skilled jobs in the supply chain come

from? Whoever wrote the Ineos report used a set of estimated figures that was being publicised a few years ago by the Institute of Directors, based on a study by the Ernst and Young consultancy. David Cameron himself spoke in favour of shale gas using these figures and claimed 74,000 jobs in total would be created – and was then embarrassed when, in October of 2013 headlines appeared contradicting him. The one in the Financial Times read “Fracking Jobs now forecast to be one third of what Cameron quoted.” (<http://www.ft.com/cms/s/0/a4e24b70-35ac-11e3-b539-00144feab7de.html>)

What had happened was that that in 2013 the government employed an engineering consultancy AMEC, to draft a “Strategic Environmental Assessment” for the Department of Energy and Climate Change. AMEC used two scenarios for the development of shale in the UK – a high and a low activity scenario. The high activity view estimated peak national employment at a far lower level than the IoD had claimed. The AMEC figures were in the range 16,000 – 32,000 full time equivalent positions (an average of 24,000). Having embarrassed the government AMEC inserted a footnote in their report saying that the IoD figures were based on different assumptions. But that is just the point. The figures are bandied about but are not really solid at all. They were not so much estimates as guesstimates and for political reasons the assumptions underpinning them generously erred on the optimistic side.

What might be a more realistic figure was given by Alan Toothill of Refracttion to the recent Lancashire Planning Inquiry. When Lancashire County Council rejected a planning application Cuadrilla was ready to roll with its operations and 36 drilling rig workers had to be laid off. Toothill used the figure of 36 jobs per rig to multiply with another estimate from the Institute of Directors study, namely that 31 rigs would be in operation over 16 years. <http://www.refracttion.com/index.php/how-many-jobs-might-fracking-bring-to-the-uk/>

With 31 rigs employment would be $31 \times 36 = 1116$ rig related jobs. It would be necessary to double that for admin and other roles giving a total direct employment 2,232 at any one time.

According to the Institute of Directors there might be 5 years where drilling and fracking was at a particularly high level with a rig count of 50. For these 5 peak years the direct employment would then be 3,600.

Perhaps Toothill's figures are too low. How long is a piece of string? What is also observable is that early calculations made for the industry were much lower and perhaps more realistic. In 2012 a consultancy called Regeneris did another estimate for Cuadrilla and came up with a peak of slightly over 6,000 direct and indirect jobs at peak employment, albeit from the Bowland shale area alone. All over the USA it has been observable that the industry promised jobs and prosperity that did not then materialise. They have a track record for inaccurate job claims.

And what kind of jobs are these? They are often short term and extremely dangerous. The occupational fatality rate among oil and gas extraction workers is 7 times the national average. In terms of occupational deaths the industry is two and a half times worse than building sites.

Mason, K.L., Retzer, K.D., Hill, R., & Lincoln, J.M. (2015, May 29). Occupational fatalities during the oil and gas boom – United States, 2003-2013. Morbidity and Mortality Weekly Report, 64,551-554. Retrieved from <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6420a4.htm>

Ineos tells us about taxation

The issues of the price for natural gas, the alleged economic gains and employment are related to a further claimed benefit – taxation revenues. Not only will shale gas bring in tax revenues claim the spin doctors, but the risks taken in developing the industry would fall on the industry, on companies like Ineos and not on the tax payer. “Private companies would be making the investment and taking the financial risk, not the taxpayer or energy user” they tell us.

That's rich coming from Ineos which came under a scrutiny few years ago about whether it was avoiding paying taxes on the profits of its Grangemouth refinery by using accounting tricks. These made it appear that Ineos made a loss when in fact it was making £7 million a year. This is from a company which moved its HQ to Switzerland to avoid paying UK tax in 2010 and which, in addition to basing itself in Switzerland, operates from 4 other tax havens - Jersey, Luxembourg, Bermuda and Singapore.

<http://www.dailyrecord.co.uk/news/scottish-news/grangemouth-bailout-ineos-screw-taxpayer-2528931>

Ineos claim that the taxpayer is not making part of the investment and not carrying the risk of fracking. This is not the case either. There is a generous tax loophole called “enhanced capital allowances” which Ineos can make use of that is not enjoyed by companies trying to develop renewable energy. When it announces that it will be investing in shale gas exploration, Ineos accountants know that some of the investment expenditure can be offset against tax on the profits of its offshore gas fields.

<http://energydesk.greenpeace.org/2016/05/25/oil-tax-how-the-uk-taxpayer-could-spend-millions-funding-the-hunt-for-fracked-gas/>

As for taxpayers not carrying the longer term risk of fracking – we have to take that with a pinch of salt too. It is not the case. When falling oil and gas prices prompted companies in Alberta (Canada) to abandon their operations in 2014-2015, it was the provincial government that was left with the task of closing down and dismantling orphaned and abandoned wells. In one year the number of these increased from 162 to 702.

Johnson, T. (2015, May 11). Alberta sees huge spike in abandoned oil and gas wells. CBC News. Retrieved from <http://www.cbc.ca/news/canada/calgary/alberta-sees-huge-spike-in-abandoned-oil-and-gas-wells-1.3032434>

Would that not occur here too? If Ineos went bust, unless a secure insurance bond system is set up at the outset, we can be sure that it would be taxpayers that would have to pay for cleaning up the mess at the local level. Or, what has happened a lot in the USA is that fracking operations are hyped, suckers buy in and take over what they think is a good business deal, they take the loss and go bust. Then the taxpayer ends up footing the bill for the clean up.

<http://www.credoeconomics.com/shale-euphoria-the-boom-and-bust-of-sub-prime-oil-and-natural-gas/>

Shale Gas, the Chemicals Industry and the 'Green Economy'

Ineos wants to use shale gas to protect its chemical operations in the UK as a feedstock and as an energy source. It argues that, as a part of the chemical industry

“we are committed to reducing our own emissions, as well as facilitating the development of renewables, and advancing decarbonisation across society. The chemicals industry makes green technologies such as insulation, lightweight vehicle components, fertilisers, biofuels, and the materials needed to manufacture renewable energy technologies, such as wind turbines and solar panels. McKinsey and Company has calculated that the chemicals industry saves two tonnes of greenhouse gas for every tonne it emits, and has a vital role to play in delivering decarbonisation.”

It is worth exploring these claims in a little depth. In particular the 2009 McKinsey report needs to be challenged. It was written for the International Council of Chemical Associations and demonstrates the narrow techno-fix approach that has come to characterise corporate approaches to sustainability with the promotion of a dubious kind of “Green Economy”. (For a good description and critique of recent corporate “greenness” see https://pl.boell.org/sites/default/files/critique_of_the_green_economy.pdf)

In summary, the McKinsey report and companies like Ineos want to convince us that

- (1) chemical products like various forms of insulation material will help to reduce energy use, and therefore help to reduce carbon emissions.
- (2) if one puts a product in plastic packaging made by the chemicals industry, rather than putting it in a paper bag, making the paper bag will use more energy, and thus give rise to more carbon emissions than making the plastic packaging.
- (3) One can calculate these things by doing what are called “carbon life cycle impact assessments”.

Put like this, it is difficult to argue against the idea that there will be some use for the products of the chemical industry in the future – perhaps as part of making wind turbines and solar panels too. Perhaps. But close scrutiny should be paid to the way that McKinsey have framed the issues. Their method of presenting the problem is entirely as a choice between products and materials which can in theory be substituted for each other. Some of the products would be made by the chemical industry and the alternatives would not. Then, in this choice between substitutes, chemical industry products are judged as winning on the single criteria of having the lowest CO2 equivalent emissions.

What this ignores are many other vital ecological issues – such as the use and potential contamination of fresh water, non-CO2 atmospheric pollution, depletion of scarce strategic raw materials. It also ignores the fact that some of the most effective responses to the ecological crisis are changes in lifestyle - like arrangements that do away with the need to buy more products altogether because people are sharing more. For example, massive amounts of energy can be saved if people share living space or heating systems. When there are two people in one room you don't need to heat another one. When many people share a bus or a train they share the energy costs of the journey. When many people borrow the same book from a library it is unnecessary to print as many copies. Of course sharing is generally bad news for companies that want to produce and sell more.

When the McKinsey study explicitly assumes no life style changes, it rules out something very fundamental. For example, the report argue that plastics in cars are lighter in weight and so helps to improve the fuel efficiency of cars that use plastic compared to cars constructed using heavier materials. What McKinsey do not do though is compare cars with plastic in them with people who decide not to buy a car but who walk or cycle more instead, or take the bus - nor with saving emissions in a society that makes fewer cars and where people share a more limited number by becoming members of car pools. Walking more short distance journeys would not give rise to any carbon or plastic pollution problems either. It would contribute positively to people's health and reduce atmospheric problems in cities. These solutions would reduce the need for feedstocks and process energy and hence the “need” for fracking.

The ecological crisis has many dimensions and and ecologists have warned repeatedly that a lack of holistic responses will end up "solving" one problem by creating other problems instead (like the pollution arising from fracking). Thus, while plastics may "save energy" in a variety of settings, the stream of non biodegradable plastic waste that is dumped after-products and their packaging are discarded has become a very serious problem for biodiversity. It is not too strong to describe this plastic pollution as killing the world's oceans and marine food sources. There is now even a growing problem of atmospheric contamination made up of small plastic particles. (After writing this document it has been learned that Ineos hope to dump fracking waste water at sea. They claim that it will be treated but water industry professionals have expressed scepticism of the technical processes for doing this and there is fear that waste water loaded with chemicals, radioactivity and metalw damage marine environments.

<https://www.theguardian.com/environment/2016/jun/15/uk-fracking-firm-plans-dump-wastewater-in-sea-ineos>)

<http://researchbriefings.parliament.uk/ResearchBriefing/Summary/POST-PN-0528>

In this situation the best solution may be a behavioural changes – such as the regular use of an organic cotton bag to take the shopping home in. It might take more energy and carbon to make it than a plastic one, but if it is used for years then it is still preferable.

In conclusion, the approach of Ineos (and the consultants that it likes to cite) is entirely technological. It focuses narrowly on carbon efficiency measures and offers no solutions to the ecological crisis other than changing production methods and products. The most effective solutions have been placed outside the framework of their thinking - i.e. to radically reduce the need to consume altogether through lifestyles change and greater sharing. But this should not surprise – for Ineos wants to sell more products and make more money – otherwise it will not be able to service its debts. For the very same reason corporations like Ineos are poorly placed to solve the ecological crisis which is a threat to their business model. Indeed they

have tried to frame the public's understanding of serious problems for humanity in such a way that these problems become business opportunities for them. Their attempt to co-opt the green agenda is blocking real understanding and real action. It is going in exactly the wrong direction, promoting techno-fixes that do more harm than good and then using corporate PR to try to persuade us that it's all for the best. They even claim that the responsible and ethical thing to do is to follow their advice – which perhaps coincidentally matches their business plans.

(Further criticism of the McKinsey Report can be found in Appendix Three of this commentary)

Ineos and Climate Change – Bridge or delay to a low carbon future?

Obviously climate change mitigation is an important aspect of the Ineos “case”. Ineos fully recognises that climate change is happening, that human economic activity is causing it and that something must be done about it. Its case is proposed as the responsible way of reacting to a crisis facing humanity.

On a closer examination the Ineos argument is a variant of the “fracked gas is bridge to a low carbon future” story – with some embellishments. To give this credence, it claims “the bridge” idea is supported by the International Panel on Climate Change, the body that co-ordinates and brings together findings on climate science from around the world. IPCC supports use of gas rather than coal as a transition fuel, Ineos tells us and we have “an environmental responsibility to choose gas over coal as far as possible, because burning gas creates half the CO₂ and a quarter of the nitrous oxides.”

However when one tracks down the IPCC position on gas fracking, it is not nearly as clear cut as this. According to one of the lead authors of the most recent IPCC report on climate change, Keywan Riahi:

“The report clearly shows that unabated fossil fuels need to be phased out over the long-term, and this is also the case for natural gas, including shale gas. There might however be short-term opportunities for conventional natural gas to replace coal power plants. This opportunity might not be there for shale gas, however. The report clearly cautions against shale gas because of concerns with regards to fugitive emissions.”

<http://www.carbonbrief.org/does-the-ipcc-endorse-fracking>

So, just as Ineos have used the health of children in its spin offensive to build support for its business agenda, so it is prepared to use climate change and argue that the ‘responsible’ thing to do is to align with its business plans for extracting fracked gas.

While appearing to advocate climate change action, a closer examination reveals that those who run Ineos are really arguing for delaying it. The core of the argument is that because gas currently plays a major role in home heating and in providing the energy for a variety of other industrial processes, its use cannot be reduced rapidly – so it must be remain in use “for a few decades”. Moreover, because gas supplies are depleting in the North Sea, we need to explore for replacement gas sources on land. To make this double-think more credible, they argue that by using gas to replace coal fired electric power generation, global warming emissions will be that much the less.

In this way a several decades delay to a low carbon future is dressed up as a bridge to it by a company that profiles itself as sincerely wanting to help in the effort to do something against the climate threat. Let's put this spin under closer examination – because, as the propogandists are well aware, their arguments are vulnerable on many points.

How many decades can Britain use gas and stay in its carbon budgets?

A key issue is how much time there is in which to deploy the “bridge”. Ineos managers assert that we will have to be burning gas “for several decades”. However, given the urgency of action, do we actually have the

luxury of “several decades” to make the adjustments? One of Britain's leading climate scientists is Professor Kevin Anderson at Manchester University and the Tyndall Institute of Climate Change. Professor Anderson's specialism is how fast the world, and Britain will have to decarbonise if humanity is to have a reasonable chance of not exceeding various levels of global warming. He has applied that knowledge to whether there is space in Britain's future “carbon budgets” for “several decades” of fracked gas.

Here's what he says:

“The development of a UK shale gas industry may be compatible with the UK's domestic carbon budgets – *just*. These budgets are however premised on a high probability of *exceeding* the 2°C threshold between acceptable and dangerous climate change and on a highly inequitable allocation of the global carbon budget to the UK. Even under such lax conditions (and hence a larger UK carbon budget) there is a significant risk that a new and large-scale UK shale gas infrastructure could become a stranded asset within a decade or so of major shale gas extraction.....

The development of a UK shale gas industry is incompatible with UK's equitable share of the IPCC's carbon budget for a “*likely*” chance of not exceeding the 2°C obligation. This remains the case even if shale gas can be combined with carbon capture and storage (CCS) technologies. The CO₂ emissions from gas-CCS are anticipated to be five to fifteen times greater per kWh of electricity generated than are the emissions from either renewables or nuclear. Add to this the timeframe for developing a mature UK shale gas industry, and, even with CCS, shale gas can have no appreciable role in the UK's energy mix.”

<http://kevinanderson.info/blog/why-a-uk-shale-gas-industry-is-incompatible-with-the-2c-framing-of-dangerous-climate-change/>

So much then for the “several decades” of gas use! This time frame is not compatible with bringing down emissions fast enough. It is true that it will be a challenge to reduce emissions rapidly, but to say “we will need to be burning gas for several decades” is not “responsible” at all - indeed it is a betrayal of that struggle in favour of the business interest of Ineos.

Carbon Capture and Storage was part of the Ineos case – but it has been abandoned

This betrayal is even more marked when one considers that a major part of the case for continuing to use gas has been that in the future it can be done safely by deploying a technology called “carbon capture and storage” (CCS). This is the idea that emissions from burning gas to generate electricity can be captured, liquified and pumped underground into safe long term storage. When you read the McKinsey report mentioned earlier, the future for the chemical industry is very much premised on CCS working as the technologists hoped it would. That, anyway is what they hoped. Unfortunately progress on CCS has ground to a halt because Govt has cut its funding.

For Ineos this is bad news. If the company is going to keep its “case” updated and not mislead then the people running Ineos ought to have had the decency to admit this. Yet the CCS idea is still there, mentioned in paragraph 22 where the spin doctors argue gas “...could play an important role in our energy mix if abated with Carbon Capture and Storage technology, delivering vital industrial heat, and providing flexible backup to intermittent renewables and inflexible nuclear. Gas, combined with Carbon Capture and Storage also has the potential to underpin a move to using hydrogen in the energy system”

Let's look at the dates again. Ineos has issued a report that appears to have been written in December of last year and updated on mid February 2016. Yet only a few months earlier the government cancelled its £1bn programme for carbon capture and storage. They didn't mention this.

This matters. It was a policy U turn that dismayed many and probably Ineos managers too. For example, it was reported in the Ferret, a Scottish internet journal that

“A leading academic who was an adviser to the Scottish Government on fracking no longer believes that unconventional gas development is viable, saying it has been “fatally undermined” following an energy policy U-turn by the UK Government.

The Ferret can also reveal that Professor Paul Younger – who holds the Rankine Chair of Engineering at the

University of Glasgow – has resigned as a director from a company that wants to practice underground coal gasification (UCG) in Scotland.

“Professor Younger is an expert on systems, power and energy who was appointed to the Scottish Government’s expert panel on unconventional gas to advise on fracking.

“He advocates unconventional gas as a source of energy but speaking to The Ferret after the UK government’s announcement regarding carbon capture and storage (CCS), he said the Conservative Party’s new position meant pursuing fracking and UCG would be pointless.”

<https://theferret.scot/top-government-advisor-says-fracking-no-longer-viable/>

So why is this not in the Ineos report? It is not difficult to make a guess as to the reason.

Fugitive emissions – how Ineos hides an inconvenient fact in a footnote

Just as Ineos employ the tactic of appearing to champion climate action in order to disguise their real agenda of delaying it, so they disguise one of the most serious flaws in their argument for shale by drawing attention to the problem and then trumpeting the need to combat it. What is this flaw? It is the fact that there are massive leakages of methane from unconventional gas fields, gas infrastructures and distribution networks and methane gas is far more powerful than CO₂ as a greenhouse gas. So Ineos head off this danger to their argument by stating:- “We must minimise methane leakage to deliver the full climate benefits of gas” .

Indeed they must. The more gas extraction and distribution gives rise to leakages, the less it can be claimed that the effect of gas is only 50% that of burning coal. Indeed there is a level of leakage where more gas extraction and use is worse than using coal. In their “case” the Ineos PR department goes to great lengths to discredit the growing scientific literature on these questions. They would have to succeed in this if they want their climate case is to be taken as credible.

This issue was first raised in a paper published by a team of Cornell University academics in 2011 – Robert Howarth, Renee Santoro and Anthony Ingraffea. Their paper gave rise to a large amount of research and a great deal of controversy. The oil and gas industry rushed to discredit what the Cornell scientists were suggesting because, if true, it was very damaging to their case. The academic debate very largely split into two camps. On the one side, there were those who defended the gas industry who found leakages rates to be rather low. This included the US government’s Environmental Protection Agency. On the other side, there were those who found leakage rates to be much higher – so high in fact that there was no advantage to gas as compared to coal.

As it happened the controversy appears to be related to the measuring methods. Those who found the leakage rates to be low have generally used the so called “bottom up” or “inventory” measurements made upon technical components that might leak at gas installations of various kinds. Those who found leakage rates to be high used so-called “top down” measurements based on measuring atmospheric methane or related compounds at regional or larger scales - often by flying airplanes over gas fields or taking data from satellites.

There was a huge discrepancy between the two types of measurements and various suggestions to explain the differences have been made. In this regard you have to wonder about an author or authors who lecture their audience about “responsibility” and “ethics” and then hide a fact that is damaging to their case in the footnotes - the fact that bottom up measures were often made using a faulty instrument. Behold footnote 77 which reads

*The only significant study on the issue found that methane leakage was far lower than assumed by Howarth: Allen et al, ‘Measurements of Methane Emissions at Natural Gas Production Sites in the United States’, in PNAS, Vol. 110 (2013): <http://www.pnas.org/content/110/44/17768> **The accuracy of the above has itself been challenged in a recent paper, however, on a technical basis: Touché Howard, ‘University of Texas study underestimates national methane emissions at natural gas production sites due to instrument sensor failure’, in Energy Science & Engineering (2015): <http://onlinelibrary.wiley.com/doi/10.1002/ese3.81/abstract>***

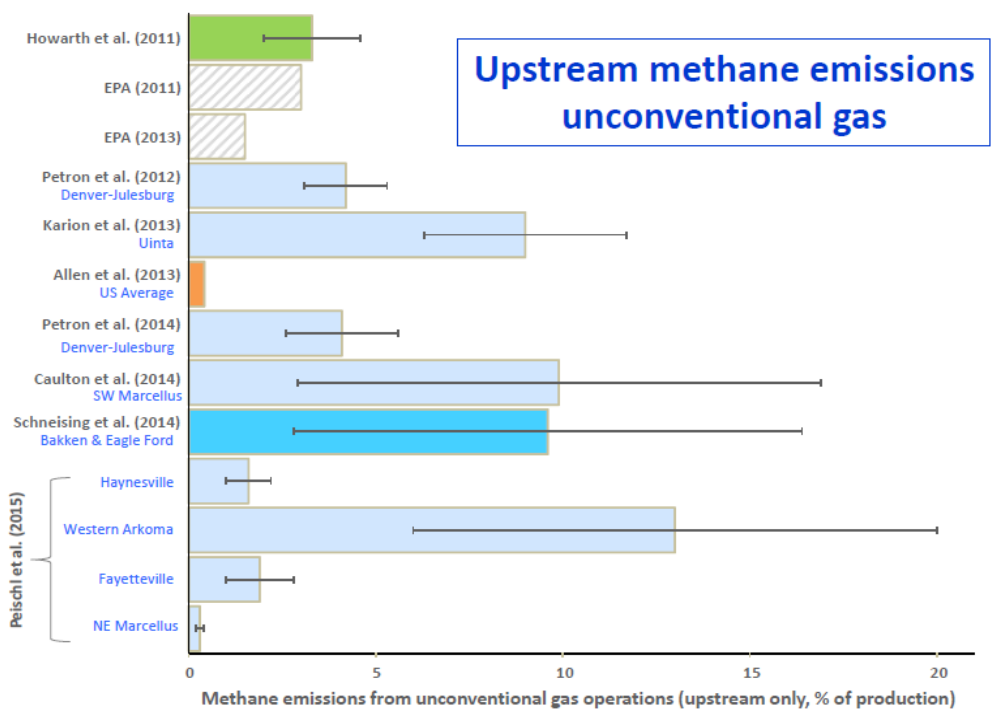
The malfunctioning of the “Bacharach Hi Flow Sampler” called into question the results of the supposed

“only significant study “ because it relied on the BHFS device for its measurements. The failure of the BHFS was not a minor issue. A reanalysis of 2011 figures that had been taken using this equipment around Fort Worth had originally shown sample concentrations at or below 5% . However the re-analysed figures ranged from 6.1 to 90.4% .

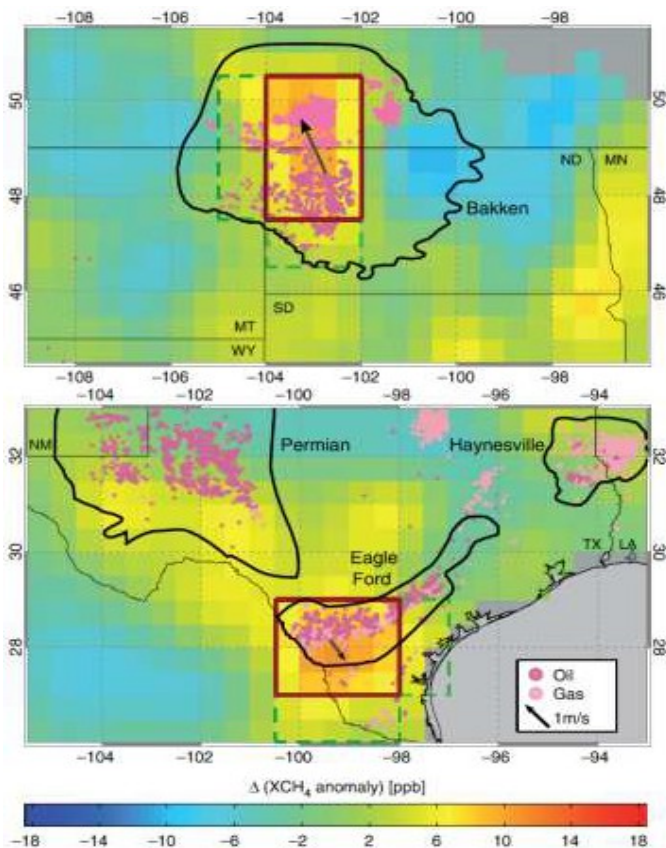
Howard, T., Ferrara, T., & Townsend-Small, A. (2015). Sensor transition failure in the high flow sampler: Implications for methane emission inventories of natural gas infrastructure. Journal of the Air & Waste Management Association, 65(7), 856 -862.

Howard, T. (2015). University of Texas study underestimates national methane emissions at natural gas production sites due to instrument sensor failure. Energy Science & Engineering . Advance online publication. doi: 10.1002/ese3.81

There are other ways in which this footnote misleads. The Allen paper was not the “only significant one”. Several peer review studies have come out between when the Allen PNAS paper was published in 2013 and when someone at Ineos wrote up their “case for shale gas”. This Ineos propagandist does not report on some highly credible “top down” studies made by driving around gas fields, or flying over them or taking readings from satellites. These kind of studies suggest far higher leakage rates than inventory method based studies and have focused the search for what is going wrong on problems that were not recognised before. Of course sources of methane may not all be derived from gas infrastructure but it is usually possible to identify the signature of methane from burping cattle or landfills. (See presentation on next page)



http://www.eeb.cornell.edu/howarth/documents/2015_04_14_Howarth_Ingraffea_4th_Anniversary_Lecture.pdf



Satellite data showing increase in methane emissions over the Bakken, Permian, Eagle Ford Gas fields during the period since fracking began from slide 39 of this Cornell University lecture

http://www.eeb.cornell.edu/howarth/documents/2015_04_14_Howarth_Ingraffea_4th_Anniversary_Lecture.pdf

A great deal of pertinent criticism has been focused on the Allen paper too. While gas industry propagandists like to quote the Allen findings there are some things that should be said about their scientific credibility. When it was published on the Proceedings of the National Academy of Science website it was stated that "The authors' declare no conflict of interest". A month later, when it was no longer getting publicity from gas industry spin doctors, the PNAS published a correction. It turned out that most of those involved in producing the paper had links with the oil and gas industry. There was a very strong conflict of interest. That was not all either.

As Paul Mobbs has pointed out: "The Allen paper is not a life-cycle study – it omits the totality of losses covered in other papers. More importantly, it's a non-randomised sample of 0.1% of the wells drilled in the US. In other words, the gas industry – whose names and site details remain anonymous – told Allen which sites to go and sample. The paper doesn't even say if the sites were producing shale gas, coal-bed methane, or if gas production was associated with shale oil wells." To call this study "the only significant study" is purely and simply dishonest.

http://www.fraw.org.uk/mei/musings/2014/20140530-the_governments_dodgy_dossier_on_shale_gas.html

Allen, D.T., Torres, V. M., Thomas, J., Sullivan, D.W., Harrison, M., Hendler, A., . . .

Seinfeld, J.H. (2013). Measurements of methane emissions at natural gas production sites in the United States. *Proceedings of the National Academy of Sciences*, 110,17768–17773. doi:10.1073/pnas.1304880110

The Global Warming Impact of Methane – 20 year or 100 year measures?

Now let's turn to other aspects of the argument. Methane breaks down in the atmosphere over time so there are different measures of the global warming impact over 20 years and over 100 years. In their document Ineos claim that the appropriate measure is the 100 year one.

They would of course because it gives the lower figures convenient to their case. However, as the International Panel on Climate Change put it, IPCC (2013): “There is no scientific argument for selecting 100 years compared with other choices.” “The choice of time horizondepends on the relative weight assigned to the effects at different times.” In this regard we should note that Ineos wants us to accept shale gas for “several decades”. So let's say that is 3 decades – if we add twenty years to that we will have the high temperature increases locked in for 50 years – during this time a variety of feedback effects and tipping points could be crossed. The climate system does not stand still – if it is given a 50 year shove at an accelerated rate a variety of reinforcing feedbacks would not somehow go into reverse. Melting sea ice means less sunlight will be reflected back into space and more will be absorbed by ocean water which is darker and so absorbs more solar heat. More methane hydrates in the earth's oceans and peat bogs will have been converted into methane gas that will bubble into the atmosphere reinforcing the crisis that could send today's children and their children into early graves.

Green completions – will they be enough to rescue the case for shale gas?

The other argument from Ineos is that by changing practices when setting up gas fields the leakage can be put right. The magic phrase here is “Green completions”. During the completion of the well a flow back of liquids and gases typically leads to gas being vented to the atmosphere. But technologies are on hand to reduce the amount of gas that gets released. The gas is captured and ideally it is then processed and sold. Or that is the theory. However, on current policy green completions will be voluntary in the UK. Indeed in September of last year an article appeared in the London Guardian that said:

“The UK government has added its weight to a behind-the-scenes lobbying drive by oil and gas firms including BP, Chevron, Shell and ExxonMobil to persuade EU leaders to scrap a series of environmental safety measures for fracking, according to leaked letters seen by the Guardian.

The deregulatory push against safety measures, which could include the monitoring of on-site methane leaks and capture of gases and volatile compounds that might otherwise be vented, appears to go against assurances from David Cameron that fracking would only be safe “if properly regulated”.

<http://www.theguardian.com/environment/2015/sep/10/uk-backs-bid-by-fossil-fuel-firms-to-kill-new-eu-fracking-controls-letters-reveal>

Although Ineos is not mentioned in this there are reasons to doubt whether “green completions” will always happen given this two-faced approach to policy and enforcement. The industry says that they are in business to capture and sell gas - not to vent it. But it is not as simple as that. Green completions are a fuff for the industry that adds costs as well as possibly yielding some gas for sale. As the price of gas falls so it is worth less to go to the bother of green completions from a strictly commercial point of view. The fact that green completions will be voluntary in the UK means that the theoretical possibility that they can be deployed may be raised rhetorically to win arguments but in practice they might not always be deployed. Despite the EPA push in the USA green completions have been introduced there slowly.

Methane emissions that would not be captured by “Green Completions”

That's not all either. The controversy started by Howarth and his colleagues at Cornell led to a flood of new research which revealed sources of methane emissions that had previously not been recognised – and which would not in any case be captured by “green completions”. It has become clear that methane is often released in pre-production and drilling phases. It has been found too that leakages in gas distribution networks and installations are not as small as had previously been assumed. Indeed they may be more than at the well head. A study by a University of Houston team found that emission rates from compressor stations in the Texas Barnett Shale area were far higher than emissions at well pads. That will not be solved by green completions. Nor are methane emissions always the result of leakage. There are also “blowdowns”. This is the gas industry name for venting gas from installations to allow work to be done on them.

One can argue that a UK onshore shale gas industry would be plugged into the existing gas network and that if that is leaking, then it will not be worse than before – but this ignores the need to wind down gas usage and this grid quickly anyway.

Lan, X., Talbot, R., Laine, P., & Torres, A. (2015). Characterizing fugitive methane emissions in the Barnett Shale area using a mobile laboratory. *Environmental Science & Technology*, 49, 8139-46. doi: 10.1021/es5063055

Song, L. & Hirji, Z. (2015, July 8). Methane emissions in Texas fracking region 50 percent higher than EPA estimates. *Inside Climate News*. Retrieved from <http://insideclimatenews.org/news/08072015/methane-emissions-texas-fracking-region-50-higher-epa-estimates-oil-gas-drilling-barnett-shale-environmental-defense-fund>

Wells leaking when Ineos has long gone?

To add to the catalogue of gas industry problems, there is the matter of how much gas will be leaking from wells when they have been plugged and abandoned. Recent US research is beginning to highlight difficulties that were not recognised before – again not mentioned in the selective presentation of issues by Ineos. It has been recognised for some time that the older the well, the more the borehole and its cement seal deteriorates.

Thus, for example, a December 2014 study measuring leakage from abandoned oil and gas wells in Pennsylvania found positive methane flow from decades-old wells. The authors concluded that cumulative emissions from these abandoned wells “may be significantly larger than the cumulative leakage associated with oil and gas production, which has a shorter lifetime of operation.” Further, methane flow rates from plugged wells measured in this study were not consistently lower than unplugged wells and indeed were sometimes higher, even though wells are plugged for the precise purpose of limiting the escape of gases.

Kang, M., Kanno, C.M., Reid, M.C., Zhang, X., Mauzerall, D.L., Celia, M.A., Chen, Y., & Onstott, T.C. (2014, December 8). Direct measurements of methane emissions from abandoned oil and gas wells in Pennsylvania. *Proceedings of the National Academy of Sciences*, Advance online publication. doi: 10.1073/pnas.1408315111

In many of the places that Ineos would like to drill there are long abandoned mines and seismic activity associated with them. Over time this is likely to make it difficult to securely plug wells at the time of abandonment. Seismic activity is likely to continue to stress and degrade concrete seals and bore holes when they have gone. If the experience of the USA is anything to go by, when Ineos are long gone the hundreds of wells that they want to sink could be slowly leaking methane and adding to an enduring climate crisis.

So yes, “green completions” will reduce fugitive emissions if they happen but what part of the total will that solve? Howarth thinks about 40%. That would probably still leave sufficient leaking methane where, if a comparison is made with coal, it is still not longer clear cut that replacing coal in power stations with gas fracking is much, or any, kind of an improvement.

When Gas does not replace Coal but is used in addition to it

As should be clear this is not an argument for coal – it is an argument for not delaying the transition to a climate friendly economy by going through a fracking detour. It is an argument of concentrating efforts on alternative climate friendly energy sources and energy saving strategies – not supporting the competition.

As if this were not enough there is another difficulty for the Ineos argument. As they admit there will be no reduction of greenhouse gas at all unless gas replaces coal. If gas is used AND the coal that is displaced is used somewhere else then gas fracking will increase emissions. They acknowledge this difficulty is real but then skirt around the problem without a convincing answer. They accept that shale might be used in addition to coal so they make a lot of policies to phase out coal like, in Europe, the EU Large Combustion Plant Directive and the Industrial Emissions Directive. Then they write

“If this approach is adopted internationally it is a credible and practical path to decarbonisation...”

Note the use of the word “if”. Yes, indeed.... if...

But is this the case? “If” there were some global scheme that companies and countries had signed up to that required all producers of fossil fuels to have permits for the carbon they brought out of the ground. And “if” the permitted tonnage was limited and rapidly reduced each year and “if” there was nowhere that coal producers could divert their production to sell to....

Pro-frackers are very keen on a study by the late Professor J C MacKay and Dr Timothy Stone who advised the government on matters like this. However, there is a bit of MacKay and Stone's report not usually selected by the spin doctors:

“If a country brings any additional fossil fuel reserve into production, then in the absence of strong climate policies, we believe it is likely that this production would increase cumulative emissions in the long run. This increase would work against global efforts on climate change.”

To summarise, even if there were no problem of “fugitive methane”, the bridge to a low carbon future is no such thing. It is a delay on a transition that needs to be far more rapid. A part of the Ineos case is the introduction of a functioning carbon capture and storage system. Yet Ineos forget to tell anyone reading their/its “case” that this policy has been abandoned by the government. There is a serious problem of methane leakage that the industry can only partly remedy and which Ineos have/has tried to hide, misrepresenting a still emerging story about a growing number of new scientific finding. There is currently not enough evidence that coal displaced by gas would not be burned elsewhere. If gas is extracted used in addition to coal then there is no way it can help mitigate climate change.

Is it really “not the case” that Fracking Industrialises of the Countryside?

Turning to another element of the critique Ineos PR Department do a clumsy job trying to disguise the fact that unconventional gas industrialises the countryside. Their dodgy dossier says “it is sometimes claimed that extracting shale gas would 'industrialise the countryside' and cause serious disruption, but this is not the case. Shale gas extraction uses significantly less land than other energy sources. A typical site might drain 10 to 15 square kilometers of shale and at its peak (during fracking) use a few acres, shrinking down to roughly the size of two football pitches when producing. “

Once again the deception is in the framing and the selection of what to describe and what to leave out. Ineos know very well that they would not only be developing “a typical site”, by which they mean a well pad, they would be developing a whole gas field. There is a huge difference.

In early May 2015 Ineos advertised for seismic survey contractors. The advert said that, depending on local conditions, they hoped to aim for up to 30 well sites with up to 396 wells originating from each site on each 10 km by 10 km square (the area of a PEDL licence). They then put out a statement that there had been an error. The proper figures were now given as 10 pads with 10 to 12 wells per pad.

Whichever is the true figure, if Ineos want to seriously address the issue of industrialisation of the landscape, they would start with this – multiple well pads with multiple wells across a landscape. At 10 pads per 100 square kilometre, the well pads are not going to be much further than 3 km apart in any direction. This will have both spatial and temporal consequences.

The Ineos spin doctors try to pass off how long the drilling and fracking and traffic movements will be for a single well pad. But when there are multiple well pads, each with multiple wells, this way of framing the issues misleads – and we can suspect that this is intended. Ineos are well aware that to develop a gas field, the completion of the wells on one pad leads to the rigs and then the fracking pumps being moved quickly onto the next pad (less than 2 miles away) which will itself have been under preparation. This is a process which would roll across the countryside. On anything less than this scale the entire process will have no chance whatsoever of being commercially viable.

So why do they refer to well pads when the relevant scale is the development of a gas field? The document tells us that there are 120 onshore oil and gas sites already in the UK - with 250 wells as if the existing pattern of oil and gas development will be similar and demonstrates that there is nothing to be worried about. However with a moment's reflection one becomes aware that this is a misleading comparison. It means that current sites have an average of 2 wells associated with each site. This is nothing like the

intensity and scale of development that Ineos are proposing for their unconventional gas fields. In just two 10km by 10km PEDL areas Ineos wish to develop the same number of wells as already exist across the whole country. The scale and intensity difference is enormous and obvious.

It is also disingenuous to present the issues without mentioning a great deal of infrastructure and activities that would have to go along with the well pads – like pipelines. When Dart Energy applied to develop a gas field in Falkirk in Scotland the area that they wanted to take for pipeline corridors would have been 4.5 times the area of the well pads. There would be a need for access roads too. Roads and pipeline corridors are likely to intersect roads, footpaths, bridleways, hedgerows, drainage channels and other “obstacles”.

A description of fracking infrastructures in the *“Compendium on Scientific Finding demonstrating the risks and harms of Fracking”* describes them in this way:

“Beginning where silica sand is mined and processed and ending where gas is burned or liquefied for export, infrastructure includes pipelines, compressor stations, dehydrators, processing plants, rail tankers, flare stacks, and storage depots through which gas is moved, filtered, pressurized, stored, and vented. It also includes injection wells and recycling facilities that dispose and treat the prodigious amounts of liquid waste that fracking generates. Air pollution is produced at every stage of the process. Compressor stations and pipelines are major sources of air pollutants, including benzene and formaldehyde, that raise potential health risks for those living nearby while offering no offsetting economic benefits—indeed, they are associated with loss of tax revenue and economic development for the communities where they are sited and traverse....” (<http://concernedhealthny.org/wp-content/uploads/2012/11/PSR-CHPNY-Compendium-3.0.pdf> pp118-119)

For some reason Ineos forgets to mention all this. Why have they forgotten? We can only guess.

Studies on the effects of unconventional gas field development on the landscape in the USA are unambiguous. A United States Geological Survey study of landscape impacts from unconventional gas development notes that the effect on the landscape is “substantial” with “serious patterns of disturbance” for wildlife and human populations. Another recent US study notes problems with silting and run-off in watercourses, and highlights the many other ill-defined impacts of unconventional gas development upon the natural world...

Landscape Consequences of Natural Gas Extraction in Bradford and Washington Counties, Pennsylvania, 2004-2010
Slonecker E.T. et al., United States Geological Survey, 2012.

<http://pubs.usgs.gov/of/2012/1154/of2012-1154.pdf>

Regulation will make us safe.

This is the mantra of government and the fracking industry, including Ineos. It is also what the Royal Society and Royal Academy of Engineering said....4 years ago anyway. But 4 years ago there was very little research on the health and environment consequences of fracking for the RS/RAE to base its conclusions on. 80% of the 700 peer reviewed articles on these topics have appeared after January 1st 2013, so the RS/RAE were basing their conclusions on what they assumed the problems might be. The same can be said about a report by Public Health England. Nor, at that early stage was there any experience of 'gold standard' world class British regulations for fracking actually in operation. It is no accident that pro-frackers are always quoting very old references. At that early stage it all looked so good. Things often do before you have real life experience of them. Psychologists call this “optimism bias”. Optimism bias applies to all sorts of things – including underestimating health and safety and environmental risks. It can also lead people to over estimate what regulators can deliver too.

In its “Strategic Environmental Assessment” for DECC in 2013 consultants AMEC admitted that there could be problems with a handful of small issues – like waste and waste water disposal; health of communities and workers; land use, geology, soils, landscape and visual amenity; biodiversity, habitats and eco-systems; noise, vibration, air quality, traffic; flood risks. However, AMEC knew what the government and the gas

industry wanted to read, so, for each of these, it wrote a variant of this line “it can be assumed/expected that planning controls/regulation will mitigate so that the problem is ‘not unacceptable’”.

This, for example, was an example of the assumptions that we are expected to believe:
“It is assumed that current controls are enforced by regulators and followed by operators”

Several years later those of us who were sceptical then have noticed that the actual experience of world class regulation has been less than perfect. All the exploratory shale gas wells drilled by Cuadrilla in Lancs had some technical difficulty. In addition to 10 breaches of planning conditions, there were 5 examples of drilling problems, three reprimands, as well as accusations of well integrity failure, trespass and damage and several cases where it wasn't clear whether or not Cuadrilla had broken regulations. Meanwhile in Yorkshire, Rathlin Energy exploratory well North of Hull breached 14 permit conditions between early July and mid October 2014 of the same year.

<http://drillordrop.com/2015/02/19/investigation-underway-into-more-breaches-at-rathlin-energys-west-newton-drill-site/> and

<http://drillordrop.com/2015/05/05/investigation-finds-multiple-planning-breaches-and-technical-problems-at-cuadrillas-drilling-sites/>

Meanwhile the “world class” regulation relies heavily on an Environment Agency permitting system which is almost never refused and barely amenable to any influence and control by the people that will be negatively affected by poor decisions.

Conditions vary across the UK but the part of this system that does appear to under local and democratic control is the bit where county council planning committees take decisions about minerals planning policies. However, to describe this as democratic is stretching the use of the word 'democracy' a bit. Planning committees and officers are under central government written “guidance” regimes. The guidance was written largely under gas industry influence because the industry had parachuted their people into the relevant departments using their connections in government. (Lord Browne, former CEO of BP and a leading light in Cuadrilla, was highly instrumental doing this and had a place in the Cabinet Office from which to exert his influence). Thus national planning guidance emphasises a prioritisation for economic development and hydrocarbon development. A diagram of the network showing oil and gas industry influence in central government has been researched by Paul Mobbs and can be viewed here:

http://www.fraw.org.uk/mei/archive/fractured_accountability/frackogram_2015.shtml

Of particular importance to the way the system has been ‘stitched up’, is the way that local planners are required to limit their considerations to individual applications placed before them. As John Ashton explains in a recent article in the Guardian. “Fracking at scale has a large footprint. It would threaten the fabric of our communities and countryside, woven over centuries. Maybe that is why industry and government have been at pains to ensure that the planning process considers each application in isolation from all the others. Each step in the journey can be discussed but the destination is off limits.” Thus the planning system has been set up to try to confine us into a largely futile process where local decisions on environmental grounds can be overturned on appeal by notions of national need which would have extreme adverse effects on climate, communities and local ecosystems.

In this regard some of the deepest issues of all are those of public health counterposed to (un)economic development – yet planning authorities cannot really discuss public health and the risks involved. Planning Authorities are required to take it for granted that the Environment Agency and the Health and Safety Executive can respond to risks adequately through regulation and thus rarely ignore their advice.

However we already know from experience that the EA has not been able to prevent multiple breaches of regulations and technical problems in exploratory wells (as explained above). The same happened all over the USA and Australia Whilst we get the talk about best practice and gold standard regulations, the reality is then a catalogue of mistakes and failures. In the real world, rather than the fantasy, Murphy's law applies. Multiplied across a gas field this adds up to ill health and misery for local residents. Meanwhile the

regulators would reprimand and sometimes companies would be fined – but for corporations this becomes another financial cost to be paid. And the disaster would continue to happen.

The danger is that, in an era of high staff reduction in public services, the Environment Agency and Health & Safety Executive are not up to the difficult task in front of them. The EA rely on a so called initial “permitting process” which is deeply flawed. In processing permit applications, the EA is prepared to accept risk assessments based on the purchased subjective opinion of another group of “consultants” rather than on available evidence from comparable situations revealed in peer reviewed studies. The permits are then issued based on the judgements of consultants who write what their clients want them to tell the Environment Agency. This is not a safe system and merits more public attention and concern.

It is all rather reminiscent of the ratings agencies for the financial sector before the financial crash of 2008 who were paid by financial corporations to rate toxic financial instruments at AAA grade. Is it not patently obvious that consultancy companies doing the phoney risk assessments that go with the permit applications have an interest in more business of this kind and therefore have no interest in raising difficult issues? It isn't obvious to the Environment Agency and the Government. One supposes that this is because the public authorities think that corporations like Ineos can be trusted. Unfortunately, to borrow the phrase that the Ineos PR department uses repeatedly:

“This is not the case”.

Written by *Brian Davey*, Frack Free Notts (with thanks to Nigel Lee and Peter Jaggar who are not responsible for any errors and for all the opinions expressed here)

June 2016

Appendix One

There is a lot more Ineos PR literature out there. It is garbage too. If you want to check out particular issues using scientific peer reviewed literature these will be found particularly helpful.

A very quick overview of the findings of academic literature on water contamination, air contamination and public health between 2009-2015 can be found at

<http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0154164>

For more details the following website have comprehensive lists of articles on different topics

<http://www.psehealthyenergy.org/>

and

An extremely comprehensive “Compendium on Scientific Findings demonstrating the risks and harms of Fracking” can be found at

<http://concernedhealthny.org>

At the time of writing this is in its third edition and can be downloaded from

<http://concernedhealthny.org/wp-content/uploads/2012/11/PSR-CHPNY-Compendium-3.0.pdf>

Appendix Two

Ineos claims to be top of the class on chemical industry health and safety statistics. In that case - well done – now try harder:

2008 Grangemouth: oil spill, Ineos fined £100,000

2008 Cologne: major fire at Ineos Dormagen

2004-2009 Ohio: Clean Air Act violations including acrylonitrile & butadiene causing closure of elementary school, Ineos ABS USA and previous owner charged \$3.1m penalty

2010 Texas: butadiene emissions violation, Ineos fined \$10,000

2010 County Durham: release of PVC powder over Newton Aycliffe, Ineos fined £10,000

2010 Runcorn: worker's hand trapped, Ineos fined £12,000

2010 Cologne: fire from burst ethylene pipe threatened acrylonitrile tank, 1,300 emergency workers deployed to prevent explosion

2005-2012 Grangemouth: 761 breaches of sulphur dioxide levels

2012 USEPA: failure of IneosChlor to comply with rules on chlorine chemicals – fined \$175,000

2012 Runcorn: chemical spill, Ineos ChlorVinyls fined £166,650

2014 Cologne: explosion and dense black smoke

2015 Grangemouth: safety failings by Petroineos – fined £24,000

More detail on this list and its sources can be found at <http://frackfreenotts.org.uk/sherwood-forest-threatened-by-fracking/>

Appendix Three

Fertilisers as part of the Green Economy

It is not just the earth's oceans and atmosphere that are being degraded by the products and practices of the chemical industry since many of the chemical products championed by McKinsey and Ineos are toxic in other ways. Soils are threatened by the chemical industry too. Thus one part of the McKinsey study is particularly controversial - that a fertiliser and pesticide based agriculture is superior to organic cultivation. However, as already mentioned, the McKinsey report frames the agricultural issues only in terms of CO2 equivalents and separates off other issues, like biodiversity or soil health, into another mental silo. But all of these ecological issues are interconnected. Soil sequesters a huge amount of carbon in the roots of plants and in humus. The issue of how much carbon is sequestered in soils is connected to other ecological features like the health of the soils. If the soil microbiology is functioning healthily plants will put down more root mass. When that root mass degrades it will increase the carbon content of the soil.

It may seem that this is going off on a tangent but the Ineos dodgy dossier explicitly claims products like chemical fertilisers as part of its vision of a "green economy". This is questionable. Anyone taking the trouble to read the McKinsey report will find that its authors employed a German research organisation, the Oeko Institute, to cast a critical eye over the methodology. The Oeko Institute made a number of observations. Some of these observations were about the climate and greenhouse gas implications of chemical agriculture vs organic agriculture. The English translation is not perfect but it's clear that the Oeko Institute found the McKinsey conclusions on organic and chemical agriculture "particularly arguable".

"At the scenario case of "Fertilizer & Crop Protection", matters on productivity of areas under cultivation as carbon adhesion capacity in humus have been intensively discussed in dependence of the different cultivation methods. From the view of Öko-Institut, the related methodical and data-related questions could not be answered exhaustively in the framework of this project, hence the results in relation to the scenario case being particularly arguable."

In the face of criticism it looks like the McKinsey report authors were not so sure of their argument after all. Instead of firmly concluding that chemical agriculture was better for climate mitigation, they hedged their bets and wrote - "the study has adopted two scopes, one where chemical agricultural contributions lead to net savings and one where these net savings are neutralized."

Other researchers believe that agriculture without chemicals can do better than that and offers real opportunities to take carbon out of the atmosphere and sequester it by increasing the richness and health of soils and hence plant yields too. The label "organic agriculture" is very generic – other words describe more specifically where the cutting edge of ecological thinking is on this approach to carbon sequestration through a healthy approach to soils – ie agroecology, permaculture, grass fed, regenerative agriculture and so on. <http://cmasc.osu.edu/pageview2/Home.htm>

