***Public Perceptions of Hydraulic Fracturing on the Fylde Coast***

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**Abstract**

Fracking has been taking place in one way or another for 60 years. In more recent years the process has been developed to become more economically and logistically viable. This controversial, but some would argue necessary, process is causing concern to some residents of the Fylde in the Northwest of England.

Through primary and secondary data collection consisting of questionnaires, an interview and a literature review, this research aims to understand the feelings of the residents of the Fylde with regards to the process and implications associated with Hydraulic Fracturing.

Results from the primary research show a strongly adverse attitude, albeit not 100% fact based. Questionnaires were completed by a random sample of residents at the shopping centre Freeport in Fleetwood, which is situated in the Fylde. Results from the quantitative data showed a more mixed attitude to the whole process with varying degrees of understanding of what Fracking actually is. The result of this lack of understanding seemed to be reflected in people’s attitude to the process. An interview was held with a member of Residents Against Fylde Fracking (RAFF), this made up the qualitative element of the research, unsurprisingly the responses to the questions asked were negative on the whole.

It is felt that this dissertation met its aims and objectives but more could have been done to make the results a little less biased.

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Finally I would like to thank my friends who have shown me such support, in their help with proof reading, grammar checking and encouragement.

**Declaration**

I declare the work within this dissertation to be my own innovative work and that no part has been plagiarised from any source whatsoever. Where I have used proposals, ideas and research by other authors, these have been properly cited and referenced.

This dissertation stands at approximately 10,000 words.

Signed……………………………………………

Print Name…………………………………….

Date……………………………………………….

**Chapter 1 – Introduction**

Global Energy Demands have increased in recent years with expanding populations and decreasing supplies of natural resources. This has meant an increase in costs for the everyday family. ‘Fossil fuel prices have risen to record levels in real terms over the past decade. Average annual real oil prices over the five years 2007-11 were 220% above the average for 1997-2001; for coal the increase was 141% and for gas 95%. These long run price movements inevitably lead to demand and supply responses.’ (BP Energy Outlook 2030, 2013). The political and economic implications of these statistics have meant that new innovative ways of extracting energy from our planet have to be considered.

Oil and gas firms are utilizing a controversial drilling technique, hydraulic fracturing, or **fracking,** to access unconventional natural gas (Finewood & Stroup, 2012)

Fracking has been a common place practice since the 1940’s using vertical wells. The problems in recent years have come since horizontal drilling commenced. Whilst this process yields greater volumes of natural gas it does require larger quantities of water and chemicals which have the potential to leak when in the flow back phase toward the surface. Anthony Ingraffea is cited in Mooney, 2011 as saying that the companies responsible for the drilling operations do not fully consider what is actually happening during their scientific analysis of the process. ‘Bob Weinhold outlines the potential detrimental affect the industry could have on human health. ‘Among human health effects that have been associated with these pollutants are cancer; cardiovascular, respiratory, neurologic, and developmental damage; and adverse outcomes such as premature mortality, emergency department visits, lost work and school days, and/or restricted activity days. The pollutants are also associated with reduced visibility, climate change, and/or vegetation damage’ (Weinhold, 2012)

‘**If fracking is defined**as a single fracture of deep shale, that action might be benign. When multiple "fracks" are done in adjacent wells, however, the risk for contaminating drinking water may rise. If fracking is defined as the entire industrial operation, including drilling and the storage of wastewater, contamination has already been found’ (Mooney, 2011)

Some scientists take a more pragmatic approach to the shale gas industry first of all noting that a transition method of fuel is required to bridge the gap between now and when renewable energy sources are more technologically advanced and economically viable. Not to mention once the power held by lobbyists for the energy corporations has transitioned into a more politically acceptable medium. Peter Gray outlines the benefits of Fracking as follows;

* It could lessen our dependency on foreign oil companies and therefore enhance our national economic security
* It releases less Carbon Dioxide than the combustion of coal or oil
* Of the fluid used in Fracking 99.5% is water and sand showing the chemicals used (a source of bad press), make up only 0.5% of the fracking fluid.
* Claims that lack of full disclosure of what is in said fracking fluid chemicals show that the shale gas companies have something to hide. However, this level of confidentiality can be easily explained by the fact they are trade secrets. Would a chef reveal all of his recipes? could be a similar way to look at it?

Mr Gray also highlights what have been past problems and how steps have been taken to fix them. In brief the past problems were returned ‘flow back’ stored in rudimentary pools or lagoons, was able to leach out of the bottom and contaminate groundwater. This is being solved by using closed loop systems which store and transport flow back within a series of pipes and above ground tanks.

Leaking well casings, commonly made out of cement, are considered another potential pathway for groundwater contamination, to safeguard against this some companies have started to encase well borings with many layers of steel. (Gray, 2012)

In recent years there has been increase in activity of Hydraulic fracturing on the Fylde coast, many anti Fracking groups have sprung up in protest to this. This project will talk to a member of the anti-fracking group ‘residents against fylde fracking’ (RAFF) as well as surveying members of the general public to better understand what the actual public perceptions of this industry are and to explore the rationale for said perceptions.

**1.1 Aim:**

* To gain a clear understanding of the opinions of residents of the Fylde in relation to Hydraulic Fracturing.

**1.2 Objectives:**

* To gain an understanding of the Hydraulic Fracturing Process
* To identify both the positive and negative aspects of the industry
* To consider the industry’s place within the broader energy market
* To conduct research assessing the public perceptions of Hydraulic Fracturing on the Fylde Coast.

**Chapter 2: Methodology**

This chapter outlines the methods of data collection which have been used to test the hypothesis. According to Bell (2010), the nature of the study and the type of information required determines the most suitable methods of data collection. Appendix 1 shows the methodological model that will be followed in order to carry out the research. The most important part of any research is the outcomes it produces (Bryman, 2006), and therefore the research consists of primary and secondary research, along with quantitative and qualitative data, in order to allow for triangulation. Bryman (2006) created a table showing the key differences between the outcomes of quantitative and qualitative research (see appendix 2).

**2.1. Triangulation**

Triangulation is used to cross-check research findings in order to remove bias. This is achieved by using a range of data collection methods during the research process. As mentioned above primary and secondary research has been conducted for this study which produced quantitative and qualitative data. Laws et al (2003) discusses the importance of triangulation when undertaking a research project in order to assess the same issue from different perspectives that will confirm or challenge the findings of one method with those of another. Such use of a range of research methods runs the risk of conflict between the different types of data, however, Laws et al (2003) argues that participants may have very different attitudes and opinions regarding the topic, therefore mismatched data should be critically examined to understand it.

**2.2. Primary Research**

Primary Research involves original data collection gathered by the researcher e.g. by participants completing questionnaires or by conducting interviews etc. Naoum (2007) stated that the three practical approaches associated with primary research are the survey approach, the case study approach and the problem-solving approach.

This study uses the survey approach which, as Naoum (2007) claims, is ideal for fact finding. Surveys can be descriptive or analytical and should generalise data from a particular sample. According to Bell (2010) survey questions should be the same for all participants, and asked under the same circumstances. The survey methods of data collection for this study include an interview and self-completion questionnaires.

**2.2.1. Self-completion Questionnaires**

A face to face method of gathering data was used in filling in the questionnaires. The researcher spent an afternoon in the shopping district of Fleetwood called Freeport with an aim of 40 responses. Closed questions were used to gain an insight into the participant’s opinion of Hydraulic Fracturing on the Fylde Coast. Mostly closed questions were chosen as they are easier and quicker for participants to complete thanks to a restrictive choice of answers, e.g. yes or no. Another advantage of using closed questions was found to be the straightforward analysis by way of tables and graphs to highlight findings. There are obvious disadvantages of this method such as the lack of detail provided by the answers; however open questions would have been very time consuming for the respondent to complete, which would have run the risk of receiving a poor response rate with answers that would be more difficult to analyse and compare (Adams et al 2007). As a direct consequence of the research undertaken into methods used to collect data a combination of open and closed questions were used with a ‘yes’ or ‘no’ answer leading onto asking participants to provide a slight insight as to why they had answered one way or another. Questions such as asking participants to ‘recommend an alternative’ proved useful in determining a participant’s knowledge and engagement with the subject. A total of 50 completed questionnaires were received which provided a good source of quantitative data; a copy of the questionnaire can be found in appendix 3. The reason Freeport was used as the survey site is due to the fact it is easily accessible and always has a high level of foot traffic, therefore increasing the likelihood of finding the desired amount of participants.

**2.2.2 Quantitative Research**

Quantitative research deals with the collection of numerical data which can be measured using various scales which may identify a trend. These scales may be nominal, ordinal, interval or ratios (Adams et al 2007). Rasinger (2008) characterised quantitative data to be that which consists of information that is quantifiable i.e. can be put into numbers, figures and graphs. This type of research is used to conclude how many there is/are of whatever we are interested in and can reveal hard and reliable data which, according to Bouma and Atkinson (1995), are ‘*measurements of tangible, countable, sensate features of the world*’. Naoum (2007) believes that quantitative research is used to find facts about a concept, a question or a characteristic, or to study the relationship between factual evidence in order to test a hypothesis. Bell (2010) says that quantitative research is objective in nature, i.e. truthful and unbiased, as it is not subject to the viewpoints of individuals. Therefore quantitative research is useful when looking at large samples.

**2.2.3. Interview**

An interview was conducted with a member of the anti-fracking group Residents Against Fylde Fracking (RAFF), Mike Johnson, in order to gain personal opinions of the topic and provide qualitative data. This is a small sample however the questionnaires will make up the main body of the primary research. A semi-structured interview method was used asking questions around data found in the literature review. This method allowed flexibility in that an interview guide was developed (see appendix 7) but additional questions could be asked as a result of the interviewee’s responses. The disadvantage of the interview process was that it was very time consuming in terms of conducting the interview and analysing the data received. The use of personal opinions also creates an element of subjectivity, with which a danger of bias is created (Bell, 2010).

**2.2.4. Qualitative Research**

According to Naoum (2007), qualitative research focuses on smaller samples, gathering descriptive information based on thoughts, insights and opinions. It is therefore subjective in nature i.e. it might not show the whole picture or opinions might be biased. Qualitative data is often verbally communicated research which emphasises meanings, experiences and descriptions and can be categorised into two forms: exploratory research or attitudinal research. This study uses attitudinal research in order to subjectively review opinions, views and perceptions of an attribute, variable, factor or question (Naoum 2007). Individual thoughts and beliefs about the topic have been researched. Exploratory research would be used when a deeper understanding of a topic is required in order to find a solution (Zikmund 2003).

**2.3. Secondary Research**

Secondary research looks at existing sources of information which has been produced by others. The secondary research for this dissertation consists of a literature review. According to Hart (1998) a literature review is a discussion of relevant literature which is important to provide an understanding of the research topic, what has already been done on it, how it has been researched and what the key issues are. It shows understanding of the main theories in the subject area and how they have been applied, developed and criticised. Literature which has been reviewed for this dissertation includes journal articles; Books andWebsites.

**2.4. Pilot Study**

A pilot study was conducted in order to ensure that all questions had the same meaning for each participant and to ensure the timing was suitable for participants to answer all questions (Bell, 2010). The questionnaire was piloted on five friends who flagged up a few errors with the original questionnaire e.g. confusion about question meanings and typing errors. The questionnaire was then able to be adjusted before distribution. A pilot interview was also conducted with a friend to ensure there was no confusion about questions, which also allowed the researcher to double check all the necessary questions were being asked.

**2.5. Limitations**

The main limitation of this study is the sample size used for the questionnaire. There are approximately 320,000 people that live in the Fylde and a sample of 50 people is not representative of this population. An ideal 10% sample of this would not be viable for the scope of this research due to time and cost implications. This could create bias; however it does give the researcher a general insight into public perceptions of hydraulic fracturing. Interviewing only one person also limited this research to only one person’s thoughts and opinions.

**2.6. Contingencies**

When conducting any research there is a chance that something might not go to plan and so contingencies were put in place as a precaution to ensure the research could still be conducted if something went wrong. Appendix 4 shows problems that could have occurred when conducting the research and what was done to minimise the effect of these.

**Chapter 3 - Literature Review**

**3.1. Current Energy Needs**

Energy is a resource universally needed, no matter who or what you are. It is what powers movement, heating, chemical reactions- even life itself. And in an ever-developing world with an expanding population, the demand for energy is getting higher. Last year the U.K alone required the equivalent of 138.3 million barrels of oil to open our businesses, drive our transport support and power, well, everything (Department of energy and climate change, 2012). So where are we getting all this vital energy from, and how will our changing lifestyles and industries affect how we supply it all. Our longest standing energy sources come from fossil fuels. These are coal, petrol and natural gas, all by-products of organic matter that has been buried or trapped in the ground for millions of years, slowly degrading into hydrocarbons (Jessa, 2010). These hydrocarbons can be converted quite simply back into energy.

However we use fossil fuels far, far faster than nature can replace these stocks. At the start of the Industrial Revolution, in the mid-1700’s, the population of the world increased by 57% (McLamb, 2011), that is to say about 700 million people. A little over three hundred years later and the world population is a staggering 6 000 000 000 (McLamb, 2011). By the year 2100 it is predicted that the total population will be 10 billion. As our demand for energy is already putting huge strain on the limited stocks of fossil fuels, alternatives are desperately being sought.

Another major factor in modern energy needs is the emerging markets, the largest five being China, India, Brazil, Indonesia and Russia. These are national economies characterised by large populations undergoing expansive reforms in trade. In less than ten years they are expected to contribute 16.9% of the global market output (Li, 2012). With such rapid expansion, their infrastructures will need scaling up to cope with the strain, and this includes energy demands. As such these countries are investing in new energy sources, with most nations have a strong renewable aspect to them (Markey et al, 2013).

**3.2. Alternatives to Fossil Fuels**

Nuclear power, developed in the latter half of the 20th century is one technology developed to try and quench our growing thirst for energy (Wired, 2013). It involves uses particles of radioactive material such as plutonium or uranium to split in a reactor and release heat energy that can be stored. (National Geographic, 2012) However the by-products of the process are highly radioactive and disposing of them is a big problem. (World Nuclear Association, 2012) It is highly poisonous, difficult and expensive to process and can remain a danger for thousands of years. There are the added dangers of problems with nuclear reactors having devastating ecological repercussions.

Renewable energy sources, however, tend to be far cheaper and cleaner processes than nuclear power, and as the name implies, they can be naturally be renewed. Harnessing the power of the sun, moon, wind, sea, and earth has all been implemented in order to either provide sustainable energy sources or as an effort to reduce greenhouse emissions that damage the upper atmosphere (National Energy Information Centre, 2004). Solar power stores up energy directed from the sun. It is a relatively expensive method, and associated with some forms of pollution, but once installed is cheap to maintain. However in many parts of the world, sunlight isn’t reliable enough as a sole source of power(Energy Informative, 2013).

Wind farms are an abundant and effective way of harnessing the kinetic energy of the wind. Erecting wind farms, while requiring an initial outlay, is becoming cheaper to invest in and is cheap to maintain once founded. However they have been found to pose a threat to wildlife such as bats and birds, and a lot of people consider them eyesores in the countryside, and adopt a “not in my back yard” attitude, that is to say, they might think it’s a good idea, but not want it in an area near them. (Energy Informative, 2013) This attitude, coined as NIMBYism, can also be found towards other energy producing ventures, which will be expanded upon later.

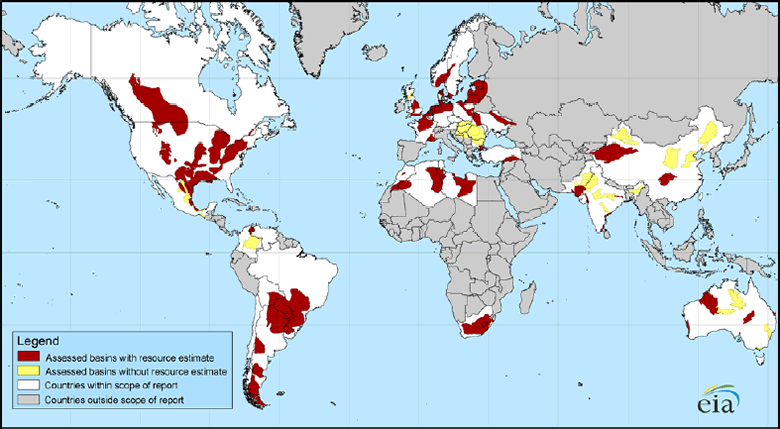
There are other renewable energy sources being tapped, such as geothermal energy, drawing heat energy from deep in the Earth, hydroelectric dams that harness the potential energy of rivers flowing down to the oceans, and wave farms that catch the potential energy of the tides. These are all effectively endless supplies of energy handed to us by nature itself (The Guardian, 2013)). Each method has its advantages, some efficiency, some low cost, some ease of setting up. However they are not all ideal in every situation. These reasons could be financial, geographical or ecological and vary greatly from need to need.

**3.3. Making Fossil Fuels Go Farther.**

With supplies of existing sources of fossil fuels beginning to dwindle, another way to keep up with growing energy demands is to use alternative fossil fuel sources. There is still a lot out there, however extracting and processing it will require new techniques. In Canada, large fields of tar or oil sands have been found, and extraction is taking place. The largest field is the Athabasca site, where a joint venture between the oil companies Shell, Chevron and Marathon began extraction in 2003. The site reports a 90% recovery of the bitumen from the sand, comparing to the 35% normally recovered in conventional extraction methods (Shell, 2013). There are concerns with the pollution involved in the process, as large volumes of CO2, a greenhouse gas are used in the process (Guardian, 2013).

Oil shale is a long known but minimally used source of fossil fuel. It can be burnt in its natural state quite easily for a low energy yield, or processed by pyrolysis:- heating to between 450 C – 500 C in order to produce combustible gas, and on cooling shale oil. Oil shale is currently a major energy source in Estonia, China, Russia and Brazil. In Estonia, oil shale accounts for 95%of the nation’s energy supply (Global Oil Shale Group, 2013). According to a study by the United States Government Accountability Office, the Green River oil shale formation, which lies between Utah, Wyoming and Colorado, could contain more potential oil than the proven world-wide reserves.

Shale gas, a form of natural gas, has been extracted as an energy source since the late 1800’s but due to low profits from the early years was a largely ignored source of fuels. Hydraulic fracturing was first demonstrated in 1949 (Global Oil Shale Group, 2013). Later, in the 1970’s, improvements in the application of gelling and use of lateral drilling techniques, shale gas become much more economically viable. With very large shale gas deposits (see figure), it is estimated that there is around 6,622 trillion cubic feet of shale gas still available for extraction (Smith & Montgomery, 2006). Hydraulic fracturing is the most common method of extraction, account for around 60% of all current wells.

**Figure1 – Map of Shale Gas Deposits around the World**

**3.4. The Fracking Process**

Hydraulic fracturing or ‘Fracking’ has been used for over 60 years now, the original and what is considered conventional style for this process is a relatively simple one. Typically vertical wells are drilled downwards into the earth until they hit a layer of shale - usually between 1000 and 12000 feet underground (Deutch, 2011), at this point water, which has been treated with chemicals, and sand are blasted into this void at high pressure to crack open the shale rock and release natural gas which can then be used as a source of energy (Mooney, 2011). So forceful is this procedure that it has been said it is like a baseball hitting a glass window and shattering it (Marsa, 2011). This technique, however, had not been used intensively until more recent years. Developments in technology have led to a new technique in fracking in which horizontal well bores, or laterals as they are referred to in the industry, can be exploited. This has resulted, at any one drilling site, in thousands of additional feet of shale being readily available to be fractured thus releasing this precious fuel. The process still involves a downward plodding drill bit, but one which can be turned at an angle of up to 90 degrees enabling drilling to occur parallel to the ground above (Mooney, 2011).

**3.5. The Cost of Fracking**

This breakthrough in technology has surely then alleviated any immediate concerns over energy supplies in the future? Take for example the Marcellus Shale rock plane lying underneath the ground of the nearby City of Buffalo in the United States of America, that particular piece of rock protrudes underneath 4 of the states including New York and Ohio and is a 95,000 square mile slab containing up to 500 trillion cubic feet of natural gas. Correctly harvested that site could meet all of America’s gas needs for over 2 years (Marsa, 2011). This development could also be good news for the wallets of the world, with fracking bringing new countries into the fray of being an energy competitor there are more options for nations all around the world. Consider that at between $2 to $3 production cost per thousand cubic feet of gas depending on region that this ‘unconventional’ gas is one half to one third of the production cost of ‘conventional’ gas and with technology developing further with added experience these costs are reducing week on week making the energy market a much more competitive place (Deutch, 2011).

**3.6. The down side of Fracking**

However, fracking as an industry has faced large scale scrutiny around the world and most notably in the United States. In the UK this industry is in its infancy but it is facing major opposition following case studies which have emerged from America. A 2009 hydrogeologic study in Colorado showed that drinking water supplies had been contaminated by the local gas drilling operation there. Whilst at the same site scientist Theo Colborn found diesel, ethylene glycol and formaldehyde, all of which can be considered ‘fracking chemicals.’ These chemicals it is fair to say carry with them an inherent risk of aiding cancer development within the human body, can cause birth defects and developmental problems (Charman, 2010). Not only that but the greenhouse gas footprint of this gas is considered to be higher than that of coal or conventional gas owing to the large scale release of methane during extraction (Levitt, 2011). Whilst it does have a shorter lifespan in the atmosphere, methane is 20 times more powerful a greenhouse gas than carbon dioxide and consequently can have a considerably greater damaging impact on global warming in the short-term. Natural gas is made up mostly of methane, in shale production as much as 8 per cent of the gas could potentially escape into the atmosphere over the lifetime of a well. Which is somewhere between 30-50 per cent higher than those from conventional gas production, with particularly large amounts of methane escaping during the controversial fracturing process. During the return of water and chemicals pumped down the well as flow-back there are also large quantities of methane. More methane is also emitted during the so-called drill out phase when gas is released for production. Professor Robert Howarth from Cornell University has said that 'The footprint for shale gas is greater than that for conventional gas or oil when viewed on any time horizon, but particularly so over 20 years’(Levitt, 2011). It is interesting to note the significant growth in the number of wells drilled in recent years. In Pennsylvania’s reserves there is extensive growth in the number of wells that have been drilled, in 2005 only 2 wells were drilled but by 2008 this figure had risen to 210 and by 2009 the figure stood at 768. Significantly the proportion of permits granted for horizontal wells (laterals) accounted for 75% in 2009 and 87% in 2010 (Fischetti, 2010). For the four years between 2005 and 2009 3000 permits were granted, in 2010 the anticipated figure was 5000 (Fischetti, 2010). With relation to defending their standpoint on the fact that they are not responsible for polluting water supplies the energy companies it would seem only tell half a story. Anthony Ingraffea, an engineering professor at Cornell University has a great deal to say on this matter, following a meeting in March of 2011 in Virginia which was chaired by the U.S. Environmental Protection Agency in a bid to sort out what has turned into a dire situation in the area. Ingraffea’s origins stem back to global gas conglomerate Schlumberger but he has since come to the front as a leading scientific critic of the gas rush described the meeting by saying "I saw beautiful PowerPoint slides depicting what they think is actually happening, in every one, the presenter concluded it was highly improbable." Yet, Ingraffea explains, these analysis considered only single "Tracks"--one water blast, in one lateral, one time. To maximize access to the gas, however, companies may drill a dozen or more vertical wells, closely spaced, at a single site. They may frack the lateral for each well in multiple segments and perhaps multiple times (Mooney, 2011) He goes on to explain this intensive drilling does in fact increase the probability of contamination to water supplies. "You've got three spatial dimensions and time" to consider, Ingraffea says. He doubts a single lateral frack can connect the shale layers to the surface. Still, he adds, "if you look at the problem as I just described it, I think the probabilities go up. How much? I don't know." It would seem such damning opinions and seemingly ‘evidence’ would spell the end for ‘fracking’ but if this specific technology were to be cast by the wayside what could be the implications politically and financially if it is not kept up? (Mooney, 2011)

**3.7. The political ramifications**

What is coming to be known as the ‘gas age’ is tipped to reverse current geo-political shifts which have slowly but surely been occurring since the cold war. A drop in oil prices to as low as $35 a barrel would challenge the political stability of nations built on oil revenue such as Saudi Arabia, Iran, Kuwait and most notably Russia (and other members of the organization of the Petroleum exporting countries – OPEC) by vastly reducing the disposable income to which they have become accustomed (Deutch, 2011). It seems strange however then that news of Iran’s nuclear ambitions are so prevalent in today’s media as with such a threat to its already unstable economy the more typical behaviour of an ‘OPEC nation’ would be to stay quiet on the world stage. Maybe Iran’s hurry to become a nuclear power then is not ambition but rather a desperate misguided attempt to maintain respect internationally this time through a sense of fear rather than through affluence. Perhaps this cavalier attitude would indicate a real ‘beginning of the end’ in the fate of the oil rich nations and could be the strongest indication yet that we are in fact entering the gas age (Levine, 2010). There is the interesting prospect of, in a new energy world, that the United States could be the supplier and Iran the customer in terms of fuel supplies. President Barack Obama is keen to see gas drilling fully exploited and 90% of gas drilling carried out uses the fracking method. Together with nuclear, solar and wind power, natural gas is a corner stone of the United States goal of producing 80% of electricity from perceived clean energy sources by 2035. Natural gas drilling is very lightly monitored by the US environmental protection agency leaving state and regional authorities trying to write their own rules – and they seem to be struggling with this task. This action points to a political will, perhaps driven by economic considerations to turn a blind eye to some of the environmental issues which ‘fracking’ are inextricably linked with. (Efstathiou and Chipman, 2011).

**3.8. An un-tested industry**

Fracking as an industry is one with many complex pitfalls and benefits. Like any area of the energy market it follows a political agenda. When you consider the varying reports of water contamination, future environmental risks and the carbon footprint of the industry it would seem surprising that its rate of growth has continued to be so fast without any real legislation guiding the industry. A reason for this might be that there has never been a conclusive report or any real damning evidence presented by a respected scientific body of a long enough period of time to warrant enough concern. Amy Mall of the natural resources defence council supports this point by saying ‘fracking has never been investigated thoroughly’, she goes on to criticise those responsible for it and leans towards suggesting those who live near the drilling sites are nothing more than large guinea pigs to these energy conglomerates ‘it’s a big experiment without any actual solid scientific parameters guiding the experiment’ (Fischetti, 2010). The trouble is there doesn’t seem be anything at the moment to stand in the way of the industry’s growth, the obvious political agenda to help the economy and save costs on importing gas in many countries means an effort of individuals and communities would be the only way of stopping the gas juggernaut. Then again with handsome compensation being offered to land owners this seems unlikely ‘Oil and natural-gas companies are willing to offer upfront payments and royalties that can amount to thousands of dollars monthly in exchange for the right to recover oil and **gas** from shale in the Formation’ (Kiplingers Personal Finance, 2011).

**3.9. Not soon enough**

What remains to be seen is how important this prospective shift from oil to natural gas might become. But two points stand out as the most notable. First, although the unprecedented growth of shale gas production will lead to gas substituting for oil and diminish the political power of today's major oil- and gas-exporting countries, this market penetration will not be substantial enough that the security concerns of the United States and other oil importers about dependence on foreign oil will disappear. It would seem that in the foreseeable future that will always be a concern. And second, in the long run, the world will need to make the transition from fossil fuels to carbon-free sources of energy, such as wind, solar, geothermal, and nuclear energy. In this sense, shale gas is a way station en route to a new energy future -- not a permanent solution to the problem. (Deutch, 2011).

**3.10. Looking forward**

So in terms of limiting the development of fracking due to concerns about its environmental impacts - there seems to be little worry that the industry will be held up by these said concerns. Given the evidence at hand it is extremely important that industry should learn from the consequence of its previous actions and embrace all knowledge and technical expertise to ensure a safe and environmentally sound development of any future projects. The level of control and intervention will largely be decided by political and economic considerations. This may not be the most environmentally friendly route but it is the world that we live in. What is in fact the larger issue is that these ‘fracking nations’, if they continue to rely on gas, may fall behind in the race to become a renewable energy nation which in the very long term is where everybody has to be.

**3.11. Fracking on the Fylde**

Unbeknownst to most people Fracking has been taking place on the Fylde for 20 years now, at Elswick the Hydraulic Fracturing process has been taking place since 1993. The reason Lancashire, and the Fylde in particular, is so attractive to energy companies is that it sits on a basin of Bowland Shale which contains large amounts of natural gas. There are an estimated 200 trillion cubic feet of gas, which when you consider 3 trillion cubic feet a year are being used in the UK per year, is rather a lot. It is expected that this abundance in the region and the country could have large economic effects to the energy market (bringing prices down) as a whole and the regions wealth in particular. If drilling runs to 2021 as predicted it is estimated that the equivalent of up to 5600 jobs could be created over that time period, and as a skilled industry many of the workers would be earning in excess of twice the national average for wages. Cuadrilla is the main company driving this industry forward in the Northwest and is keen to build strong community links, developing training programmes with Blackpool and the Fylde College to be completed later this year when full field development goes ahead.

**3.12. Earthquakes caused by Fracking?**

In 2011 the British Geological Survey attributed an Earthquake which took place in Blackpool to Fracking, tremors were felt near to the singleton drilling site. These tremors were most likely a result of cracks and fissures being opened up by the blasting of sand, water and chemicals into the Shale Rock which is a necessary process to allow the natural gas to flow more freely (Visit Fylde, 2012).

**3.13. Carry on regardless?**

It is clear to see there are upsides and downsides to Fracking as is the case with any other source of energy. As an evolved and civilised world we use huge amounts of electricity and we make a decision about the implications of energy usage every time we turn a light switch on. What remains as fact is that we do need power although it would be fair to say that a perfect way of delivering it without any negative impact would still seem to elude the worlds scientists (Visit Fylde, 2012)

**Chapter 4: Results and Discussion**

This chapter will explore the results, what the questionnaires and the interview yielded. The data from each section is evaluated here question by question. Exploring why the results have gone in one direction or another, suggesting possible reasons why and connecting this in with the secondary data already collected in the literature review.

**4.1. Questionnaire**

Firstly the questionnaire is analysed, it provides the quantitative element of the research which has made triangulation possible ensuring the work is as unbiased as possible.

**4.1.1. Question 1**

**Figure 2**

As you can see from figure 2 the first question of the questionnaire asks ‘Do you know what fracking is?’ This question was designed by the researcher to initially establish to what extent the participant understand the subject area they will be providing there opinion on which forms part of the data for this project. Seven people said they fully and comprehensively understood what ‘Fracking’ was. Twenty two claimed to ‘pretty much’ know what it was. Twelve claimed to have an idea and Nine declared that they ‘didn’t have a clue’. Whilst the participants who claimed ‘not to have a clue’ agreed to carry on with the questionnaire it does go to show that this initial question influences the validity of the data that follows. It could be argued then that it makes 18% of the data beyond question 1 inadmissible or that that figure should be taken into consideration. However, the researcher felt that it is a fact that not everyone in the region being studied will have an awareness of hydraulic fracturing and as such the research starts of by doing what it achieved to, Which is to show a representation of public perceptions of hydraulic fracturing. In this sample then it would seem that only 82% of people have any such awareness of this industry. Of that 82% 14% claim to comprehensively have knowledge of it. So if you look at the extremes at either side of this data they represent a similar amount. So similarly you could argue this shows a sample of the population of the Fyldes perception of fracking quite evenly. The two middle categories for this question than equate to 68% of the answers, meaning that going forward a relative knowledge of this process and its relative implications can be assumed.

**4.1.2. Question 2**

**Figure 3**

As you can see from figure 3 question 2 asks ‘What is the proximity of your address from our current location?’ This question was relevant as the aim of the research is to find out public perceptions of hydraulic fracturing on the Fylde Coast, therefore proximity to the survey site (Freeport, Fleetwood) is key. The results in figure… showed that five people lived 0-5 miles away, eight people lived 5-10 miles away, twenty five people lived 10-20 miles away and twelve people lived more than 20 miles away. So realistically 24% of participants surveyed lived outside of the Fylde region. This is not to say that their perceptions of fracking on the Fylde are any less relevant than those who live any closer. What the graphs above do not show however is the correlation between the answers in questions one and two. As outlined earlier, 18% of people surveyed did not know what fracking was. A fair assumption might be that this same group makes up the majority of people who lived outside the Fylde, however when the raw data is studied (omitted to protect privacy) it shows that this is not the case. In fact only three people who lived outside of the 20 mile parameter had no idea what fracking was. So far then the questionnaire has established that 82% of people surveyed have some awareness of hydraulic fracturing and that 76% of people live within the Fylde. The relevance of the data then in the following questions in providing a sample of public perception of ‘Fracking on the Fylde’ can be considered high.

**4.1.3. Question 3**

**Figure 4**

As you can see from figure 4 question 3 asks ‘how much did you spend on energy bills last year?’ The researcher’s intent for this question was to get the participants linking the cost and demand of energy and fracking as this is after all the driving force and reason for the presence of the industry. Four participants said they spent less than £1000 per year on their household energy bills last year. Thirty five said they spent between £1000 and £2000 a year on energy. Eleven stated that they spent between £2000 and £3000 and none of the participants spent over £3000 a year on their household energy bills. These results show that 70% of participants then spend between £1000 and £2000 a year on household energy bills. According to U-switch the national average for this spend is £1252(McPhillimy, 2013), this is another strong indicator that the random sample group used is a good representation of the population and the validity of their views can be more confidently extrapolated. It also indicates that the sample group are what you would consider normal, all with household bills to consider and obviously none are of a vast wealth to the extent where they are heating mansions as this would have been reflected in the cost of their energy bills. Hopefully then there should be no elitist right wing views or similarly none that are too far to the left. Meaning that the questions which give a real insight into the public perceptions of Fracking in the Fylde, questions 5 & 6, should show an accurate representation of opinion.

**4.1.4. Question 4**

**Figure 5**

As you can see from figure 5 question 4 asks ‘Would you like your household energy bills to be cheaper?’ Unsurprisingly all participants answered ‘yes’ to this question further clarifying that they are all of sound mind and that they have engaged with the questionnaire and in fact reading and answering the questions rather than just ticking random boxes.

**4.1.5. Question 5**

**Figure 6**

As you can see from figure 6 question 5 asks ‘Do you believe there are any issues related to Fracking?’ This question has been included by the researcher to assess whether or not people are aware of any particular issues with the process, it also asked that if a participant had stated yes to say what they believed the issues to be. 10% of participants stated they believed there to be lots issues with fracking, their responses when probed as to what these were included tales of flames coming from taps, affected drinking water and detrimental impacts on ecosystems. There was also a concern raised by one participants of the effect this would have on traffic in the region and the impact it could have on the areas primary industry, tourism. 26% of participants believed there to be no issues related to fracking. 50% believe there may be some minor issues with the process and its associated implications whilst 14% believed there could be ‘quite a few issues’ with hydraulic fracturing on the Fylde. These results show that those who believed there were lots of issues have perhaps formed their opinions following exposure to propaganda material such as the film ‘gaslands’. More specifically to the Fylde participants may have encountered or are even be campaigners with RAFF (residents against fylde fracking). One questionnaire which was filled out actually gave a response without being asked for one, the participant in this case believed that there were no issues related to fracking and commented in the section below saying ‘the benefits on the economy in the area far outweigh the portrayed negative implications’.

**4.1.6. Question 6**

**Figure 7**

As you can see from figure 7 question 6 asks participants to state ‘to what extent fracking has had an impact on them and their household?’, the researcher included this question to get a personal insight into each of the participants rationale for their answers and to address the common phenomenon of ‘NIMBY’ism. 84% stated that Fracking had no direct impact on them or their household which when you compare that to the 74% in the previous question which showed participants believed to some extent there were issues with Fracking makes these two results quite surprising. Surely if 84% believe there is no direct impact on them the process would face little opposition, although from the literature review earlier it is evident that it is not the case. The anti-fracking groups in the region are quite vocal and it would seem are impacting people’s opinions, as can be seen by 74% of participants’ belief that there are issues associated with the industry. So whilst it would seem there is negative feeling towards the process the actual problems cannot, it would seem, be pin pointed to such an extent that the participants in general felt confident enough to say it impacted upon them or their household. This is perhaps the biggest example yet of the NIMBY attitude in the region when only the negative implications are considered. Perhaps residents have not considered the economic and employment benefits associated with fracking, it is after all being likened to ‘the gold rush’.

**4.1.7. Question 7**

**Figure 8**

As you can see from figure 8 question 7 asks participants if they believe ‘fracking could bridge the energy gap?’, at this point in the questionnaire participants have most likely made their minds up one way or the other as to whether or not they believe fracking to be a justified process in the region. This question is designed to assess to what end it is serving a purpose. Merely to provide a bit more energy or whether it is just a stop gap to greener pastures whilst the renewable sources of energy technologically advance so they are efficient enough to meet the worlds energy demands. The term used here to explain the process above has been coined by the researcher as ‘bridging the energy gap’. 20% of participants believed it to be the case that the role of fracking is indeed to bridge the energy gap whilst 80% believed otherwise. There was no further comment from participants on their decision making process for this but there are many possible motivations for why the majority felt that it was not within the mandate of fracking to bridge the energy gap. Many of the participants questioned were of an age where they will have remembered the three day week so perhaps still have a dim view of energy resources in this country. Perhaps then the hype around the rumoured availability of shale gas underneath the ground in Lancashire is something they had not bought into.

**4.1.8 Question 8**

Question 8 asks participants ‘to what extent would they be willing to lower their energy consumption?’ This question is looking at the purpose of what Fracking needs to do and considering the option that if people are against it then other options perhaps need to be explored. 20% of participants stated that they would be willing to lower their energy consumption by up to 10% the same amount said that they would be willing to lower their energy consumption by up to 20%. The majority said they would be willing to lower their energy consumption by up to 30% whilst only 4% stated they would be willing to lower their energy consumption by over 50%. Surprisingly high numbers then believe they would be willing to contribute in reducing their energy consumption to either do their bit for the environment, ensure there was enough energy to go around or perhaps they just even fancy saving a bit of money. The implications of this though may not have been fully considered by the individuals and to measure this figure would certainly be a difficult and thankless task.

**4.2 Questionnaire Summary**

The questionnaire was a relatively simply and efficient way of collecting data, it has provided an insight into the public perceptions of hydraulic fracturing and the rationale behind those perceptions.

**4.3 Interview**

The interview conducted with Mike Johnson of Residents Against Fylde Fracking (RAFF) is analysed here. The interview took place at Mr Johnsons home the address of which has been omitted at his request. Similarly it is broken down question by question to remain consistent with the way the questionnaire was analysed. (The CD containing the original recording of the interview can be found at the back of this dissertation)

**4.3.1 Interview Question 1**

Question 1 asked Mr Johnson ‘What is your objection to hydraulic fracturing?’ He cited many reasons which included:

* Damage to the environment,
* additional road traffic it would create during construction
* Pollution to the water table
* Gas coming out of taps

Mr Johnson starts off with the broad and well known objections which have been brought into the public domain by the media and seems to be relatively well informed. As he continues to answer the question however he does become more alarmist as he quotes examples he has seen but that are not common place such as the gas coming out of taps. His second point regarding road traffic is a mixture 0f knowledge gained by media sources combined with local knowledge of the road networks. Mr Johnson also mentions about contamination of the water table which is a common problem with the process in America, although the differing Geology in the Northwest of England compared to the U.S. means that this is not yet a proven fact for the Fylde.

**4.3.2. Interview Question 2**

Question 2 asks ‘What do you see as the main problems?’ He felt there was one major issue and some smaller concerns:

* Water contamination,
* Self Regulating industry,
* In the US risk assessments were lenient and no government overseeing of the industry.

Mr Johnsons main concern is water contamination which again is well documented in the media. He appears to base his concerns around information coming out of the United States where it is common knowledge that many of the rules and regulations were relaxed to allow the fracking industry to grow in that country. Mr Johnson quite rightly points out that it is a self-regulating industry and this appears to be a main plank of his worries.

**4.3.3 Interview Question 3**

Question 3 asks ‘What do you know about the process of fracking?’ Mr Johnson gives a well-rounded answer to this and shows an intermediate level of knowledge about the process.

*‘It seems to be where a mixture of water, chemicals and sand are blasted through shale rock at high pressure to release gas’*

However, he does not go into any details about the specific chemicals used or the ratios of waster to sand to chemicals. This would indicate again that his knowledge is derived from what he has heard in the media. He again comes back to the point about environmental damage which seems to underpin his entire argument. Interesting to note here that he does say he has no problem with the drilling of wells in isolation but the ramifications do concern him.

**4.3.4. Interview Question 4**

Question 4 asks ‘Do you believe there would be financial benefits to the region as a result of the fracking industry in the area?’ Mr Johnson here gives a 2 pronged and well considered response and considers the prospective short term and long term financial rewards associated with the industry on the Fylde. In the short term he considers there to benefit to small businesses the construction of these sites will bring eg, sandwich shops and petrol stations. Longer term he sees the same benefits plus the added bonus of extra jobs for people in the region. Mr Johnson then cleverly returns to his core argument of damage to the environment but this time also talks specifically about traffic concerns. He raises the spectre of potential gridlock on the areas main motorway systems in the event of an accident or chemical spillage and raises the question of who would foot the bill for the inevitable damage to the systems road network. He for the first time in the interview mentions the areas tourist industry.

**4.3.5. Interview Question 5**

Question 5 asks ‘If fracking were to go ahead on a larger scale than is already being done would you continue to live in the area?’ Mr Johnson here comes across for the first time from a personal point of view, stating that he likes the area, and would not want to break his family or friendship ties here. He also brings up the prospect of being possibly unable to find work out of the area. All these things on a personal level then tie him to the area. He claims that he might not get a fair price for his house as the price for property would drop as demand fell away, is this an unfounded fear or a properly researched concern based on previous sites? He does go on to categorically state that if circumstances allowed he would look to move out of the area if Fracking operations significantly increased here.

**4.3.6 Interview Question 6**

Question 6 asks ‘Do you believe the predicted price drop in energy associated with the growth of this industry is a realistic proposition?’ Mr Johnson seems sceptical that he would see reduced energy prices if shale gas were to start providing a significant amount of energy to the market. His mind appears to be made up about Fracking and he somewhat unkindly puts forward the notion that any supplier of Shale gas would be happy to join a cartel to fix prices to enable them to get the best price for their product. As a member of an anti-fracking group I suppose this is to be expected and perhaps highlights the ‘charm offensive’ that the Shale gas extracting companies have to undertake on top of all the political and logistical barriers that they face.

**4.3.7 Interview Question 7**

Question 7 asks ‘How do you see the industry impacting upon house prices and small businesses?’ Mr Johnson refers back to his previous opinions on the detrimental effect the industry will have on house prices. He makes a comparison to the difficulties people have had selling properties which sit underneath power cables. He again mentions in this answer by pointing out the bulk of business rely on tourist trade to survive. It has to be acknowledged that as somebody living in the area he probably has a good ‘feel’ for the types of small businesses and industries in the area and how they link into the tourist trade. His point about the problems people experienced selling houses which sat underneath electricity cables shows an awareness of wider issues but again as in previous points still raises the question about his depth of knowledge regarding the effect of fracking on house prices

**4.3.8 Interview Question 8**

Question 8 asks ‘Tourism is the primary industry in your region, do you feel this will be adversely affected by Fracking?’Mr Johnson does not hesitate in his response to this question he cites significant risks from air and water pollution as the reason for saying the tourism industry will be adversely affected although he does fail to provide any particular data such as high acidity levels in water. He also mentions here the prospective abundance of said wells and is under the impression that you could never be far from any one well on the Fylde and as such considers it to be a region wide problem. However in a 169 square mile area perhaps this view is a little pessimistic.

**4.3.9. Interview Question 9**

Question 9 asks ‘Do you feel there is a sufficiently robust infrastructure to deal with the additional traffic caused by the industry?’ Mr Johnson is again very sure of his answer in relation to how the industry associated traffic will affect the regions roads. He sees the roads as already over stretched during the holiday season and feels that the excessive amount of construction traffic will only make a bad situation worse. He cites from personal experience how any problems on the M55 between junction 1 and 3 leave you trapped as there is no exit from that stretch of road and you have to wait for any problem to be cleared before you can continue your journey. In this instance his knowledge is beyond contestation as a resident of the area he is far better informed than the researcher of this issue.

**4.3.10 Interview Question 10**

Question 10 asks ‘On the whole do you see fracking as a good or a bad thing for the people of the Fylde?’ As the interview has gone on Mr Johnson has become more and more confident and assured in his beliefs. He starts again with a superlative saying it is undoubtedly a bad thing. He mentions again what seems to be his largest concern, the environment which as discussed earlier is not really evidence he is any sort of authority on. This knowledge could be gained quite easily by watching a news bulletin. Reference in this answer again to tourism and infrastructure show his knowledge of the region although he finishes by discussing earthquakes which is still a bone of contention in the area as to whether or not the Blackpool ‘earthquake’ of 2011 was indeed caused by fracking.

**4.3.11 Interview Question 11**

Question 11 asks ‘How do you know so much about fracking?’ Mr Johnson here seems a little subdued when asked this question admitting that his information came from 4 main sources:

* Gaslands documentary
* News bulletins
* Newspaper/magazine articles
* Internet

He did go onto say that he very much agreed with the view points put forward in the gaslands documentary.

**Chapter 5 - Conclusion**

This dissertation used a range of research methods to gain a clear understanding of the opinions of residents of the Fylde in relation to Hydraulic Fracturing. Through following the objectives set out at the beginning of this study it is felt that a good understanding of the Hydraulic Fracturing process has been gained. Both positive and negative aspects of the industry have been explored and the industry’s place within the wider energy market has been identified. Unfortunately the number of in depth interviews that had been planned failed to materialise despite this trying to be avoided in the contingencies plan. This in turn meant that the results of the interview, forming the qualitative data, were extremely biased seeing as it was with a member of Residents Against Fylde Fracking (RAFF). This in turn meant that triangulation was not possible and that the results were skewed in a negative trajectory. So whilst the aim of the study was met it certainly has had a bias in finding it. What has been interesting to note is the rationale for the answers of some of the responses from both the quantitative and qualitative data. Reasons for answers in some extremes seem to have come from the video ‘gaslands’, a popular youtube hit. Where some it would seem just ticked random boxes in a questionnaire, and where I feel the majority of the rationale came from…….NIMBY’ism. The **N**ot **I**n **M**y **B**ack **Y**ard attitude seems prevalent in this research with every participant of the survey stating they would like cheaper household energy bills but yet a fair amount claiming it impacts them and their household when this is realistically unlikely when you consider that Fracking is only in the exploration stage in most of the region.

**5.1. Study Limitations**

Whilst the survey/questionnaires did provide some good data from which conclusions have been drawn and been able to meet the aims and objectives. It did not allow the researcher to explore the inter-relationships between answers given by any one participant. For example, it would have been interesting to study the relationships between the answers for questions two and six as I’m sure that the proximity to the location where the surveys took place and the extent to which participants considered Fracking to have had an impact on them and their household would have had a large bearing on one another.

The lack of public knowledge about this subject in general has been a slight limitation too.

**5.2. Future Work**

Any future research could perhaps benefit from contrasting two sample groups. For example, the average lay person off the street as has been the case in this project compared to a group of academics/engineers at a university who would be considerably better informed about the intricacies of the industry.

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**Appendices**

**Appendix 1: The methodological model**

Consider the aims and objectives in developing methodology

Decide on hypothesis and develop aims and objectives that will guide research to confirming or rejecting the hypothesis.

Primary Research

Secondary Research

Semi-structured interview

Questionnaires

Literature Review

Qualitative Research

Quantitative Research

Analysis of data

Conclusion: Do results confirm or reject the hypothesis?

**Appendix 2: Bryman (2006), Outcomes of quantitative and qualitative research**

|  |  |  |
| --- | --- | --- |
|  | Quantitative Research | Qualitative Research |
| ROLE OF RESEARCH | Preparatory | Means to exploration of interpretations |
| RELATIONSHIP BETWEEN RESEARCHER AND SUBJECT | Distant | Close |
| RESEARCHER’S STANCE IN RELATION TO SUBJECT | Outsider | Insider |
| RELATIONSHIP BETWEEN THEORY/CONCEPTS AND RESEARCH | Confirmation | Emergent |
| RESEARCH STRATEGY | Structured | Unstructured |
| SCOPE OF FINDINGS | Nomothetic | Ideographic |
| IMAGE OF SOCIAL REALITY | Static and external | Processual and socially constructed |
| NATURE OF DATA | Hard and reliable | Rich and deep |

**Source:**

BRYMAN, A (2006). Quantity and Quality in Social Research. [online]. London, Routledge. Book from Dawsonera, last accessed 22 November 2012 at: http://www.dawsonera.com

**Appendix 3: Questionnaire**

1. Do you know what fracking is?

Yes, comprehensively Pretty Much I have an idea Not a clue

1. What is the proximity of your address from our current location?

0-5miles 5-10miles 10-20miles >20miles

1. How much did you spend on house hold energy bills last year?

>£1000 £1000-£2000 £2000-£3000 £3000-£4000

1. Would you like your household energy bills to be cheaper?

Yes No

1. Do you believe there are any issues related to fracking? If ‘yes’ please state what they are?

Yes, lots of issues Quite a few issues Some minor issues No

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. Please state to what extent Fracking has an impact on you and your household?

None A small amount A fair amount A lot

1. Do you believe ‘fracking’ could be one of the methods of ‘bridging the energy gap’ whilst renewable sources of energy advance technologically to meet the worlds needs? If ‘no’ can you suggest an alternative?

Yes No

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. To what extent would you be willing to lower your energy consumption?

10% 20% 30% 50% More

**Appendix 4: Contingencies**

This outlines the potential problems that could have occurred during the research and what precautions were taken to minimise the effect of these potential problems

|  |  |
| --- | --- |
| **Potential Problem** | **Precautions taken to minimise the problem** |
| Poor outcomes from questionnaires and interview | A pilot study was conducted which tested the questionnaires and the interview on a small sample that ensured questions were easy to understand and would produce the required outcomes to fulfil the aims and objectives of the study. It was also used to check the timing of completion of both in order to reduce the likelihood of poor results |
| Ethical issues | A full ethical review was conducted as part of the dissertation proposal before data collection which ensured there were no sensitive issues |
| Low response rate from questionnaires, or sample too small | Questionnaires were conducted at an early stage during the study in January/Febuary. This ensured there was enough time to take more at a later stage if the desired sample was not achieved first time. |
| Biased results from questionnaires | Participants were picked at random to reduce bias |
| Struggle to secure interview | A back-up contact was found in case the first choice of interviewee backed out. Interview was arranged at an early stage to ensure participant was more likely to go through with it. Ensured participants that the interview would not take up too much of their time. |

**Appendix 5: Questionnaire Results**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Do You Know What fracking is? | yes, comprehensively | pretty much | I have an idea | Not a clue |  |
| number of answers | 7 | 22 | 12 | 9 |  |
|  |  |  |  |  |  |
| What is the proximity of your address from our current location? | 0-5 miles | 5-10 miles | 10-20 miles | >20 miles |  |
| number of answers | 5 | 8 | 25 | 12 |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| How much did you spend on energy bills last year? | >£1000 | £1000-£2000 | £2000-£3000 | £3000-£4000 |  |
| number of answers | 4 | 35 | 11 | 0 |  |
|  |  |  |  |  |  |
| Would you like your household energy bills to be cheaper? | yes | no |  |  |  |
| number of answers | 50 | 0 |  |  |  |
|  |  |  |  |  |  |
| Do you believe there are any issues related to 'Fracking'? | Yes, lots of issues | Quite a few issues | Some minor issues | No |  |
| Number of answers | 5 | 7 | 25 | 13 |  |
|  |  |  |  |  |  |
| Please state to what extent 'Fracking' has an impact on you and your household? | None | A small amount | A fair amount | A lot |  |
| Number of answers | 42 | 7 | 0 | 1 |  |
|  |  |  |  |  |  |
| Could Fracking 'bridge the energy gap'? | Yes | No |  |  |  |
| Number of answers | 10 | 40 |  |  |  |
|  |  |  |  |  |  |
| To what extent would you be willing to lower your energy consumption? | 10% | 20% | 30% | 50% | more |
| number of answers | 10 | 10 | 28 |  | 2 |
|  |  |  |  |  |  |

**Appendix 6: Ethical Review**

**Application for safety and ethical approval for all projects**

**School of Built and Natural Environment**

All undergraduate, postgraduate, commercial and research projects need ethical approval. No field work, experimentation or work with participants can start until approval is granted. The questions below should be completed by the Principal Investigator or supervisor of the proposed project. Where projects involve students, the Principal Investigator is always the supervisor and never the student.

For **undergraduate** and **postgraduate taught** projects: use the questions to identify whether the project should be referred to the relevant Ethics Committee.

* If you answer “No” to questions, then do not apply for approval.
* If you answer “Yes” to **any** of the questions, please discuss them with your supervisor. If your supervisor is confident that you can follow standard forms, protocols or approaches, then your supervisor can approve your application. If your supervisor is not, then the application should be sent for approval.

For **research, commercial and other** projects: use the questions to help compile suitable evidence to support your application.

* If you answer “No” to questions, then your application is likely to be approved quickly.
* If you answer “Yes” to **any** of the questions, please provide evidence relating to the management of the activity. If your approach seems appropriate, then your application is likely to be approved quickly.

Submit the application form and any supporting evidence to an appropriate Ethics Committee. Different committees might have different approval processes.

Principal Investigators, or project supervisors, are responsible for ensuring that all activities fall within the principles set down in the [University Code of Conduct for Research](http://www.uclan.ac.uk/information/research/research_degrees/ethics_research_governance.php) and the [University Ethical Principles for Teaching, Research, Knowledge Transfer, Consultancy and Related Activities](http://www.uclan.ac.uk/information/research/research_degrees/ethics_research_governance.php). They are also responsible for exercising appropriate professional judgment in undertaking this review and evaluating the activity according to the criteria laid down in this application. If you are uncertain about any sections of this document, or need further information and guidance, please consult a member of the relevant School Ethics Committee.

TheSchool Ethics and Safety Committees are to ensure that you comply with the University’s ethical principles in the conduct of the activity. Committees can ask for clarification or set conditions for you to meet before approval is granted.

Expiry and review: The principal investigator is responsible for ensuring activities are reviewed. Normally:

* each year: review risk assessments: check for changes to hazards and training refreshers
* after 5 years: review ethics: check for new laws, practices
* closure: dispose of [materials](http://www.uclan.ac.uk/information/services/fm/environment/files/Hazardous_Waste_Disposal_GuidancePDF.pdf) and [sensitive data](http://www3.imperial.ac.uk/secretariat/policiesandpublications/informationsystemssecurity/guidelines/guide11/) properly

Refer to the relevant documents from the following links:

1. [Ethical Principles](http://www.uclan.ac.uk/scitech/files/aethics.doc) for Research, Consultancy, Practical Work and Related Activities
2. [Research Governance](http://www.uclan.ac.uk/information/research/research_degrees/ethics_research_governance.php) (Multiple documents)
3. [Health, Safety & Environment](http://www.uclan.ac.uk/information/services/fm/safety_and_health/guidance_procedures.php) (Multiple documents)

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 Project synopsis |  | | | Approver: | | | | Cmte number: | | | |
| 1.1 Title | Exploring the medias influence in forming people’s negative perceptions of hydraulic fracturing on the Fylde Coast. | | | | | | | | | | |
| 1.2 Project type | Original research |  | Research degree |  | PG taught |  | UG taught | | x | Commercial |  |
| 1.3 Short description  in layman's terms [no acronyms or jargon] | This undergraduate dissertation project aims to investigate the medias role in influencing the publics opinion of hydraulic fracturing by undertaking both qualitative and quantitative research. A survey will be taken of the general public at random in Blackpool to see to what extent the media has influenced their opinion of hydraulic fracturing. | | | | | | | | | | |
| 1.4 Dates | Start May 2012 | | | End April 2013 | | | | | | | |
| 1.5 School of ….. | Built and Natural Environment | | | | | | | | | | |

2 Participants

|  |  |
| --- | --- |
| 2.1 Project supervisor /principal investigator: name, position and original signature | Dissertation Supervisor: Mark Toogood  Principle Investigator: Liam Hurley |
| 2.2 Co-workers:  names and positions  [eg student] |  |

3 External collaborators  
3.1 List external collaborating bodies  
3.2 Provide evidence of any ethical approvals obtained [or needed] by external collaborators  
3.3 Indicate whether confidentiality agreements have been or will be completed

Read any associated procedures and guidance or follow any associated checklist, and delete, Yes or No, for each characteristic in A) to F) below.

If you respond **No**, then in your judgment you believe that the characteristic is irrelevant to the activity.

If you respond **Yes**, then you should **provide relevant documentation** [including [risk assessments](http://www.uclan.ac.uk/information/services/fm/safety_and_health/risk_assessment_guidance.php)] with the application, and cross-reference to it, eg A2 or B9. **Use reference numbers of standard** forms, protocols and approaches and risk assessments where they exist.

|  |  |
| --- | --- |
| * 1. Does the activity involve [field work](http://www.uclan.ac.uk/information/services/fm/safety_and_health/field_trips.php) or [travel](http://www.uclan.ac.uk/information/services/fm/safety_and_health/staff_travel.php) to unfamiliar places? If Yes:  1. Does the activity involve field work or leaving the campus [eg [overseas](http://www.uclan.ac.uk/information/services/fm/safety_and_health/staff_travel.php)]? 2. Does the field work involve a ‘party’ of participants or [lone working](http://www.uclan.ac.uk/information/services/fm/safety_and_health/lone_working.php) ? 3. Does the activity involve children visiting from [schools?](http://www.uclan.ac.uk/information/services/fm/safety_and_health/school_visits.php) | A) Yes   1. Yes 2. Yes 3. No |
| B) Does the activity involve humans other than the investigators? If Yes:   1. Will the activity involve any external organisation for which separate and specific ethics clearance is required (e.g. NHS; school; any criminal justice agencies including the Police, CPS, Prison Service)? – start this now [CRB clearance process at [Loughborough](http://www.lboro.ac.uk/admin/personnel/recordchecks.html); [Uclan contact](http://www.uclan.ac.uk/information/services/sas/admissions/staff_list.php) Carole Knight] 2. Does the activity involve participants who are unable to give their informed consent (e.g. children, people with severe learning disabilities, unconscious patients etc.) or who may not be able to give valid consent (e.g. people experiencing mental health difficulties)? 3. Does the activity require participants to give informed consent? [consent guidance at [City U](http://www.city.ac.uk/acdev/academic_framework/re/guidance_consent.html)] 4. Does the activity raise issues involving the potential abuse or misuse of power and authority which might compromise the validity of participants’ consent (e.g. relationships of line management or training)? 5. Is there a potential risk arising from the project of physical, social, emotional or psychological harm to the researchers or participants? 6. Does the activity involve the researchers and/or participants in the potential disclosure of any information relating to illegal activities; the observation of illegal activities; or the possession, viewing or storage (whether in hard copy of electronic format) which may be illegal? 7. Will deception of the participant be necessary during the activity? 8. Does the activity (e.g. art) aim to shock or offend? 9. Will the activity involve invasion of privacy or access to confidential information about people without their permission? 10. Does the activity involve medical research with humans, clinical trials or use human tissue samples or body fluids? 11. Does the activity involve excavation and study of human remains? | B) Yes   1. No 2. No 3. Yes 4. No 5. Yes 6. No 7. No 8. No 9. No 10. No 11. No |
| C) Does the activity involve animals and other forms of life? If Yes:   1. Does the activity involve scientific procedures being applied to a vertebrate animal (other than humans) or an octopus? 2. Does the activity involve work with micro-organisms? 3. Does the activity involve genetic modification? 4. Does the activity involve collection of rare plants? | C) No   1. No 2. No 3. No 4. No |
| D) Does the activity involve [data](http://www.uclan.ac.uk/information/services/sds/dpa_foia_management/data_protection.php) about human subjects? If Yes:   1. After using the data protection [compliance checklist](http://www.uclan.ac.uk/information/services/sds/dpa_foia_management/advice.php), have you any data protection [requirements](http://www.uclan.ac.uk/information/services/sds/dpa_foia_management/DP_code_of_practice.php)? 2. After answering the data protection [security processing questions](http://www.uclan.ac.uk/information/services/sds/dpa_foia_management/advice.php), have you any security [requirements](http://www.uclan.ac.uk/information/services/sds/dpa_foia_management/DP_code_of_practice.php#SECURITY)? [[Data storage](http://www.uclan.ac.uk/health/research/data_storage.php)] [[keep raw data for 5 years](http://www.uclan.ac.uk/health/research/data_storage.php)] | D) No   1. No 2. No |
| E) Does the activity involve [hazardous substances](http://www.uclan.ac.uk/information/services/fm/safety_and_health/coshh.php)? If Yes:   1. Does the activity involve substances injurious to human or animal health or to the [environment](http://www.uclan.ac.uk/information/services/fm/environment/files/Hazardous_Waste_Disposal_GuidancePDF.pdf)? Substances must be disposed properly. 2. Does the activity involve igniting, exploding, heating or freezing substances? | E) No   1. No 2. No |
| F) Other activities:   1. Does the activity relate to military equipment, weapons or the Defence Industry? 2. Are you aware of any ethical concerns about the company/ organisation, e.g. its product has a harmful effect on humans, animals or the environment;  it has a record of supporting repressive regimes; does it have ethical practices for its workers and for the safe disposal of products? | F)   1. No 2. No |
| Note: in all cases funding should not be accepted from tobacco-related industries |  |

If you respond **Yes**, then you should **provide relevant documentation** [including [risk assessments](http://www.uclan.ac.uk/information/services/fm/safety_and_health/risk_assessment_guidance.php)] with the application, and cross-reference to it, eg A2 or B9. **Use reference numbers of standard** forms, protocols and approaches and risk assessments where they exist.

These standard forms are being followed [cross reference to the characteristic, eg A2]:

A1 + A2, see risk assessment

B3 + B5, see risk asessment

**Appendix 7: Interview Questions**

What is your objection to hydraulic fracturing?

What do you see as the main problems?

What do you know about the process of fracking?

Do you believe there would be financial benefits to the region as a result of the fracking industry in the area?

If fracking were to go ahead on a larger scale than is already being done would you continue to live in the area?

Do you believe the predicted price drop in energy associated with the growth of this industry is a realistic proposition?

How do you see the industry impacting upon house prices and small businesses?

Tourism is the primary industry in your region, do you feel this will be adversely affected by Fracking?

Do you feel there is a sufficiently robust infrastructure to deal with the additional traffic caused by the industry?

On the whole do you see fracking as a good or a bad thing for the people of the Fylde?

How do you know so much about fracking?

|  |  |
| --- | --- |
| **Health, Safety and Environment Section**  **RISK ASSESSMENT FORM** |  |

**Appendix 8: Risk Assessment**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Risk Assessment For** |  | **Assessment Undertaken By** |  | **Assessment Reviewed** |
| **Service / Faculty / Dept**:  SBNE |  | **Name: Liam Hurley** |  | **Name:** |
| **Location of Activity**: Freeport, Fleetwood |  | **Date: 01/02/2013** |  | **Date:** |
| **Activity:** Conducting a questionnaire |  | **Signed by Head of Dept / equivalent** |  |  |
| **REF:** |  | **Date** |  |  |

| **List significant hazards here:** | **List groups of people who are at risk:** | **List existing controls, or refer to safety procedures etc.** | **For risks, which are not adequately controlled, list the action needed.** | **Remaining level of risk: high, med or low** |
| --- | --- | --- | --- | --- |
| **A1 Leaving Campus to conduct survey** | **Liam Hurley** | Keeping mobile phone on me, ensuring I’m in a fit state to drive. Be aware when crossing any roads |  | **low** |
| **A2 Lone Working** | **Liam Hurley** | Avoid lone working where possible, take a third party to assist with the survey. Always carry a mobile phone in case of emergencies. Make sure someone always know my whereabouts and the time I am due back. |  | **low** |
| **B3 Consent from participants** | **Liam Hurley** | Getting consent from anybody I speak to and assuring them of anonymity |  | **low** |
| **B5 Slips Trips and falls when walking** | **Liam Hurley** | Use of appropriate clothing and footwear. Mobile phone on my person to call 999 if necessary. Bring first aid kit. Keep in mind the weather and the changing environments I may encounter |  | **low** |
| **B5 Cuts and grazes** | **Liam Hurley** | Know where the nearest A & E department is. Carry a first aid kit. Ensure that tetanus injections re up to date |  | **low** |
| **B5 Personal Security** | **Liam Hurley** | Always carry a mobile phone in case of emergencies. Make sure someone always know my whereabouts and the time I am due back. If possible take a third party for further security |  | **low** |
| **B5 Weather** | **Liam Hurley** | Avoid skin exposure to the sun, use sun block if necessary. Stop work if there is a large increase in risk. Be familiar with symptoms of hypothermia/sun stroke |  | **low** |
| **B5 Lack of Public Knowledge** | **Liam Hurley** | Some members of the public may possess no prior knowledge of the subject. To alleviate any possible tensions I will be taking my student card and some literature on the subject with me |  | **low** |