Public Perception of New Nuclear Power in the UK

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April 2013

Signed Declaration

'I declare that the main text of this dissertation is all my own work.'

Signed............................

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Abstract

Public perception of nuclear power in the UK tends to be mixed. Negative aspects often stem from the controversial issues involved in the nuclear industry such as; radioactive waste management, safety concerns following past accidents and a general mistrust of the industry as a whole. In contrast, positive aspects include energy security, employment, helping to reach emissions targets and a reduction in imports. In addition to this the shift towards new nuclear under UK government policy in recent years could produce a positive opinion. This study will examine public perceptions of new nuclear power stations in the UK as well as perceptions of nuclear power compares to other energy sources. Perceptions may vary in different locations of the UK due to proximity to current power stations and proposed sites. There may also be a difference between demographics such as age. Results showed that public perception of new nuclear is varied with participants accepting the benefits of nuclear power whilst also being wary of the risks and potential hazards.

Acknowledgements

I would like to thank all the members of staff who have helped, especially my supervisor Dr Mike Clark. I would also like to give thanks to all those who participated in this study.

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List of Acronyms

AGR	Advanced Gas-Cooled Reactor
BERR	Department for Business, Enterprise and Regulatory Reform
CCS	Carbon Capture and Storage
CO_2	Carbon Dioxide
DECC	Department of Energy and Climate Change
DTI	Department of Trade and Industry
EfW	Energy from Waste
EU	European Union
EURATOM	The European Atomic Energy Community
IAEA	International Atomic Energy Agency
LULUs	Locally Unwanted Land Uses
NIMBY	Not In My Back Yard
ONS	Office of National Statistics
PWR	Pressurised Water Reactor
UK	United Kingdom
WNA	World Nuclear Association

Chapter 1: Introduction

This study examines the public's perception of new nuclear power in the United Kingdom. The thought of new nuclear power stations in the UK is likely to produce some opposition from members of the public as well as from anti-nuclear campaigners and environmental groups. However, the shift towards new nuclear under UK government policy in recent years could produce positive opinion. This study will reveal the public perception of building new nuclear power stations in the UK and how perception of nuclear power compares to other energy sources. This chapter will provide a background as well as the aims and objectives and rationale for carrying out this study.

1.1 Background to the study

Electricity is vital and is needed in many parts of everyday life with UK energy consumption increasing since 1970 (DECC, 2012b). However, the UK government has committed to targets to reducing carbon dioxide emissions, which means that there is a need to a move away from heavily polluting fossil fuels. These targets have become legally binding and have been implemented in government policy (this is discussed further in chapter 2). One way in which the government proposes to reduce CO_2 emissions is through the use of low-carbon technologies such as new nuclear power.

Nuclear energy is used in many countries worldwide in order to produce electricity, according to the World Nuclear Association (2012) there are 434 commercial nuclear power reactors operating in a total of 31 countries which produce around 13.5% of the world's electricity. At present there are over 60 nuclear power reactors under construction and more than 150 which are firmly planned (World Nuclear Association, 2012). In the European Union 15 member states operate 145 reactors (Sovacool, 2011, 40), with energy from nuclear fission accounting for 14.6% of primary energy consumed and 31% of electricity generated in 2010 (European Commission, 2010, 5). There are many European countries with significant nuclear capacity, which include France, Germany, Russia and the UK. Many of these countries have announced plans to expand the use of nuclear power except Germany, who plan to phase out all nuclear power plants (Goodfellow *et al.*, 2011, 6200). Currently the UK has 16 operational nuclear reactors which provide 19% of the UK's total electricity production (World Nuclear Association, 2013) and 3.5% of total energy use. However, according to the World Nuclear Association (2013), all but one of the UK's reactors is due to be retired by 2023 which is one reason why new nuclear power plants need to be built.

However, the use of nuclear power has often been seen as controversial with many arguments both in favour and against. Nuclear power is often reported in the media and is a topic which often provides many different opinions. The UK government is planning to build new nuclear power stations to meet energy security and reduce emissions from the use of fossil fuels. It is important to hear the view of the public on this issue and discover whether they agree with the government’s plans or think that other forms of energy should be used instead. Goodfellow *et al.* (2011, 6208) explain that public perception of nuclear power is important as it can have significant impacts on nuclear new build and whether a country opts to develop this form of energy. One reason for this study is because of the renewed interest by the UK government in nuclear power and the fact that since the government’s announcement for plans to build new nuclear power stations there has been little research into public perception of new nuclear.

1.2 Aims and Objectives

Aim

To determine public perception of new nuclear power stations in the UK.

Objectives

1. Develop and carry out a survey to discover the views of the public on nuclear power and whether they think it is needed in order to become energy secure.
2. Analyse results from the survey.

1.3 Overview of Layout

This study is divided into 5 chapters. This chapter (chapter 1) provides an introduction to the study. Chapter 2 contains the literature review which introduces the key themes of this subject and trends from past work relating to this study. The methodology in chapter 3 provides details of the ways in which data was collected and analysed. Chapter 4 presents and discusses the results of this study. The final chapter, chapter 5, draws conclusions from the research and brings together the key findings. Further data is available in the appendix.

Chapter 2: Literature Review

The previous chapter provided a background to and the aims and objectives of the study. This chapter will explore some of the most important work on new nuclear power and public perception, focusing on past studies and research in the area of public perception towards nuclear power. There will also be a focus on UK government policy and why the UK may need new nuclear. Some of the issues which concern nuclear power will be mentioned as this could influence public perception.

2.1 What is Nuclear Power?

Nuclear power can be defined as the generation of electricity through a nuclear reaction called nuclear fission. Nuclear fission takes place in the reactor core and involves creating a nuclear reaction by splitting uranium atoms into smaller particles in a chain reaction which produces large amounts of heat. This heat is used to heat water to produce steam which is used to drive a turbine which turns a generator to produce electricity (Westinghouse, 2013).

2.2 History of Nuclear Power in the UK

Public perception of nuclear power has changed significantly over the years, reasons for this include past accidents involving nuclear power plants and changes in government policy. The UK has a long history of using nuclear power with the world's first large-scale nuclear plant coming online in 1956 at Calder Hall (Sovacool, 2011, 15; Teravainen *et al.*, 2011, 3436). However, in 1957 the public first became aware of nuclear accidents following the fire at Windscale. This was the world's first nuclear accident and worst in Britain's history and involved the release of large amounts of radioactive material into the surrounding area (BBC Cumbria, 2008). However, after the Windscale fire public support only dropped by a few percentage points, this could have been due to good public relations which helped reduce fear amongst the public (Dalquist, 2004, 20).Following this accident the UK nuclear industry gave more attention to safety and the development of radiation protection criteria in nuclear plants (Mak, 2008).

Between 1962 and 1971 nine full-scale Magnox power stations were opened and in 1964 the government announced plans to build new AGRs (Advanced Gas-Cooled Reactor) between 1970 and 1976 to replace Magnox reactors (The Guardian, 2012). The AGRs started construction between 1965 and 1970 and were completed between 1976 and 1978. Nuclear power received some negative views from the public in the 1970s because of issues involved in the Magnox and AGR programmes. These issues included high capital costs, long construction times, unreliability, inefficiency, environmental concerns from radioactive waste disposal and distrust in regulators (Dalquist, 2004, 20; Pidgeon *et al.*, 2008, 72).

In 1978 plans to build ten new PWRs (Pressurised Water Reactor) were announced by the UK government however all of these plans except one were abandoned in 1988 (The Guardian, 2012). Teravainen *et al.* (2011, 2436) mention how nuclear power was being seen less favourably at this point as its costs were rising while oil and gas prices were declining and could be extracted from the North Sea. This made domestic energy supplies cheaper and made nuclear power a less economically viable option. Another reason why there was a less favourable view of nuclear at this point could include an increase in concerns from the public about safety following the accidents at Three Mile Island (1979) and Chernobyl (1986). Goodfellow *et al.* (2011, 6200) mention how accidents involving nuclear power plants caused governments in many parts of the world to shift away from nuclear power. In a survey carried out in the UK immediately after the Chernobyl accident over 80% of participants were opposed to nuclear power compared to 68% in the previous year (Pidgeon *et al.,* 2008, 72).

Since the mid-1980s the use of nuclear power worldwide has declined from 17% to 13.5% in 2011 (WNA, 2011). In the UK nuclear power was an important part of the energy mix up until the 1980s but faced opposition from the public following major accidents (Goodfellow *et al.*, 2011, 6200) and concerns regarding waste disposal (Teravainen *et al.*, 2011, 3436). It is suggested that past accidents created a legacy which continued throughout the 1980s, 1990s and early 2000s (Goodfellow *et al.*, 2011, 6200; Venables *et al.*, 2012, 371).

In the late 1990s nuclear power contributed around 25% of total annual electricity production in the UK but this has since declined as old plants have shut down and have not been replaced (WNA, 2013). In 1997 the New Labour government declared that nuclear power was an expensive form of electricity (Teravainen *et al.*, 2011, 3436) and there would be a focus on renewable energy instead (Greenhalgh and Azapagic, 2009, 1052). The main reasons why nuclear power was not seen as an option at that time was because sufficient supplies of North Sea gas were available, public unease still remained following past accidents, nuclear was not thought necessary to meet CO_2 emissions targets and uncertainty remained regarding decommissioning and waste disposal (Greenhalgh and Azapagic, 2009, 1053).

Figure 1 shows the changes in the amount of electricity produced from nuclear and the share of total electricity production nuclear has had from 1971 to 2010. This figure shows that the use of nuclear energy increased sharply from 1971 until 1991 where its use more than doubled in 20 years. However, since the late 1990s and early 2000s the use of nuclear energy for electricity production starts to level off as there is a lack of nuclear new build. The share of nuclear energy has also changed over the years, for example in 1971 this was less than 1%, compared to ten years later in 1981 when it increased to around 5% and in 1991 when it was approximately 12%. Since the 1990s this began to level off, with the exception of some fluctuations, until the early 2000s when the percentage share of nuclear energy started to decline. This could be due to the increase in cost of nuclear new builds, increased use of renewable energy or a lack of acceptance of new nuclear power plants from the public. For current uses of nuclear power see chapter 1.

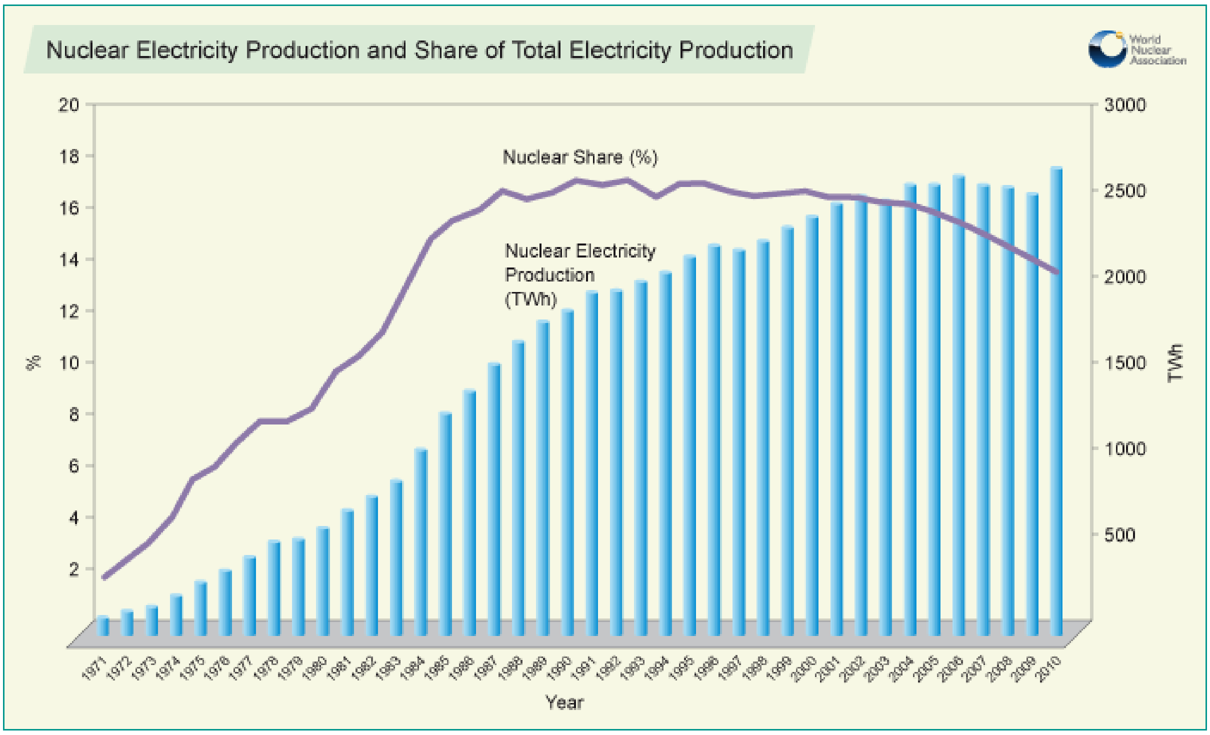

Figure 1 – Nuclear Electricity Production and Share of Total Electricity Production (WNA, 2012).

Nuclear energy has been described as being back on the agenda (Parkhill *et al.,* 2010, 40) or going through a nuclear renaissance (Goodfellow *et al*, 2011, 6199) as many countries around the world are investing in or considering new nuclear power plants. This is a contrast to the lack of nuclear new build over the past 20 years where the development of nuclear power was put off because of economic difficulties, concerns over waste disposal, accidents and a lack of public support for nuclear power (Parkhill *et al.*, 2010, 40).

2.3 Why New Nuclear?

Concerns over climate change, an increasing dependence on overseas supplies of fossil fuels, energy security, rising energy demand and the need to reduce emissions targets have all been expressed as reasons why there is a need to build new nuclear power plants (World

Nuclear Association, 2011; Parkhill *et al.*, 2010, 39 – 40; Goodfellow *et al.*, 2011, 6199; Venables *et al.*, 2012, 371; Greenhalgh and Azapagic, 2009, 1055).

An increase in awareness of climate change and global warming have created a need to start using more efficient low-emission energy sources to replace fossil fuels (European Commission, 2007, 4; WNA, 2011). One way in which the UK plans on doing this is through the use of nuclear power as it has been framed as a low-carbon form of energy. The UK government has committed to targets cut greenhouse gas emissions by at least 80% of the 1990 baseline by 2050 (DECC, 2011b, 9) which were made legally binding in the Climate Change Act 2008. In addition to these targets in 2009 the UK government released a white paper on the Low Carbon Transition Plan which sets out the aim to reduce emissions by 34% by 2020 (WNA, 2013). In order to achieve these targets DECC (2011b, 9) states that an energy efficient and low-carbon economy needs to be formed. This will involve an increase in the use of renewable energy, new generation nuclear and new generation gas and coal-fired power stations with CCS technology (DECC, 2011b, 9). Currently the largest source of emissions (27%) comes from the power generation sector, however this figure needs to be close to zero if the 2050 emissions target is to be reached (DECC, 2011b, 9).

Energy security is another reason for the increased interest in new nuclear power and is further discussed later in this chapter. The UK has long had sufficient production of domestic oil and gas. However, in 2004 the UK began importing oil and gas as domestic production declined at a faster rate than consumption which has made the UK reliant on imports (IAEA, 2012) and created the need for the UK to diversify energy supplies (Teravainen *et al.*, 2011, 3440).

The availability of uranium and its cost also make nuclear power a viable option. Uranium is found in a wide range of countries and according to WNA (2011) uranium is an abundant resource with estimates suggesting that globally there are sufficient reserves of uranium to last around 85 years. Unlike with fossil fuels, uranium prices are less likely to fluctuate compared to other energy sources (European Commission, 2010, 5). Greenhalgh and Azapagic, (2009, 1056) state that the large energy yield per tonne makes uranium relatively inexpensive. Furthermore, countries which have uranium supplies to export are seen as politically stable and open to trading with the UK, this includes Canada and Australia (Greenhalgh and Azapagic, 2009, 1056).

Nuclear power has also become a more attractive option as it is likely to be the least expensive way of generating electricity in the future and can be cost-effective with other methods of electricity generation (DECC, 2011b, 75). WNA (2011) state that the economic benefits of nuclear power will increase further as CO_2 emissions reductions are encouraged through government incentives and emissions trading schemes. Nuclear power could become a viable option for the UK as it is a proven technology which can produce continuous electricity (DECC, 2011b, 75). Teravainen *et al.* (2011, 3439) mention that nuclear new build could also create up to 100,000 jobs in the UK.

2.3.1 Energy Security

Currently the energy system in the UK faces many challenges in terms of energy security as existing infrastructure closes, domestic fuel supplies decline and the energy mix begins to change so low-carbon objectives can be met (DECC, 2013a). One major threat to UK energy security is the prediction that by 2020 the UK could be importing almost 50% of its oil and over 55% of its gas (DECC, 2011b, 14). This poses a risk to energy security as global demand rises and political instabilities in many oil and gas producing companies cause energy prices to increase. Some of threats to energy security include disruptions of supply, geo-political instability and increasing energy prices (Greenhalgh and Azapagic, 2009, 1055) which have affected the price and availability of energy (Watson and Scott (2009, 5094). Energy security has been affected by fuel blockades, tensions in the Middle East and through the lack of onshore gas storage in the UK (Watson and Scott, 2009, 5094).

In the past the UK experienced strong energy security mainly due to extensive North Sea resources, good regulation and liberalised energy markets DECC (2013a). However, in 1999 North Sea production peaked and meant that the UK can no longer be reliant on indigenous supplies of oil and gas (Greenhalgh and Azapagic, 2009, 1055). Between 2003 and 2007 the UK went from exporting 91,000 GWh of gas to importing 215,000 GWh (Goodfellow *et al.*, 2011, 6201) and in 2007 32% of British gas was from imports. This figure increased to around 50% in 2009 and is expected to increase to at least 75% by 2015 (WNA, 2013). The increase in imported oil and gas has made the UK vulnerable to interrupted deliveries and security of supply (WNA, 2011).

In December 2012 the DECC published the Energy Security Strategy which revealed how the UK government will respond to the challenges it faces from energy security. Some important areas of the Energy Security Strategy include the risks facing UK energy security, the main characteristics of energy security, work which is already being done to maintain a reliable energy supply to the UK and actions being taken to maintain the UK's energy supply (DECC, 2013a). The DECC (2011b) suggest that with the use of a low-carbon economy which is more energy efficient, the UK will become less reliant on imported fossil fuels and less exposed to higher energy prices in the future. However, the low-carbon economy will include the use of renewable energy as well as other energy sources which may produce a less secure supply as they may not be able to meet peaks in demand, for example demands in mid-winter due to cold weather (DECC, 2011b, 14). The WNA (2011) explains that nuclear power is the only available large-scale alternative to fossil fuels for continuous, reliable supply of electricity to meet demand.

A further problem which may affect energy security in the UK is the fact that one fifth of electricity generating capacity in the UK will be lost because of the closure of coal mines and nuclear power plants over the next decades (DECC, 2011b, 14). This creates the need for new nuclear as demand of electricity increases and alternatives to fossil fuels need to be found. Teravainen *et al.* (2011, 3437) state that in the UK nuclear power is often classed as a clean technology which has the potential to create energy independence.

Energy security within the EU is also of importance as currently 40% of gas imported into Europe comes from Russia with projections suggesting this could increase to 60% in the future. One major threat to supplies is through political instabilities between Russia and countries where pipelines travel through. In January 2006 a dispute between Russia and Ukraine resulted in gas not being delivered to Europe and energy prices increasing rapidly (Greenhalgh and Azapagic, 2009, 1055). A similar situation was seen in 2009 when many European countries were left without Russian gas supplies for over a week.

Other challenges to the EU include increasing energy demand, a need to diversify and ensure energy supply at reasonable prices and a need to meet commitments related to greenhouse gas emissions (European Commission, 2010, 5). The European Commission (2007, 4) suggests that nuclear power would be beneficial for energy independence and security of supply as according to statistics the share of energy imports from non-EU countries has risen to over 50%. It is predicted that if no action is taken to tackle energy security in the next 20 years then 70% of EU energy will be from imports (De Esteban, 2002, 1). However, according to the results of a European-wide survey (Special Eurobarometer 271) carried out in 2007 many interviewees believed that increasing the share of nuclear energy is not the answer to these challenges (European Commission, 2007, 57).

2.3.2 Suitable Sites for New Nuclear Power Plants

Between July and November 2008 there was a consultation on the process to identify suitable new sites for new nuclear power stations in the UK. In January 2009 in a response to this consultation the government invited nominations for these sites to be assessed for their suitability for new nuclear power plants (WNA, 2013). Eight sites were assessed as suitable for the development of new nuclear power stations in England and Wales before the end of 2025 (DECC, 2013b) and can be seen in figure 2.

Figure 2 – Sites of existing and proposed nuclear power stations in the UK (DECC, n.d).

In November 2012 a licence was given to the Hinkley Point site and in March 2013 planning permission was granted for a new nuclear power station to be built (The Guardian, 2013).

All of the sites selected for nuclear new build already have nuclear facilities, this could be partly because of their infrastructure but also because it could be assumed that local communities will be more supportive or will offer less resistance as they are more used to living near these facilities (Parkhill *et al.*, 2010, 40; Venables *et al.*, 2012, 371).

2.4 UK Policies Relating to New Nuclear

Prior to 2006 new nuclear build was ruled out by the UK government, however a review of energy policy in 2006 reversed the government's opposition (World Nuclear Association, 2013). The 2006 Energy Review (DTI, 2006, 4) addresses two long-term challenges to UK energy security which include:

- The need to reduce CO_2 emissions by using cleaner, more efficient forms of energy in order to tackle climate change.
- Reducing dependence on imported energy and ensuring a secure supply of clean, affordable energy.

The policy suggests some solutions to these challenges which include the use of new nuclear power stations which it is suggested would create a mix of energy supplies for the UK and help contribute towards creating a reliable energy supply, as well as helping the UK cut its CO_2 emissions by 60% by 2050 (DTI, 2006, 10 - 17).

Following The Energy Review 2006, a white paper on energy was released in 2007 followed by a white paper on nuclear power in 2008. The 2007 Energy white paper sets out how the government plans to deal with the challenges mentioned in the Energy Review 2006, the strategies mentioned include saving energy, developing cleaner energy supplies and securing reliable energy supplies at prices set in competitive markets (DTI, 2007, 6 – 8).

The 2008 white paper on nuclear power states the government's view that new nuclear should be included in the UK's future energy mix alongside low-carbon energy sources and it would be in the public's interest to allow energy companies to invest in it and for the government to encourage the construction of new power plants (DECC, 2013b; BERR, 2008, 10). The white paper also insists that all new nuclear power plants will be financed, built, managed and decommissioned by the private sector with no subsidies made by the government (WNA, 2013; Goodfellow *et al.*, 2011, 6201; Parkhill *et al.*, 2010, 39). It is stated in this white paper that without clean, secure and sufficient energy supplies the UK economy and society would not be able to function properly which is why new nuclear power stations are needed as they are a low-carbon form of electricity and will help reduce reliance on imports (BERR, 2008, 17).

UK government's commitment to reduce national carbon emissions in order to address climate change is also a reason why new nuclear has become an option for the UK. The Climate Change Act 2008 commits the UK government to reduce emissions by 35% by 2020 and by 80% before 2050. Meeting these targets requires low-carbon technologies in all sectors particularly in power industry, this may be quite challenging as fossil fuels have traditionally provided majority of UK electricity (Goodfellow et al, 2011, 6200).

Following the May 2010 UK general election, the Conservative/Lib Dem coalition government announced its support for the previous policy (Goodfellow *et al*., 2011, 6201) and mentioned in its programme that nuclear power should play an important role in the UK's future energy mix alongside renewables and CCS (DECC, 2013b) .

The DECC (2011a, 1) explain that the three main objectives of the Energy Act 2011 are to deal with barriers to investment in energy efficiency, maintain energy security and to facilitate investment in low carbon energy supplies. Nuclear power is also mentioned here as it will be used both in order to increase energy security but also to increase the use of low carbon energy.

In 2011 the UK government released a white paper on how the UK government aims to transform the electricity system to ensure future supplies are secure, low-carbon and affordable (DECC, 2011c, 5). The white paper explains how the use of renewables, CCS and new nuclear will reduce the UK's reliance on imports, thus making energy supplies more secure (DECC, 2011c, 9).

The government's commitment to new nuclear power has been made clear through these acts and white papers. However, UK government recognises that the construction of new nuclear plants brings both positive and negative effects which must be identified by organisations in their applications for site licenses (Goodfellow *et al.*, 2011, 6208).

2.5 Public Perception

Public perception of new nuclear power could have an impact on government policy and whether or not potential sites for power plants receive planning permission. Past research into public perception has found that residents living in areas with pre-existing nuclear facilities tend to be more supportive of nuclear power than the general population (Pidgeon *et al.*, 2008). One reason for this could be because the building of such facilities may bring economic and social benefits for local people such as employment, local tax revenues and better infrastructure such as roads (Jenkins-Smith *et al.*, 2011, 632; Venables *et al.*, 2012, 372). Jenkins-Smith (2011, 632) go on to say that these kinds of benefits tend to reduce opposition but when these benefits are absent this is more problematic. Communities living close to nuclear facilities reveal that generally residents tend to be more supportive of nuclear facilities but have concerns about potential health threats, being stigmatised by others in society for living close to and accepting nuclear facilities and a feeling that they deserve more from companies and the government for their tolerance of power plants (Parkhill *et al.,* 2010, 40; Goodfellow *et al.*, 2011, 6203 - 6204).

The main findings of a 2010 survey (Special Eurobarometer 324) carried out by the European Commission (2010, 117) revealed the majority of participants accept nuclear energy can bring benefits such as decreasing energy dependence, stabilising energy prices and helping to combat climate change. Opinion on nuclear power also varies greatly between countries.

Issues which receive high levels of media attention such as the cost of nuclear power and the fear of terrorism are often mentioned as objections to nuclear power (Greenhalgh and Azapagic, 2009, 1060).

Bickerstaff *et al*. (2008) found that when nuclear power is framed alongside important issues such as climate change people tend to be more supportive towards nuclear energy. This is described as “reluctant acceptance” as people’s views changed when nuclear power was positioned alongside other issues. However, this survey also found participants were still reluctant to accept nuclear power as a solution.

2.6 Problems and Issues with Nuclear Power

Although new nuclear is seen as a reliable source of energy, a way of reducing energy security and reducing emissions there are still many negative opinions towards its use. There are many problems and issues relating to nuclear power which may affect public perception which according to Goodfellow *et al.* (2011, 6199) is the main barrier to the construction of new nuclear power plants. In the past negative public opinion has had major consequences for the nuclear industry such as the cancellation of and significant delays to projects including Sizewell B and Druridge Bay (Goodfellow *et al*, 2011, 6199). Past studies have found that some of the main concerns the public have with nuclear power include; a lack of security against terrorist attacks, radioactive waste disposal, management of waste, safety concerns and distrust in the industry (European Commission, 2010, 11; Venables *et al.*, 2012, 371) and environmental threats such as contamination, climate change and mining for uranium (Parkhill *et al.*, 2010, 40; Sovacool, 2011, 246).

The costs associated with nuclear power are a reason why the public may be opposed to new nuclear power. Nuclear power stations tend to have high construction and decommissioning costs with many projects suffering cost overruns (Sovacool, 2011, 39).

There are also high costs associated with managing nuclear waste and ensuring safety of reactors (De Esteban, 2002, 3).

One major concern for many members of the public is radioactive waste management which is often seen as a barrier to the development of nuclear power stations. The main concerns the public tend to have include the difficulty of securing waste over long periods of time, the lack of solutions for nuclear waste disposal and environmental concerns (Parkhill *et al.*, 2010, 41; Greenhalgh and Azapagic, 2009, 1059). However, WNA (2011) maintains that radioactive waste is handled and managed responsibly in all countries with nuclear power.

The media can equally have a major influence on public perception as for many people the mass media tends to be their only source of information relating to nuclear power. However, for many the information reported in the media is often biased or unreliable. A survey conducted by the European Commission (2010, 119) found that of those who took part the majority only used the media to obtain information relating to nuclear energy but many were critical of the information reported by the media about nuclear energy.

The idea of NIMBYism could be used when discussing nuclear power as many people may accept nuclear power as a form of energy but may not want a nuclear power station in their area or community. Nuclear facilities are also often described as LULUs (Locally Unwanted Land Uses) as they are often not accepted by local communities due to distrust, potential environmental threats and risk perceptions (Jenkins-Smith, 2011, 629).

2.6.1 Safety concerns

Safety concerns have long been an issue when examining public perception of nuclear power, especially after major nuclear accidents, such as those at Fukushima and Chernobyl, which affected public opinion globally. Following the 2011 Fukushima Daiichi accident in Japan public perception became slightly negative towards nuclear power and renewed focus on safety, public understanding and level of acceptance of nuclear power (Goodfellow *et al.*, 2011, 6199; WNA, 2011). However, after this event many countries, including the UK, brought in safety reviews (Goodfellow *et al.*, 2011, 6208). In the UK this was done in the form of The Weightman Report on lessons from Fukushima which the DECC (2011b, 75) confirms found no safety weaknesses in the UK's nuclear industry.

It could be suggested that the 1986 Chernobyl disaster was made worse by incompetent plant operators and a lack of safety culture. However, owing to the disaster, global cooperation in sharing operating experience and best practices in safety culture have been beneficial worldwide (WNA, 2011). There are now many safety requirements, standards and guidelines which are published by the IAEA as well as regulation by national governments such as the Office for Nuclear regulation (ONR) in the UK. Regulations are put in place by The European Commission (2007, 4) which maintains that nuclear facilities must have high standards of safety which should be put in place in order to maintain high safety standards across Europe. These safety standards include safe and sustainable management of radioactive waste, safe decommissioning and making sure nuclear materials are not misused. Other European legislation includes the EURATOM treaty which promotes peaceful use of nuclear energy in member states and ensures all users have a regular and equitable supply of ores and fuels (European Commission, n.d).

One way in which nuclear safety may concern the public is through reactor design as there is no single international design standard and as Goodfellow *et al.* (2011, 6204) explain it is unusual for a nuclear power plant design which has been approved in one country to be accepted in another country without some modification. This suggests that there are different regulations worldwide and some of these regulations may be a higher priority in some countries than in others.

2.6.2 Trust towards the Nuclear Industry

There has often been a lack of trust in the nuclear industry and those who regulate it. The WNA (2011) explain that in the early years of the nuclear industry the public had respect for the decisions made by authorities but this has changed over the years for many different reasons.Findings from past studies, as mentioned by Parkhill *et al.* (2010, 42), have revealed that there is a lack of trust towards regulators, governments and the industry to provide the public with truthful information and manage risks effectively. A key finding of a survey by the European Commission (2010, 119) revealed that only 1 in 4 people interviewed felt ‘very well’ or ‘fairly well’ informed about nuclear energy, which suggests there be a lack of reliable information relating to nuclear energy and the nuclear industry. Jenkins-Smith *et al.* (2011, 631) explain that perceived risks from the public may originate from the perception that government officials cannot be trusted to effectively manage the risks of hazardous facilities.

However, ways in which the government and the nuclear industry try to transform public opinion on nuclear issues often involves getting out the right message, this is done through press releases, media, education programmes and public consultations (Goodfellow *et al.*, 2011, 6207). This can be very effective in making public opinion more favourable towards nuclear power as Jenkins-Smith *et al.* (2011, 632) explain familiarity with the activities carried out at a nuclear facility tends to decrease risk perceptions. The public also have a greater level of trust in the nuclear industry if they are more involved in procedures and consultative processes where they would be able to actively engage with officials from the government and nuclear industry.

2.6.3 Risk Perception

One factor which does affect public perception of new nuclear power is how the public perceives risk. In a survey carried out by the European Commission (2010, 118), it was found that one of the main arguments against the use of nuclear energy related to risk perception with more than 50% of those interviewed viewing nuclear energy as more of a threat than a reliable source of energy.

Goodfellow *et al.* (2011, 6201) explain how there is a difference between calculated and perceived risk. Perceived risk involves psychological or sociological factors, whereas calculated risk is described as a highly technical subject which the majority of people are unable to comprehend. In order to calculate the risk from nuclear power plants a PRA (Problematic Risk Assessment) is often used which calculates the probability or likelihood of an adverse event and how severe the possible consequences of such an event may be (Goodfellow *et al.*, 2011, 6202). It is suggested that one reason why there is objection to nuclear power is because of the perceived risks despite there being a low calculated risk (Goodfellow *et al.*, 2011, 6201). Another reason why there may be a lack of acceptance of nuclear power may be due to a lack of understanding by the public and local communities of technical risks (Goodfellow *et al.*, 2011, 6204) which can affect behaviour and practices (Parkhill *et al.*, 2010, 40). One example of this can be found in the survey carried out by the European Commission (2010, 11) which found that most of those interviewed believed that the risks relating to nuclear power were underestimated.

Chapter 3: Methodology

The previous chapter discussed the literature surrounding the topic of nuclear power in the UK and public perception. This chapter will discuss the methods used in order to obtain data on public perception of new nuclear power in the UK. Perceptions of new nuclear were obtained through the use of an online survey. The survey was created on the website “Smart-Survey” which allows users to include 15 questions per survey and a maximum of 100 responses per month. This website was chosen as users can include more questions per survey than other survey creation websites and it allows users to share surveys via e-mail and social networks such as Facebook which is how this survey was distributed. Many people regularly use social networks and e-mail which is one reason why this method of distribution was chosen as it could provide a high response rate. The survey was available online for a period of 10 days between 19/2/2013 and 1/3/2013.

3.1 Method development

Other methods could have been used instead of an online survey. This includes: door to door, face to face and postal surveys. Some advantages of door to door and face to face surveys are that it is easier to identify appropriate people to complete the questionnaire and detailed questions can be asked and explained to respondents (Charnwood, n.d). However, there are some disadvantages to this type of survey which include poor response rates and a lack of detail in opinions of respondents (Charnwood, n.d). These surveys can also be very time consuming for both the respondent and the researcher.

Postal surveys can have some advantages including the fact that respondents are able to fill out questionnaires in their own time and large numbers of people can be contacted. However, postal surveys tend to be time consuming as they need to be printed, distributed and then collected. Questionnaires also need to be kept short otherwise there is a risk that participants may be put off from filling them in.

Some of the reasons for using online surveys include the fact that they are cheap or free and are easy to use for participants. Online surveys are also less time consuming as they are quick to analyse, results are received faster and the surveys can be produced quickly.

3.2 Techniques used

Some of the questions used in this study were obtained from secondary data from a survey done by Spence *et al.* (2010). Questions 1, 4, 6 and 7 were based on this survey with some slight alternations included. Whereas questions 2, 3, 5 and 8 were created by the researcher. Finally, questions relating to the participants gender, age, employment status and level of education were added. A comments box was put at the end of the survey for any additional comments or views the participants may have had. A copy of the survey can be seen in appendix 1.

Before the survey was made available to the public, a pilot survey was created to make sure that the questions were viable and easy to understand. Any alterations that were needed could then be made.

Prior to beginning this piece of research a risk assessment and ethics form needed to be completed and approved (see appendix 3).

3.3 Criticism of techniques used

Some issues with using an online survey include the fact that participants need to have internet access. However, this may result in the inability to reach certain people who may not have access to the internet, such as elderly people. According to statistics from the Office of National Statistics (ONS) in 2012 70% of people aged 75 and over had never used the internet, compared to 0.8% of 16-24 year olds and 1.5% of those aged 25-34. These statistics also found that 98% of 16-24 year olds had used the internet in the 3 months before the survey but only 25% of those aged 75 and above had done the same (ONS, 2012). This suggests that the majority of responses to online surveys will be from younger generations.

The sample size used in this study could be described as small, as it only represents the views of 72 participants. The study focuses on public perception of new nuclear power in the UK as a whole and ideally would need to represent the views of people from all over the UK. A question about where in the UK a particular participant lived could have been included so that a sample of different areas could be taken.

A potential problem with the use of the website “Smart Survey” is that the free service is limited to 100 responses; therefore if this limit was reached it would prevent all results from being collected.

Chapter 4 – Survey Results and Discussion

The previous chapter discussed the methods used in this study and this chapter will discuss and analyse the results. A total of 72 participants took part in this study. Firstly the profile of participants will be discussed and the results from the remaining eight questions will then be presented and analysed. All raw data can be found in appendix 2.

4.1 Profile of Participants

Characteristic		%	Characteristic		%
Gender	Male	41.67%	**Age**	18 or under	4.17%
	Female	56.94%		19 - 29	58.33%
	Rather not say	1.39%		30 - 39	11.11%
				40 - 49	12.50%
				50 - 59	5.56%
				60+	6.94%
				Rather not say	1.39%
Highest level of education	No formal qualifications	0.00%	**Employment Status**	Full time working	38.89%
	GCSE/ O-Level	9.72%		Part time working	5.56%
	Vocational qualification	5.56%		Unemployed	0.00%
	A-Level or equivalent	43.06%		Retired	4.17%
	Bachelor's degree	20.83%		Student	48.61%
	Masters/PhD	1.39%		Looking after home/children	0.00%
	Still in full time education	11.11%		Other	1.39%
	Other	6.94%		Rather not say	1.39%
	Rather not say	1.39%			

Table 1 – Profile of Participants

The characteristics of participants can be seen in table 1 which shows that 56.94% were female compared to 41.67% males. Of those who took part almost half (48.61%) were students and 38.89% were in full time employment. Over half (58.33%) of participants were in the age range 19 -29, one reason for this could be because the survey was distributed online and people of this age are more likely to use the internet and have access to a computer. Another reason more students and participants in the 19 – 29 age range answered the survey could be because it was posted on social networks such as Facebook which this age range are more likely to use.

4.2 Question 1

In general how favourable or unfavourable are your opinions on the following energy sources when used to produce electricity?

	Very favourable	Mainly favourable	Neither favourable nor unfavourable	Mainly unfavourable	Very unfavourable	Don't know/ No opinion
Oil	1.4%	13.9%	25.0%	**40.3%**	19.4%	0.0%
Gas	5.6%	15.3%	29.2%	**37.5%**	12.5%	0.0%
Coal	0.0%	11.1%	15.3%	**40.3%**	30.6%	2.8%
Nuclear	16.7%	**25.0%**	18.1%	16.7%	19.4%	4.2%
Solar	**58.3%**	36.1%	1.4%	2.8%	0.0%	1.4%
Wind	**54.2%**	31.9%	4.2%	2.8%	4.2%	2.8%
Tidal	**59.7%**	26.4%	9.7%	1.4%	0.0%	2.8%
Biomass	**29.2%**	27.8%	13.9%	4.2%	5.6%	19.4%
Energy from Waste (EfW)	**40.3%**	31.9%	16.7%	1.4%	0.0%	9.7%

Table 2 – Data obtained from question1.

Question 1 reveals that public perception tends to be more favourable towards renewable energy sources. Table 2 shows that the majority of the public were either very favourable or mainly favourable towards solar, wind, tidal, biomass and EfW. It has been found in past surveys that public perception tends to be more favourable towards renewables for electricity generation (Pidgeon *et al.*, 2008, 73; Spence *et al.*, 2010, 11), with solar and wind energy most favoured (Corner *et al.*, 2011, 4825; Poortinga *et al.*, 2006, 16).

Out of all renewable energy sources biomass has the lowest level of public support. One reason for this could be because biomass may be seen by some as controversial with many negative arguments increasingly reported in the media (Delshad and Raymond, 2013, 190). 19.4% of participants had no opinion or were unsure of their opinion on biomass, this could be due to the fact that it is not as widely used as other renewable energy options, therefore there may be less awareness about it.

Perceptions of non-renewable energy sources are least favoured, with 40.3% of participants having unfavourable opinions towards oil and coal. Gas was the most favoured fossil fuel but still received a negative response with 37.5% of participants mainly unfavourable and 29.2% neither favourable nor unfavourable towards its use in electricity production. A survey carried out by Poortinga *et al.* (2006, 6) also found that gas was more favoured by the public when compared to coal and oil.

Opinions on nuclear energy tend to be a lot more varied compared to other forms of energy. 25% of participants were mainly favourable towards its use but other options received similar results. This ranged from 19.4% for very unfavourable, 18.1% for neither favourable nor unfavourable, and 16.7% for very favourable and mainly unfavourable. Results from past surveys, as previously discussed in chapter 2, carried out in 2005 by Poortinga *et al.* (2006) and in 2010 by Spence *et al.* (2010) also revealed that overall opinions on nuclear power were quite divided. Opinions tend to be divided because there are many issues surrounding its use which include safety concerns, potential risks, radioactive waste disposal and costs (for further explanation of these issues see chapter 2).

4.3 Question 2

In your opinion which statement is most relevant to each energy source?

	Non-renewable (oil, gas, coal)	Renewable (wind, solar, tidal, biomass, energy from waste)	Nuclear	Unsure / Don't know
Causes air pollution	**94.4%**	0.0%	2.8%	2.8%
Contributes towards climate change	**88.9%**	0.0%	5.6%	5.6%
Creates hazardous waste	9.7%	0.0%	**86.1%**	4.2%
Is harmful to human health	40.3%	0.0%	**51.4%**	8.3%
Is inefficient	23.6%	**48.6%**	1.4%	26.4%
Spoils the landscape	27.8%	**41.7%**	16.7%	13.9%
Is inexpensive	18.1%	**43.1%**	12.5%	26.4%
Does not produce harmful emissions	1.4%	**86.1%**	4.2%	8.3%
Is safe to use	2.8%	**87.5%**	5.6%	4.2%

Table 3 – Data obtained from question 2.

Renewable energy received the most positive responses on this question as 87.5% of participants consider it to be safe to use and 86.1% believe that no harmful emissions are produced. In addition, none of the participants thought renewables caused air pollution, climate change, hazardous waste and harm to human health. Some reasons for renewables being seen more positively may be because they do not have as big an impact as in terms of emissions than non-renewables. The use of renewable energy is also, for many, not as controversial as nuclear power.

The majority (94.4%) responded that non-renewable energy was more likely to cause air pollution and 88.9% thought that non-renewables were more likely to contribute to climate change.

Nuclear power received negative opinions on this question, mainly to do with issues concerning hazardous waste (86.1% choosing nuclear) and effects to human health (51.4%). While only 5.6% agree that nuclear energy is the safest to use. Corner *et al.* (2011, 4826) mention that in past polls the availability of better or preferable energy solutions and the perceived lack of safety in nuclear power stations have created overall negative results for nuclear.

4.4 Question 3

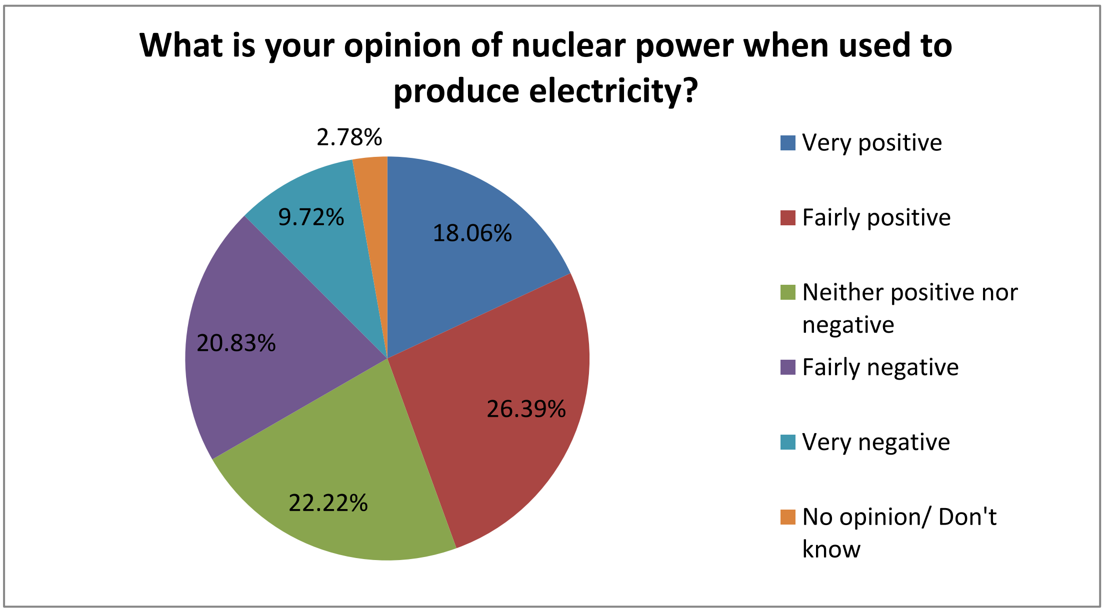

Figure 3 – Participants opinion of the use of nuclear power to produce electricity

Figure 3 shows largest proportion of participants (26.39%) were fairly positive about nuclear power. However, other opinions such as very positive, neither positive nor negative and fairly negative all received similar scores. As mentioned previously, a survey carried out by Spence *et al.* (2010) found that public perception of nuclear power was very divided. In comparison to the previous questions, these responses represent more positive results for nuclear.

4.5 Question 4

From what you know or what you have heard which of the following statements most closely represents your opinion on nuclear power?

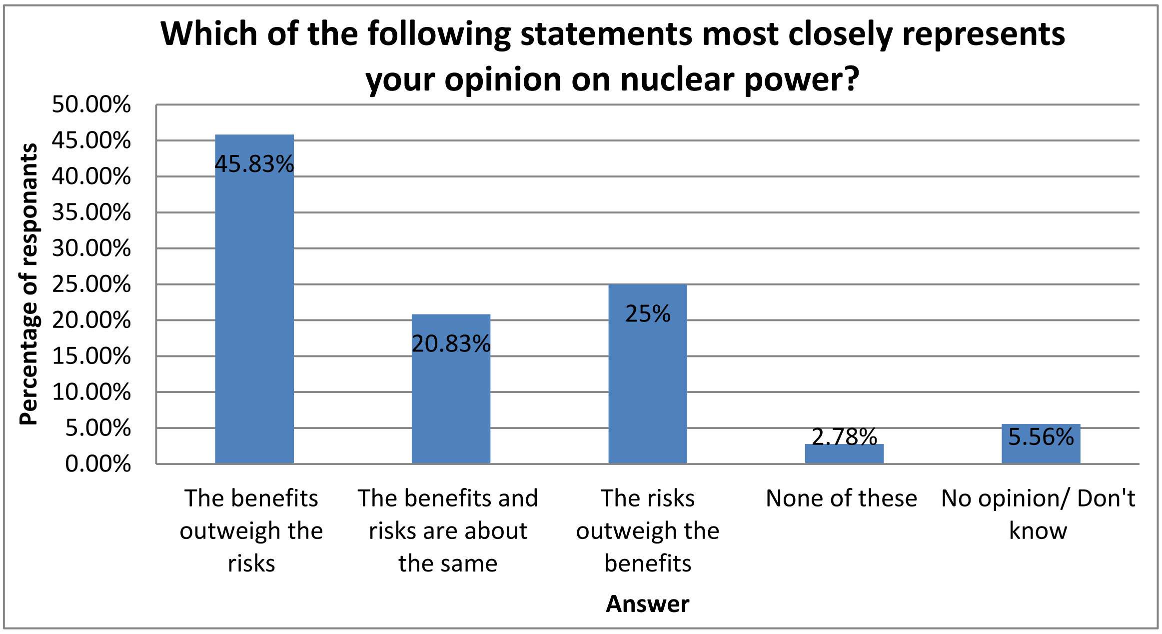

Figure 4 – Statements relating to participants opinions on nuclear power

Figure 4 reveals that almost half (45.83%) of participants agree with the view that the benefits of nuclear power outweigh the risks. However, 25% believe that the risks outweigh the benefits and 20.83% think the risks and benefits are about the same. This implies that people may be willing to accept the benefits nuclear power could bring but are also aware of the risks associated with its use.

Spence *et al.* (2010, 13) and Corner *et al.*(2011, 4828) found that more people felt the benefits of nuclear power outweighed the risks. However, in the 2005 survey by Poortinga *et al.* (2006, 9) more participants felt the risks of nuclear power outweighed the benefits. This suggests that since 2005 opinion on nuclear power has changed, becoming slightly more positive. It could also be said that public perception of nuclear power is constantly changing which could be due to media coverage of nuclear issues and changes in government policy.

4.6 Question 5

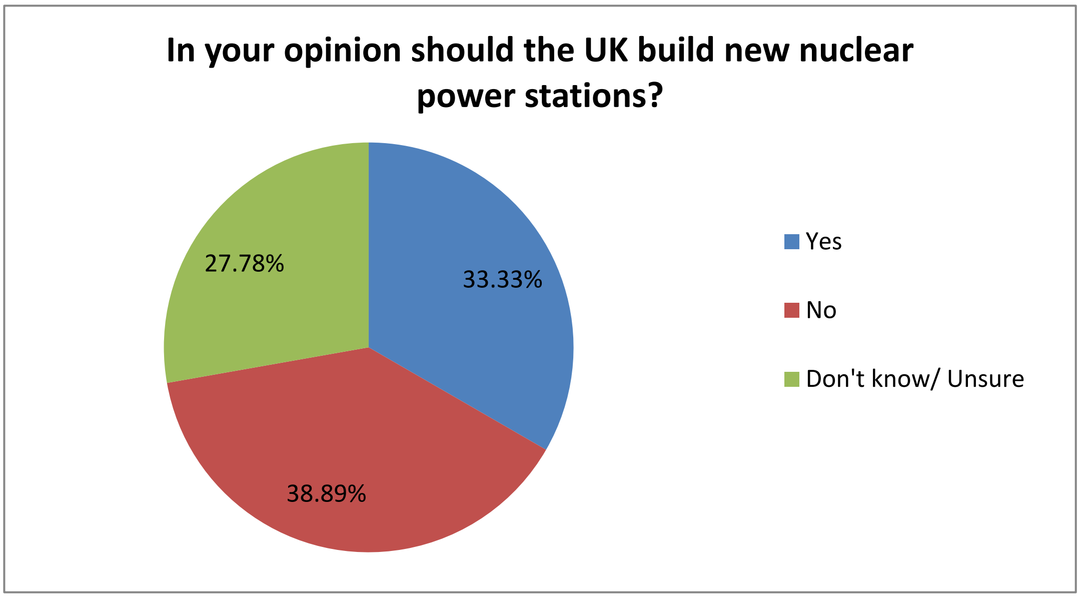

Figure 5 – Opinions on whether the UK should build new nuclear power stations

Figure 5 shows that results for each answer are quite similar and that 38.89% of participants don’t think the UK should build new nuclear power stations. Whereas 33.33% think the UK should and 27.78% are unsure or don’t know.

Participants were given the opportunity to provide reasons for their choice of answer to this question (For full list of reasons see appendix 2). Some reasons given for building new nuclear power stations include the fact that the UK is too reliant on fossil fuels which are finite resources. Several participants gave the opinion that these resources need to be replaced with nuclear power as it can provide continuous electricity and meet demand and make the UK energy secure. Other reasons given for nuclear power included the creation of jobs, the view that renewable energy sources may not be able to meet demand or that some renewable sources such as tidal power have not been sufficiently developed.

Some of the views expressed against the building of new nuclear power stations included; issues surrounding radioactive waste disposal, potential health effects and safety concerns. Some participants believe that nuclear is expensive and that more investment should go into renewable or alternative energy. Further reasons included that it is too expense and the CO_2 emissions produced through uranium mining and the construction and maintenance of power stations.

4.7 Question 6

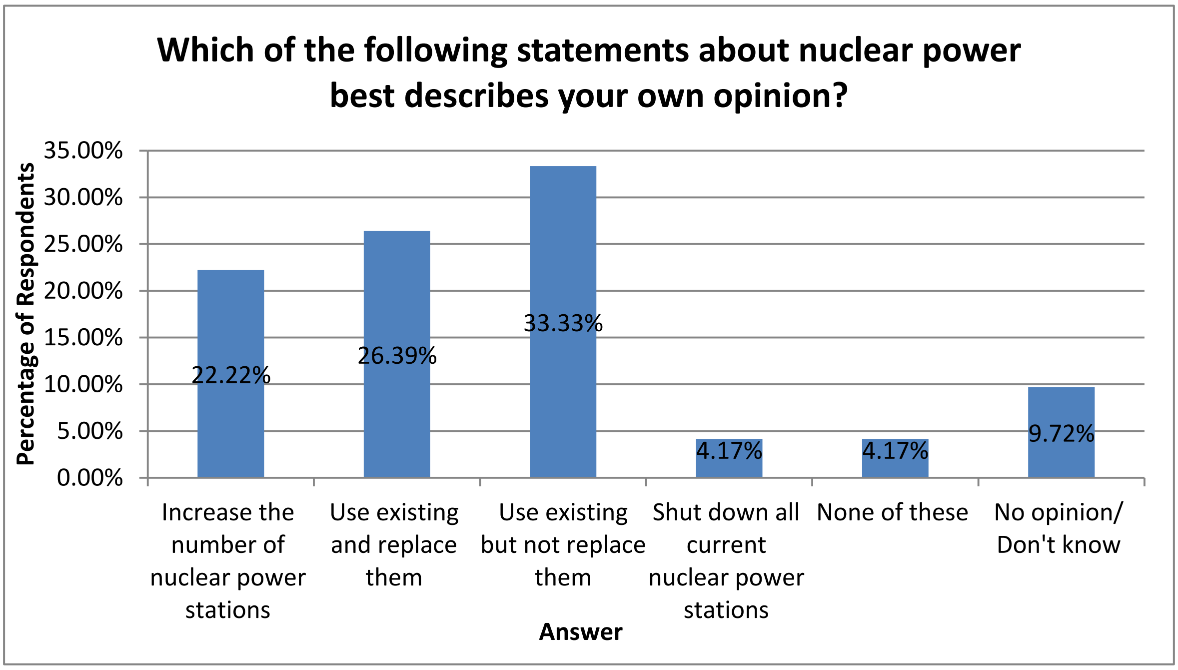

Figure 6 – Statements describing participants opinions on nuclear power

Figure 6 shows that 33.33% of participants believe that the UK should use existing nuclear power stations but not replace them when they shut down. While 26.39% think that existing nuclear power stations should be replaced at the end of their life and 22.22% think the number of nuclear power stations should be increased. This question also shows varied results, one reason for this may be because the issue of building new nuclear power stations tends to bring about diverse opinions between different people. Poortinga *et al.* (2006, 10) also found very different views, with 34% of participants stating that we should continue using existing nuclear power stations and replace them with new ones when they reach the end of their life and 34% stating we should use existing nuclear power stations but not replace them.

4.8 Question 7

For each of the following statements about nuclear power in the UK please state to what extent you agree or disagree with each.

	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree	No opinion/ Don't know
Nuclear power poses a risk to people	23.6%	**34.7%**	19.4%	15.3%	2.8%	4.2%
Nuclear power brings benefits to people in the UK	26.4%	**48.6%**	12.5%	2.8%	4.2%	5.6%
Nuclear power will help improve UK energy security	26.4%	**43.1%**	16.7%	4.2%	1.4%	8.3%
Nuclear power should be part of the future energy mix and not solely replied upon	29.2%	**44.4%**	2.8%	13.9%	6.9%	2.8%
There is a lack of trust towards the regulation of the nuclear industry	**36.1%**	31.9%	12.5%	9.7%	1.4%	8.3%
Nuclear power is needed as renewable energy sources cannot meet current and future energy demands	27.8%	**33.3%**	16.7%	6.9%	8.3%	6.9%
Nuclear power is often reported in a negative way by the media	36.1%	**45.8%**	8.3%	2.8%	2.8%	4.2%
Nuclear power plants are operated safely	**29.2%**	**29.2%**	**29.2%**	0.0%	2.8%	9.7%
Nuclear power will help limit climate change	12.5%	22.2%	**30.6%**	18.1%	6.9%	9.7%
Nuclear power plants are at risk from terrorist attacks	16.7%	**40.3%**	23.6%	6.9%	4.2%	8.3%
Other energy sources should be explored before using nuclear power	**37.5%**	16.7%	25.0%	15.3%	4.2%	1.4%

Table 4 – Data obtained from question 7

Table 4 reveals that many of the participants strongly agree or tend to agree with the negative aspects of nuclear power, for example over half (58.3%) strongly agreed to tended to agree that nuclear power poses a risk to people. While 57% strongly agree or tend to agree that nuclear power plants are at risk from terrorist attacks. However, the majority of participants strongly agreed or tended to agree with some of the potential benefits of nuclear power including the view that it could help improve UK energy security (69.5% agreed) and may bring benefits to people in the UK (75% agreed). Spence *et al.* (2010, 23) found support for nuclear power often increases when it is framed as a way of dealing with climate change and energy security or as part of the energy mix. Bickerstaff *et al.* (2008, 145) describe the changes of opinion of nuclear power when it is positioned alongside certain issues such as climate change as "*reluctant acceptance*". It could be suggested that this is one reason why most participants in this study recognise that there are many benefits to nuclear power but also maintain that there are risks associated with its use.

73.6% of participants strongly agree or tend to agree that nuclear power should be part of the future energy mix and not solely relied upon. While 54.2% strongly agree or tend to agree that other energy sources should be explored before using nuclear power. However, 61.1% either strongly agree or tend to agree that nuclear power is needed as renewable energy cannot meet current and future energy demands. This suggests that although many participants accept the benefits of nuclear power, other energy sources may be preferred and for some nuclear may only be seen as a last resort after other options have been tried.

Most participants (30.6%) answered neither agree nor disagree when asked whether nuclear power will help limit climate change. One reason for this could be due to the fact that there are often conflicting arguments surrounding the issue of using nuclear power as a way of combating climate change. Nuclear power has been presented by the UK government as a way of tackling climate change by decarbonising energy supplies through the use of low carbon technologies (DECC, 2012). However, there have been reports in the media and by other individuals which have argued that CO_2 emissions are emitted from uranium mining, enrichment, fuel manufacturing and plant construction and decommissioning (BBC News, 2008).

36.1% strongly agree and 31.9% tend to agree that there is a lack of trust towards the regulation of the nuclear industry. A similar finding can be seen in the survey carried out by Spence *et al.* (2010, 21) which found that trust towards the nuclear industry is low. One reason for this could be because of past nuclear accidents which have caused nuclear power to become a highly stigmatised technology (Corner *et al.*, 2011, 4826) and have caused high levels of concern and anxiety amongst people (Parkhill *et al.*, 2010).

When asked whether nuclear power plants were operated safely, the options of the strongly agree, tend to agree and neither agree nor disagree all received 29.2% of responses. One reason for this, as stated by Corner *et al.* (2011, 4826), could be that public perception is often divided on issues concerning nuclear safety and in general there is a perceived lack of safety in nuclear power stations.

81.9% of participants either strongly agreed or tended to agree that the media often reports nuclear power in a negative way. Culley *et al.* (2010, 499) mention that the media plays an important role in shaping public perception and that research has shown there is some divergence between what the media reports about nuclear power and its risks.

4.9 Question 8

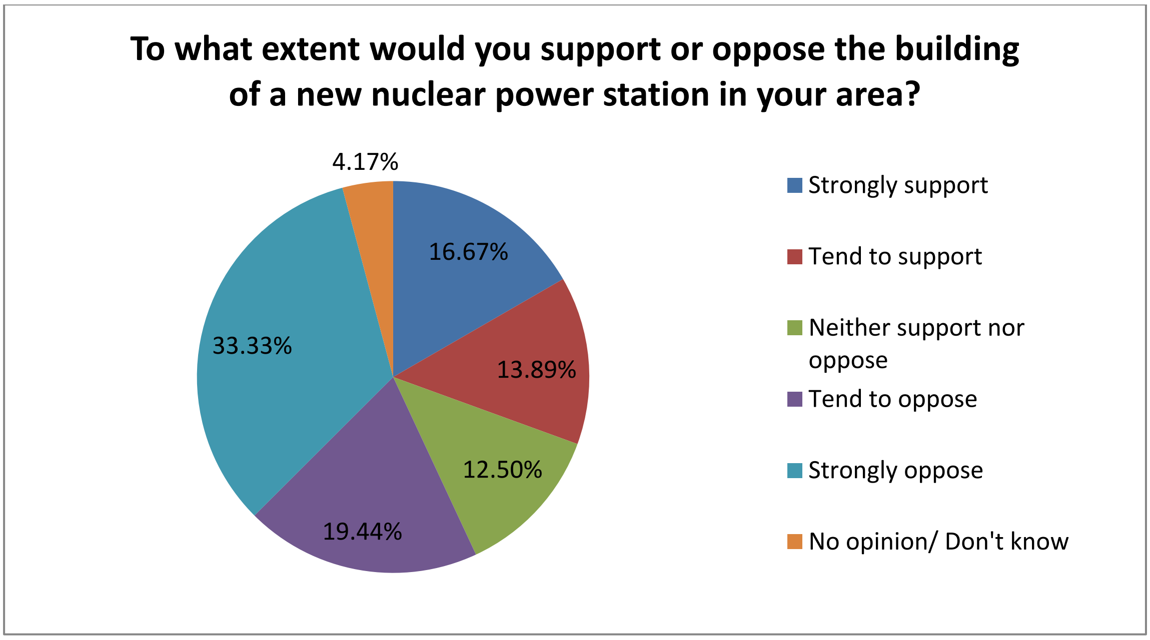

Figure 7 – Extent of participants support or opposition to the building of a new nuclear power station in their area

Figure 7 reveals that 33.33% of participants would strongly oppose the building of a new nuclear power station in their area and 19.44% would tend to oppose. Whereas 16.67% would strongly support and 13.89% would tend to support. Although opinions on nuclear power have been generally more positive than negative throughout this survey, Ramana (2011, 44) mentions that in polls participants tend to express less opposition to nuclear power in general than to a nuclear power station that would be constructed in their own area. One reason why many often oppose such facilities in their area is because there may be a feeling that no community should be subjected to the risks which such facilities bring (Ramana, 2011, 45). Furthermore, in the survey carried out by Spence *et al*. (2010, 16), when asked a similar question 39% of participants would oppose the building of a new nuclear power plant in their area.

4.10 Study Limitations

There were several limitations with this study which may have affected results. Firstly, public perception in this study was most dominated by participants aged 19 -29 and students as the greatest response was from these groups. Fewer retired people and older participants responded to the survey, one reason for this could be because the survey was distributed online which older people may not have access to. In order to gain a better representation of participants and a larger study sample alternative methods could have been used as mentioned in chapter 3. Another way of increasing sample size could have been to encourage more people to fill in the survey, informed more people about it and increased the amount of time the survey was available online. Interviews could have also been carried out with people in the nuclear industry and members of the public, however this may have been difficult to set up and there was limited time to do this research. Some changes to the questions in the survey could include asking about how the public view past nuclear accidents, waste management issues and locations of proposed new sites for new nuclear in the UK. One further change could have been on question 2 and could have allowed participants to choose more than one option as some statements could apply to more than one energy source.

4.11 Future Work

This study could be further developed by focusing on public perception of new nuclear power in a particular area of the UK or by comparing opinions in an area near a nuclear power station with opinions from an area not near a nuclear power station. Future work could be done in the form of a postal survey which may which may receive a higher response rate and would not exclude people who do not have access to the internet. In addition to this, future work could also include a focus on the opinions of different age groups or other demographics which may provide quite different results.

Chapter 5: Conclusions

The main findings from this study, as mentioned in chapter 4, reveal that public perceptions towards nuclear power tend to be very varied with no overall positive or negative response when all questions are put together. Renewable energy was most favoured with participants and non-renewable energy was viewed least favourably. One key finding of this study reveals that participants tend to accept the benefits of nuclear power whilst also admitting there are risks, with many participants agreeing the benefits outweigh the risks. However, when asked if new nuclear power stations should be built in the UK, the options of yes, no and don't know all received a similar number of responses. A further finding demonstrates that although many participants accept the benefits of nuclear power and indicated they may be in favour of nuclear new build, many would not want a nuclear power station near to their community.

Previous studies have also shown that public perception of nuclear power is constantly changing and is often divided. These studies have revealed that people are willing to accept the benefits whilst also accepting that there are risks associated with its use.

Some changes to the survey could have been such as allowing for time for results to be collected. Results may have also been different if the survey was distributed at a different time as the topic of new nuclear had been reported in the media at the time the study took place.

To conclude, although the results of this study are similar, public perception tends to be quite favourable towards the benefits nuclear power can bring such as employment and energy security. However, many participants question the uncertainty and risks associated with the use of nuclear power and tend to be more unfavourable towards new nuclear power plants being built in their area. Many members of the public tend to have so-called "NIMBY" attitudes towards major projects such as nuclear power plants.

The issue of new nuclear power in the UK is likely to remain in the minds of the public for many years to come as the UK government commits to the construction of new nuclear power plants. As with any large-scale infrastructure projects, public perception is of high importance and should always be taken into account.

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Appendix 1

Public Perception of New Nuclear Power in the UK

Page 1

1) In general how favourable or unfavourable are your opinions on the following energy sources when used to produce electricity? *

	Very favourable	Mainly favourable	Neither favourable nor unfavourable	Mainly unfavourable	Very unfavourable	Don't know/ No opinion
Oil	☐	☐	☐	☐	☐	☐
Gas	☐	☐	☐	☐	☐	☐
Coal	☐	☐	☐	☐	☐	☐
Nuclear	☐	☐	☐	☐	☐	☐
Solar	☐	☐	☐	☐	☐	☐
Wind	☐	☐	☐	☐	☐	☐
Tidal	☐	☐	☐	☐	☐	☐
Biomass	☐	☐	☐	☐	☐	☐
Energy from Waste (EfW)	☐	☐	☐	☐	☐	☐

2) In your opinion which statement is most relevant to each energy source? *

	Non-renewable (oil, gas, coal)	Renewable (wind, solar, tidal, biomass, energy from waste)	Nuclear	Unsure / Don't know
Causes air pollution	☐	☐	☐	☐
Contributes towards climate change	☐	☐	☐	☐
Creates hazardous waste	☐	☐	☐	☐
Is harmful to human health	☐	☐	☐	☐
Is inefficient	☐	☐	☐	☐
Spoils the landscape	☐	☐	☐	☐
Is inexpensive	☐	☐	☐	☐
Does not produce harmful emissions	☐	☐	☐	☐
Is safe to use	☐	☐	☐	☐

3) What is your opinion of nuclear power when used to produce electricity? *

- [ ] Very positive
- [ ] Fairly positive
- [ ] Neither positive nor negative
- [ ] Fairly negative
- [ ] Very negative
- [ ] No opinion/ Don't know

4) From what you know or what you have heard which of the following statements most closely represents your opinion on nuclear power? *

- [ ] The benefits outweigh the risks
- [ ] The benefits and risks are about the same
- [ ] The risks outweigh the benefits
- [ ] None of these
- [ ] No opinion/ Don't know

5) In your opinion should the UK build new nuclear power stations? *

- [ ] Yes
- [ ] No
- [ ] Don't know/ Unsure

Please give reasons for your choice:

6) Which of the following statements about nuclear power best describes your own opinion? *

- [ ] We should increase the number of nuclear power stations
- [ ] We should use existing nuclear power stations and replace them when they reach the end of their life
- [ ] We should use existing nuclear power stations but not replace them when they reach the end of their life
- [ ] We should shut down all current nuclear power stations and not replace them
- [ ] None of these
- [ ] No opinion/ Don't know

7) For each of the following statements about nuclear power in the UK please state to what extent you agree or disagree with each. *

	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree	No opinion/ Don't know
Nuclear power poses	☐	☐	☐	☐	☐	☐

a risk to people						
Nuclear power brings benefits to people in the UK	☐	☐	☐	☐	☐	☐
Nuclear power will help improve UK energy security	☐	☐	☐	☐	☐	☐
Nuclear power should be part of the future energy mix and not solely replied upon	☐	☐	☐	☐	☐	☐
There is a lack of trust towards the regulation of the nuclear industry	☐	☐	☐	☐	☐	☐
Nuclear power is needed as renewable energy sources cannot meet current and future energy demands	☐	☐	☐	☐	☐	☐
Nuclear power is often reported in a negative way by the media	☐	☐	☐	☐	☐	☐
Nuclear power plants are operated safely	☐	☐	☐	☐	☐	☐
Nuclear power will help limit climate change	☐	☐	☐	☐	☐	☐
Nuclear power plants are at risk from terrorist attacks	☐	☐	☐	☐	☐	☐
Other energy sources should be explored before using nuclear power	☐	☐	☐	☐	☐	☐

8) To what extent would you support or oppose the building of a new nuclear power station in your area? *

☐ Strongly support
☐ Tend to support
☐ Neither support nor oppose
☐ Tend to oppose
☐ Strongly oppose
☐ No opinion/ Don't know

9) What is your gender? *

- [ ] Male
- [ ] Female
- [ ] Rather not say

10) What is your age? *

- [ ] 18 or under
- [ ] 19 - 29
- [ ] 30 - 39
- [ ] 40 - 49
- [ ] 50 - 59
- [ ] 60+
- [ ] Rather not say

11) What is your current employment status? *

- [ ] Full time working
- [ ] Part time working
- [ ] Unemployed
- [ ] Retired
- [ ] Student
- [ ] Looking after home/children
- [ ] Other
- [ ] Rather not say

12) What is your highest level of education? *

- [ ] No formal qualifications
- [ ] GCSE/ O-Level
- [ ] Vocational qualification
- [ ] A-Level or equivalent
- [ ] Bachelor's degree
- [ ] Masters/ PhD
- [ ] Still in full time education
- [ ] Other
- [ ] Rather not say

13) Do you have any further comments relating to new nuclear power in the UK?

Appendix 2

Survey Results

1. In general how favourable or unfavourable are your opinions on the following energy sources when used to produce electricity?

	Very favourable	Mainly favourable	Neither favourable nor unfavourable	Mainly unfavourable	Very unfavourable	Don't know/ No opinion	Response Total
Oil	1.4% (1)	13.9% (10)	25.0% (18)	40.3% (29)	19.4% (14)	0.0% (0)	72
Gas	5.6% (4)	15.3% (11)	29.2% (21)	37.5% (27)	12.5% (9)	0.0% (0)	72
Coal	0.0% (0)	11.1% (8)	15.3% (11)	40.3% (29)	30.6% (22)	2.8% (2)	72
Nuclear	16.7% (12)	25.0% (18)	18.1% (13)	16.7% (12)	19.4% (14)	4.2% (3)	72
Solar	58.3% (42)	36.1% (26)	1.4% (1)	2.8% (2)	0.0% (0)	1.4% (1)	72
Wind	54.2% (39)	31.9% (23)	4.2% (3)	2.8% (2)	4.2% (3)	2.8% (2)	72
Tidal	59.7% (43)	26.4% (19)	9.7% (7)	1.4% (1)	0.0% (0)	2.8% (2)	72
Biomass	29.2% (21)	27.8% (20)	13.9% (10)	4.2% (3)	5.6% (4)	19.4% (14)	72
Energy from Waste (EfW)	40.3% (29)	31.9% (23)	16.7% (12)	1.4% (1)	0.0% (0)	9.7% (7)	72
						answered	72
						skipped	0

Matrix Charts

1.1. Oil			Percent	Total
1	Very favourable		1.39%	1
2	Mainly favourable		13.89%	10
3	Neither favourable nor unfavourable		25.00%	18
4	Mainly unfavourable		40.28%	29
5	Very unfavourable		19.44%	14
6	Don't know/ No opinion		0.00%	0
			answered	72

1.2. Gas			Percent	Total
1	Very favourable		5.56%	4

1.2. Gas			Percent	Total
2	Mainly favourable		15.28%	11
3	Neither favourable nor unfavourable		29.17%	21
4	Mainly unfavourable		37.50%	27
5	Very unfavourable		12.50%	9
6	Don't know/ No opinion		0.00%	0
			answered	72

1.3. Coal			Percent	Total
1	Very favourable		0.00%	0
2	Mainly favourable		11.11%	8
3	Neither favourable nor unfavourable		15.28%	11
4	Mainly unfavourable		40.28%	29
5	Very unfavourable		30.56%	22
6	Don't know/ No opinion		2.78%	2
			answered	72

1.4. Nuclear			Percent	Total
1	Very favourable		16.67%	12
2	Mainly favourable		25.00%	18
3	Neither favourable nor unfavourable		18.06%	13
4	Mainly unfavourable		16.67%	12
5	Very unfavourable		19.44%	14
6	Don't know/ No opinion		4.17%	3
			answered	72

1.5. Solar			Percent	Total
1	Very favourable		58.33%	42
2	Mainly favourable		36.11%	26
3	Neither favourable nor unfavourable		1.39%	1
4	Mainly unfavourable		2.78%	2
5	Very unfavourable		0.00%	0
6	Don't know/ No opinion		1.39%	1
			answered	72

1.6. Wind			Percent	Total
1	Very favourable		54.17%	39
2	Mainly favourable		31.94%	23

	1.6. Wind	Percent	Total
3	Neither favourable nor unfavourable	4.17%	3
4	Mainly unfavourable	2.78%	2
5	Very unfavourable	4.17%	3
6	Don't know/ No opinion	2.78%	2
		answered	72

	1.7. Tidal	Percent	Total
1	Very favourable	59.72%	43
2	Mainly favourable	26.39%	19
3	Neither favourable nor unfavourable	9.72%	7
4	Mainly unfavourable	1.39%	1
5	Very unfavourable	0.00%	0
6	Don't know/ No opinion	2.78%	2
		answered	72

	1.8. Biomass	Percent	Total
1	Very favourable	29.17%	21
2	Mainly favourable	27.78%	20
3	Neither favourable nor unfavourable	13.89%	10
4	Mainly unfavourable	4.17%	3
5	Very unfavourable	5.56%	4
6	Don't know/ No opinion	19.44%	14
		answered	72

	1.9. Energy from Waste (EfW)	Percent	Total
1	Very favourable	40.28%	29
2	Mainly favourable	31.94%	23
3	Neither favourable nor unfavourable	16.67%	12
4	Mainly unfavourable	1.39%	1
5	Very unfavourable	0.00%	0
6	Don't know/ No opinion	9.72%	7
		answered	72

2. In your opinion which statement is most relevant to each energy source?

	Non-renewable (oil, gas, coal)	Renewable (wind, solar, tidal, biomass, energy from waste)	Nuclear	Unsure / Don't know	Response Total
Causes air pollution	94.4% (68)	0.0% (0)	2.8% (2)	2.8% (2)	72
Contributes towards climate change	88.9% (64)	0.0% (0)	5.6% (4)	5.6% (4)	72
Creates hazardous waste	9.7% (7)	0.0% (0)	86.1% (62)	4.2% (3)	72
Is harmful to human health	40.3% (29)	0.0% (0)	51.4% (37)	8.3% (6)	72
Is inefficient	23.6% (17)	48.6% (35)	1.4% (1)	26.4% (19)	72
Spoils the landscape	27.8% (20)	41.7% (30)	16.7% (12)	13.9% (10)	72
Is inexpensive	18.1% (13)	43.1% (31)	12.5% (9)	26.4% (19)	72
Does not produce harmful emissions	1.4% (1)	86.1% (62)	4.2% (3)	8.3% (6)	72
Is safe to use	2.8% (2)	87.5% (63)	5.6% (4)	4.2% (3)	72
				answered	72
				skipped	0

Matrix Charts

2.1. Causes air pollution			**Percent**	**Total**
1	Non-renewable (oil, gas, coal)		94.44%	68
2	Renewable (wind, solar, tidal, biomass, energy from waste)		0.00%	0
3	Nuclear		2.78%	2
4	Unsure / Don't know		2.78%	2
			answered	72

2.2. Contributes towards climate change			**Percent**	**Total**
1	Non-renewable (oil, gas, coal)		88.89%	64
2	Renewable (wind, solar, tidal, biomass, energy from waste)		0.00%	0
3	Nuclear		5.56%	4
4	Unsure / Don't know		5.56%	4
			answered	72

	2.3. Creates hazardous waste		Percent	Total
1	Non-renewable (oil, gas, coal)		9.72%	7
2	Renewable (wind, solar, tidal, biomass, energy from waste)		0.00%	0
3	Nuclear		86.11%	62
4	Unsure / Don't know		4.17%	3
			answered	72

	2.4. Is harmful to human health		Percent	Total
1	Non-renewable (oil, gas, coal)		40.28%	29
2	Renewable (wind, solar, tidal, biomass, energy from waste)		0.00%	0
3	Nuclear		51.39%	37
4	Unsure / Don't know		8.33%	6
			answered	72

	2.5. Is inefficient		Percent	Total
1	Non-renewable (oil, gas, coal)		23.61%	17
2	Renewable (wind, solar, tidal, biomass, energy from waste)		48.61%	35
3	Nuclear		1.39%	1
4	Unsure / Don't know		26.39%	19
			answered	72

	2.6. Spoils the landscape		Percent	Total
1	Non-renewable (oil, gas, coal)		27.78%	20
2	Renewable (wind, solar, tidal, biomass, energy from waste)		41.67%	30
3	Nuclear		16.67%	12
4	Unsure / Don't know		13.89%	10
			answered	72

	2.7. Is inexpensive		Percent	Total
1	Non-renewable (oil, gas, coal)		18.06%	13
2	Renewable (wind, solar, tidal, biomass, energy from waste)		43.06%	31
3	Nuclear		12.50%	9
4	Unsure / Don't know		26.39%	19
			answered	72

2.8. Does not produce harmful emissions			Percent	Total
1	Non-renewable (oil, gas, coal)		1.39%	1
2	Renewable (wind, solar, tidal, biomass, energy from waste)		86.11%	62
3	Nuclear		4.17%	3
4	Unsure / Don't know		8.33%	6
			answered	72

2.9. Is safe to use			Percent	Total
1	Non-renewable (oil, gas, coal)		2.78%	2
2	Renewable (wind, solar, tidal, biomass, energy from waste)		87.50%	63
3	Nuclear		5.56%	4
4	Unsure / Don't know		4.17%	3
			answered	72

3. What is your opinion of nuclear power when used to produce electricity?

			Response Percent	Response Total
1	Very positive		18.06%	13
2	Fairly positive		26.39%	19
3	Neither positive nor negative		22.22%	16
4	Fairly negative		20.83%	15
5	Very negative		9.72%	7
6	No opinion/ Don't know		2.78%	2
			answered	72
			skipped	0

4. From what you know or what you have heard which of the following statements most closely represents your opinion on nuclear power?

			Response Percent	Response Total
1	The benefits outweigh the risks		45.83%	33
2	The benefits and risks are about the same		20.83%	15
3	The risks outweigh the benefits		25.00%	18
4	None of these		2.78%	2
5	No opinion/ Don't know		5.56%	4
			answered	72

4. From what you know or what you have heard which of the following statements most closely represents your opinion on nuclear power?

	Response Percent	Response Total
	skipped	0

5. In your opinion should the UK build new nuclear power stations?

			Response Percent	Response Total
1	Yes		33.33%	24
2	No		38.89%	28
3	Don't know/ Unsure		27.78%	20
			answered	72
			skipped	0

Answers for: Please give reasons for your choice: *53 answers*

1	19/02/13 9:58PM	nuclear power is the way forward. coal gas and oil will run out sooner or later and current tech in solar and wind energy are to expensive.
2	19/02/13 10:09PM	there is no other available source
3	20/02/13 7:32AM	closure of Coal Mines
4	20/02/13 7:55AM	If the country is already doing well with the nuclear power stations already in place, why do we need more? Especially if they are finding ways to use wind turbines etc. Just improve the nuclear power stations already in place, dont build more.
5	20/02/13 8:00AM	because we are running out of fossil fuels and must find a replacement and i believe nuclear is the best way forward because it gives good clean energy.
6	20/02/13 8:07AM	The only ways to maintain the UKs power requirements in the coming years will be to develop an efficient system for generating tidal power or to use nuclear. Currently we use nuclear fission, if nuclear fusion is developed within the coming years, this will certainly be the way forward.
7	20/02/13 8:38AM	stable, continual energy source and creation fo local jobs
8	20/02/13 8:47AM	I would like to see more investment in renewable sources
9	20/02/13 9:15AM	more harmful waste, air pollution, and is harmful to human health.
10	20/02/13 9:23AM	nuclear power is the way forward. coal gas and oil will run out sooner or later and current tech in solar and wind energy are to expensive.
11	20/02/13 10:36AM	We will run out of fossil fuels. Solar / Wind I believe unlikely to keep up with demand
12	20/02/13 1:07PM	Only if waste handled safley and no harm to environment or public
13	20/02/13 1:49PM	There are many issues surrounding disposal of nuclear waste - before new facilities are built there should be a strategy for the arising waste not only of generation waste but decommissioning. In my opinion we should not commit future generations to managing the nuclear clean up when we don't know how they can go about doing it. We have enough trouble with nuclear waste at present.

5. In your opinion should the UK build new nuclear power stations?

			Response Percent	Response Total
14	20/02/13 1:54PM	Due to the amount of waste produced currently by nuclear power stations I don't think it is a feasible option. In addition to that the limited amount of uranium and the amount of CO2 produced through mining, processing and transportation of the mineral make it fairly dirty in that respect, too. It is also potentially dangerous when in the wrong hands and can be used for dirty bombs and more advanced weaponry.		
15	20/02/13 1:50PM	Nuclear has the potential to be a renewable energy provided the right technology is used		
16	20/02/13 2:28PM	Unless nuclear power was proven to be 100% safe and without risk I wouldn't want to be living in a country with a nuclear power station - just look at Fukushima and Chernobyl		
17	20/02/13 7:05PM	Because we are rely too much on the current energy sources.		
18	20/02/13 7:07PM	It creates more energy security and would be mean less need for fossil fuels which are running out. Also nuclear is more efficient than wind and solar for the production of energy.		
19	21/02/13 6:45AM	Oil and gas are infinitve resources, solar and tidal are not yet sufficiently developed technologies, wind is intermiitent.		
20	21/02/13 7:47AM	where would they be put ?.		
21	21/02/13 7:53AM	Investment should be made in alternate technologies because of the legacy left by nuclear fuel		
22	21/02/13 10:26AM	The Half-Life is too long and the radioactive waste ruins the land.		
23	21/02/13 11:28AM	They should adapt more European methods and become more environmentally friendly.		
24	21/02/13 11:51AM	They can never be 100% safe, there's always going to be a risk to human health for the workers and the general public. Also there's a risk we could have a Chernobyl-like incident which would devastate a large area of Britain and cause a lot of human terror at the same time. We should be using our money to invest in renewable energy projects, I can see why people say it ruins the landscape, but wouldn't you rather a few hundred wind turbines to a baron, highly radioactive wasteland which is detrimental to human health?		
25	21/02/13 12:42PM	It's a head in the sand attidude to the long term safe energy solutions, the people that make the decisions today , Affect the lives of the people in the future, we can't go on burying radioactive waste forever , to what end ? total contamination of the planet ? We have to make the change now , before it's too late .		
26	21/02/13 2:44PM	if its for the right reason of energy		
27	21/02/13 4:51PM	I understand what a potentially brilliant source of enegry it could be, but don't know much about the disposal/storage of the waste		
28	21/02/13 4:53PM	Expensive, and a possible danger to people living nearby.		
29	21/02/13 8:31PM	Unsafe and expensive!		
30	21/02/13 8:43PM	We created a world on inefficient, polluting and dangerous energy practices through the oil, gas and coal extraction, mostly during a time when the consequences were speculated but for the most unknown. I believe nuclear falls into this category. The danger we are aware of is just the tip of the iceberg I believe. It deincentivises better alternatives. It used a lot of carbon in the construction and maintenance.		
31	21/02/13	Good way to generate electricity even though it has negative aspects as well such as it's		

5. In your opinion should the UK build new nuclear power stations?

			Response Percent	Response Total
	8:41PM	dangerous.		
32	21/02/13 8:51PM	I believe that there are risks in terms of health and pollution to the environment. However until renewable resources are able to maintain what is used by non-renewable resources nuclear may be the only option to carry on the same rate of energy use.		
33	21/02/13 9:03PM	A better way to deal with the waste products is needed before new power stations are built.		
34	21/02/13 9:22PM	more jobs, more efficient way of generating energy. But, very expensive to build, also takes a long time and can be a great risk to the environment as seen in the past with Chernobyl and Fukushima.		
35	21/02/13 9:49PM	They're dangerous, ugly, and are not a good long-term solution to energy shortage because we don't have a good enough way of getting rid of the hazardous waste that comes from them.		
36	21/02/13 9:50PM	We need an alternative fuel resource if we want to carry on, but renewable energy just doesn't cut it yet.		
37	21/02/13 10:19PM	There are other solutions such as biomass and heat capture systems that should be looked at		
38	22/02/13 2:59AM	We have no economically viable way of dealing with the waste in a a safe manner. also it is cheaper to deal with waste from non renewables such as coal. however nuclear is more able to deal with the energy needs of the country compared to ineffective renewables like wind farms		
39	22/02/13 10:25AM	Their are several positives that Nuclear Power will bring to the UK; Jobs, Low Carbon Electricity, Own Power Generation (Not relying on pipelines) and Expansion of the UK energy market. Although the positives seem to equal the same weight as the negatives such as; Production of nuclear waste, the danger of internal malfunctions (Windscale), will be a target for terrorists and will reduce the emphasis on renewable technologies.		
40	22/02/13 11:12AM	they are unsightly and create too much toxic waste		
41	22/02/13 11:34AM	Although there are benefits to nuclear it can have catostrophic effects on peoples health and lives if not managed in effectively. However if right measures are but in place i would have little objections.		
42	22/02/13 2:33PM	Should look into better more sustainable power options.		
43	22/02/13 2:49PM	Need a new energy source, which does not involve fossil fuels, such as the depleting North Sea reserves.		
44	22/02/13 2:46PM	therre is a looming energyrescource deficiency Nuclear energy is the best to fill this gap. also the more we work with nuclear power the more we learn about it and our control of it improves, hopefully to the ultimate solution of "Clean Nuclear Power" ,		
45	22/02/13 8:00PM	Wind generators spoil beautiful areas of rural countryside. The proposed sites for tidal power will drastically affect local wildlife. Neither source can ever provide sufficient power for our needs therefore we need a reliable permanent source of power.		
46	23/02/13 7:24AM	I can't see renewables providing all our needs and traditional sources are finite.		
47	24/02/13 11:02AM	Despite media propaganda, Nuclear energy is extremely safe, following the Chernobyl disaster, control rods are placed in the containment chamber along with the radioactive isotope of either uranium or plutonium, these rods absorb excess material that is caused by the fission reaction.		
48	24/02/13 1:00PM	increased costs and insecurity of imported gas and oil make nuclear more feasib le.		
49	24/02/13 5:22PM	time to go with the change, we need to stop holding on the what we know we are running out of and start making new plans NOW		

5. In your opinion should the UK build new nuclear power stations?

			Response Percent	Response Total
50	24/02/13 6:50PM	Although I am unsure as to its benefits or problems I do know that Sellafield (close to my home) is a massive employer which is a definite pro to building more stations. Also I happen to know someone who works for the company involved in the underground waste storage for the nuclear power station and he assures me that there are no harmful side effects.... So in that case I guess it could be argued that nuclear is potentially safer than the use of fossil fuels....		
51	25/02/13 8:00AM	There is no good solution to dealing with the waste.		
52	27/02/13 12:50PM	Too dangerous, where can the waste be put other than stuck in the ground? Where it will take an extremely long time until it becomes safe.		
53	28/02/13 1:42PM	dont know enough about it		

6. Which of the following statements about nuclear power best describes your own opinion?

		Response Percent	Response Total
1	We should increase the number of nuclear power stations	22.22%	16
2	We should use existing nuclear power stations and replace them when they reach the end of their life	26.39%	19
3	We should use existing nuclear power stations but not replace them when they reach the end of their life	33.33%	24
4	We should shut down all current nuclear power stations and not replace them	4.17%	3
5	None of these	4.17%	3
6	No opinion/ Don't know	9.72%	7
		answered	72
		skipped	0

7. For each of the following statements about nuclear power in the UK please state to what extent you agree or disagree with each.

	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree	No opinion/ Don't know	Response Total
Nuclear power poses a risk to people	23.6% (17)	34.7% (25)	19.4% (14)	15.3% (11)	2.8% (2)	4.2% (3)	72
Nuclear power brings benefits to people in the UK	26.4% (19)	48.6% (35)	12.5% (9)	2.8% (2)	4.2% (3)	5.6% (4)	72
Nuclear power will help improve UK energy security	26.4% (19)	43.1% (31)	16.7% (12)	4.2% (3)	1.4% (1)	8.3% (6)	72
Nuclear power should be part of	29.2%	44.4%	2.8%	13.9%	6.9%	2.8%	72

7. For each of the following statements about nuclear power in the UK please state to what extent you agree or disagree with each.	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree	No opinion/ Don't know	Response Total
the future energy mix and not solely replied upon	(21)	(32)	(2)	(10)	(5)	(2)	
There is a lack of trust towards the regulation of the nuclear industry	36.1% (26)	31.9% (23)	12.5% (9)	9.7% (7)	1.4% (1)	8.3% (6)	72
Nuclear power is needed as renewable energy sources cannot meet current and future energy demands	27.8% (20)	33.3% (24)	16.7% (12)	6.9% (5)	8.3% (6)	6.9% (5)	72
Nuclear power is often reported in a negative way by the media	36.1% (26)	45.8% (33)	8.3% (6)	2.8% (2)	2.8% (2)	4.2% (3)	72
Nuclear power plants are operated safely	29.2% (21)	29.2% (21)	29.2% (21)	0.0% (0)	2.8% (2)	9.7% (7)	72
Nuclear power will help limit climate change	12.5% (9)	22.2% (16)	30.6% (22)	18.1% (13)	6.9% (5)	9.7% (7)	72
Nuclear power plants are at risk from terrorist attacks	16.7% (12)	40.3% (29)	23.6% (17)	6.9% (5)	4.2% (3)	8.3% (6)	72
Other energy sources should be explored before using nuclear power	37.5% (27)	16.7% (12)	25.0% (18)	15.3% (11)	4.2% (3)	1.4% (1)	72
						answered	72
						skipped	0

Matrix Charts

	7.1. Nuclear power poses a risk to people	Percent	Total
1	Strongly agree	23.61%	17
2	Tend to agree	34.72%	25
3	Neither agree nor disagree	19.44%	14
4	Tend to disagree	15.28%	11
5	Strongly disagree	2.78%	2
6	No opinion/ Don't know	4.17%	3
		answered	72

	7.2. Nuclear power brings benefits to people in the UK	Percent	Total
1	Strongly agree	26.39%	19
2	Tend to agree	48.61%	35
3	Neither agree nor disagree	12.50%	9
4	Tend to disagree	2.78%	2

7.2. Nuclear power brings benefits to people in the UK			Percent	Total
5	Strongly disagree		4.17%	3
6	No opinion/ Don't know		5.56%	4
			answered	72

7.3. Nuclear power will help improve UK energy security			Percent	Total
1	Strongly agree		26.39%	19
2	Tend to agree		43.06%	31
3	Neither agree nor disagree		16.67%	12
4	Tend to disagree		4.17%	3
5	Strongly disagree		1.39%	1
6	No opinion/ Don't know		8.33%	6
			answered	72

7.4. Nuclear power should be part of the future energy mix and not solely replied upon			Percent	Total
1	Strongly agree		29.17%	21
2	Tend to agree		44.44%	32
3	Neither agree nor disagree		2.78%	2
4	Tend to disagree		13.89%	10
5	Strongly disagree		6.94%	5
6	No opinion/ Don't know		2.78%	2
			answered	72

7.5. There is a lack of trust towards the regulation of the nuclear industry			Percent	Total
1	Strongly agree		36.11%	26
2	Tend to agree		31.94%	23
3	Neither agree nor disagree		12.50%	9
4	Tend to disagree		9.72%	7
5	Strongly disagree		1.39%	1
6	No opinion/ Don't know		8.33%	6
			answered	72

7.6. Nuclear power is needed as renewable energy sources cannot meet current and future energy demands			Percent	Total
1	Strongly agree		27.78%	20
2	Tend to agree		33.33%	24
3	Neither agree nor disagree		16.67%	12
4	Tend to disagree		6.94%	5
5	Strongly disagree		8.33%	6

7.6. Nuclear power is needed as renewable energy sources cannot meet current and future energy demands			Percent	Total
6	No opinion/ Don't know		6.94%	5
			answered	72

7.7. Nuclear power is often reported in a negative way by the media			Percent	Total
1	Strongly agree		36.11%	26
2	Tend to agree		45.83%	33
3	Neither agree nor disagree		8.33%	6
4	Tend to disagree		2.78%	2
5	Strongly disagree		2.78%	2
6	No opinion/ Don't know		4.17%	3
			answered	72

7.8. Nuclear power plants are operated safely			Percent	Total
1	Strongly agree		29.17%	21
2	Tend to agree		29.17%	21
3	Neither agree nor disagree		29.17%	21
4	Tend to disagree		0.00%	0
5	Strongly disagree		2.78%	2
6	No opinion/ Don't know		9.72%	7
			answered	72

7.9. Nuclear power will help limit climate change			Percent	Total
1	Strongly agree		12.50%	9
2	Tend to agree		22.22%	16
3	Neither agree nor disagree		30.56%	22
4	Tend to disagree		18.06%	13
5	Strongly disagree		6.94%	5
6	No opinion/ Don't know		9.72%	7
			answered	72

7.10. Nuclear power plants are at risk from terrorist attacks			Percent	Total
1	Strongly agree		16.67%	12
2	Tend to agree		40.28%	29
3	Neither agree nor disagree		23.61%	17
4	Tend to disagree		6.94%	5
5	Strongly disagree		4.17%	3
6	No opinion/ Don't know		8.33%	6

7.10. Nuclear power plants are at risk from terrorist attacks	Percent	Total
	answered	72

7.11. Other energy sources should be explored before using nuclear power			Percent	Total
1	Strongly agree		37.50%	27
2	Tend to agree		16.67%	12
3	Neither agree nor disagree		25.00%	18
4	Tend to disagree		15.28%	11
5	Strongly disagree		4.17%	3
6	No opinion/ Don't know		1.39%	1
			answered	72

8. To what extent would you support or oppose the building of a new nuclear power station in your area?

			Response Percent	Response Total
1	Strongly support		16.67%	12
2	Tend to support		13.89%	10
3	Neither support nor oppose		12.50%	9
4	Tend to oppose		19.44%	14
5	Strongly oppose		33.33%	24
6	No opinion/ Don't know		4.17%	3
			answered	72
			skipped	0

9. What is your gender?

			Response Percent	Response Total
1	Male		41.67%	30
2	Female		56.94%	41
3	Rather not say		1.39%	1
			answered	72
			skipped	0

10. What is your age?

			Response Percent	Response Total
1	18 or under		4.17%	3

10. What is your age?

			Response Percent	Response Total
2	19 - 29		58.33%	42
3	30 - 39		11.11%	8
4	40 - 49		12.50%	9
5	50 - 59		5.56%	4
6	60+		6.94%	5
7	Rather not say		1.39%	1
			answered	72
			skipped	0

11. What is your current employment status?

			Response Percent	Response Total
1	Full time working		38.89%	28
2	Part time working		5.56%	4
3	Unemployed		0.00%	0
4	Retired		4.17%	3
5	Student		48.61%	35
6	Looking after home/children		0.00%	0
7	Other		1.39%	1
8	Rather not say		1.39%	1
			answered	72
			skipped	0

12. What is your highest level of education?

			Response Percent	Response Total
1	No formal qualifications		0.00%	0
2	GCSE/ O-Level		9.72%	7
3	Vocational qualification		5.56%	4
4	A-Level or equivalent		43.06%	31
5	Bachelor's degree		20.83%	15
6	Masters/ PhD		1.39%	1
7	Still in full time education		11.11%	8
8	Other		6.94%	5
9	Rather not say		1.39%	1

12. What is your highest level of education?

	Response Percent	Response Total
	answered	72
	skipped	0

13. Do you have any further comments relating to new nuclear power in the UK?

		Response Percent	Response Total
1	Open-Ended Question	100.00%	14

1	20/02/13 9:58AM	I have a Chemistry background, therefore understand, to a certain degree, the positives of Nuclear power, however, I would suggest most people do not understand and the word NUCLEAR immediately conjurers up a very high risk, dangerous fatal product which puts people off.
2	20/02/13 10:36AM	I don't particularly want it after Fukushima etc. I see it as the only real viable option for future energy demands however.
3	20/02/13 1:07PM	Something needs to change, but unsure if nuclear power is the only answer
4	20/02/13 2:28PM	Nope~
5	20/02/13 7:05PM	I believe Nuclear power and tidal power should be increased together in the UK, with less dependence on other energy sources. Good luck Mackerel! JP
6	21/02/13 7:47AM	we are running out of traditional sources of energy, nuclear power will have to be considered in the future, like it or not.
7	21/02/13 11:51AM	Green energy is the way forward!
8	21/02/13 8:51PM	N/A
9	21/02/13 9:22PM	no further comments
10	21/02/13 9:49PM	I think because the process of producing nuclear energy holds such high risks to it's surrounding environment, and we don't have a good enough solution to disposing of it's harmful waste, it should only be a temporary solution using only the existing power plants while we focus our money and research into building constructions that harness renewable energy.
11	21/02/13 9:50PM	Don't dump the waste in areas of natural importance.
12	22/02/13 2:59AM	Renewables are ineffective, nuclear has to be well protected and regulated, non renewables are the most cost effective without too much risk to environment overall, especially with carbon capture equipment.
13	22/02/13 10:25AM	No
14	24/02/13 11:02AM	The reason for people being opposed to nuclear power is because they don't understand how isotopes work, control rods work and don't understand nuclear reactions (Fission/Fusion)

	answered	14

13. Do you have any further comments relating to new nuclear power in the UK?		
	Response Percent	**Response Total**
	skipped	58

Appendix 3

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 and the University Ethical Principles for Teaching, Research, Knowledge Transfer, Consultancy and Related Activities. 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 and sensitive data properly

Refer to the relevant documents from the following links:

1. Ethical Principles for Research, Consultancy, Practical Work and Related Activities
2. Research Governance (Multiple documents)
3. Health, Safety & Environment (Multiple documents)

1 Project synopsis Approver: Cmte number:

1.1 Title	Public perception of proposed new nuclear sites in the UK.									
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 research will investigate the views of the public in relation to the UK government's proposed new nuclear sites. A survey will be undertaken both online and in public in order to discover the public's views.									
1.4 Dates	Start: June 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	Project Supervisor: Mike Clark Principle Investigator: Anna Mack
2.2 Co-workers: names and positions [eg student]	N/A

3 External collaborators

3.1 List external collaborating bodies

N/A

3.2 Provide evidence of any ethical approvals obtained [or needed] by external collaborators

N/A

3.3 Indicate whether confidentiality agreements have been or will be completed

N/A

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] 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.

A) Does the activity involve field work or travel to unfamiliar places? If Yes: 1. Does the activity involve field work or leaving the campus [eg overseas]? 2. Does the field work involve a 'party' of participants or lone working ? 3. Does the activity involve children visiting from schools?	A) No 1. No 2. No 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; Uclan contact 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	B) Yes 1. No 2. No

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]	3. No
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)?	4. No
5. Is there a potential risk arising from the project of physical, social, emotional or psychological harm to the researchers or participants?	5. No
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?	6. No
7. Will deception of the participant be necessary during the activity?	7. No
8. Does the activity (e.g. art) aim to shock or offend?	8. No
9. Will the activity involve invasion of privacy or access to confidential information about people without their permission?	9. No
10. Does the activity involve medical research with humans, clinical trials or use human tissue samples or body fluids?	10. No
11. Does the activity involve excavation and study of human remains?	11. No
C) Does the activity involve animals and other forms of life? If Yes:	C) No
1. Does the activity involve scientific procedures being applied to a vertebrate animal (other than humans) or an octopus?	1. No
2. Does the activity involve work with micro-organisms?	2. No
3. Does the activity involve genetic modification?	3. No
4. Does the activity involve collection of rare plants?	4. No
D) Does the activity involve data about human subjects? If Yes:	D) Yes
1. After using the data protection compliance checklist, have you any data protection requirements?	1. No
2. After answering the data protection security processing questions, have you any security requirements? [Data storage] [keep raw data for 5 years]	2. No
E) Does the activity involve hazardous substances? If Yes:	E) No
1. Does the activity involve substances injurious to human or animal health or to the environment? Substances must be disposed properly.	1. No
2. Does the activity involve igniting, exploding, heating or freezing substances?	2. No
F) Other activities:	F)
1. Does the activity relate to military equipment, weapons or the Defence Industry?	1. No
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?	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] 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]:

B – see risk assessment D – Qualitative aspects of the research will be undertaken with the requirements of the Data Protection and Freedom of Information Acts. The research will not rely on audio, video, photographic or any other recording medium and participants will not be identified from their responses. Informed consent will be sought from all participants in accordance with the guidelines set out in the UCLan: Ethical Principles for teaching, research, consultancy, knowledge transfer and related activities

Health, Safety and Environment Section

RISK ASSESSMENT FORM

University of Central Lancashire

Risk Assessment For	Assessment Undertaken By	Assessment Reviewed
Service / Faculty / Dept: SBNE	**Name:** Anna Mack	**Name:**
Location of Activity: Online	**Date:** June 2012 – September 2012	**Date:**
Activity: Survey of members of the public on views on nuclear power **REF:** surv1	**Signed by Head of Dept / equivalent** KRB [signature] **Date** 8/5/12	

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
B) Online security	**Anna Mack Participants**	Ensure that no personal information is asked or revealed in the survey, such as contact details for the participants.		**Low**
D) Data Protection/ Consent Issues	**Participants**	The research will not rely on audio video, photographic or any other recording medium and participants will not be identified from the responses they give. Informed consent will be sought from all participants in accordance with the guidelines set out in the UCLan: Ethical Principles for teaching, research consultancy, knowledge transfer and related activities. The research will be undertaken in line with the requirements of the Data Protection and Freedom of Information Acts.		**Low**