

## Case Study

# Fracking in Austria and the UK: a comparative study

Alexander Lang  
*Institute for Advanced Studies Vienna*

Contact: Alexander Lang: [lang@ihs.ac.at](mailto:lang@ihs.ac.at)

Preparation date: May 2014

Document version: final

## Introduction

Hydraulic fracturing for the purpose of shale gas production<sup>1</sup> has been a global topic for several years now. Whereas a shale gas industry has been established in the USA, unconventional gas production is still in the exploration phase in Europe. European states handle this issue in diverse ways, ranging from prohibition (France) to promotion (Poland, United Kingdom). Only recently, in January 2014, the European Commission released a Recommendation (EC 2014) on “minimum principles for shale gas” (EC 2014a).

In Austria, shale gas exploration activities came to an end in 2012 after an Environmental Impact Assessment (EIA) was made mandatory by law for hydraulic fracturing following public and political protests. Subsequently, the oil and gas company OMV abandoned their plan of developing a new, supposedly clean fracking method and implementing it in Austria due to

---

<sup>1</sup> Fracking is not only used for shale gas production but for unconventional gas production (coalbed methane, tight gas) in general. The discourse in Austria and the UK is mainly about shale gas. The report at hand will therefore refer to “shale gas” instead of “unconventional gas”.

cost reasons. The OMV linked this decision to the Amendment of the EIA act. In the UK, the government continues to push the development of a shale gas industry despite of public protests. Government and proponents deem the regulations in place as sufficient to safeguard the integrity of the environment and the health of residents and workers.

The case of fracking is about a technology<sup>2</sup> that is introduced in a public setting and that has been the cause of controversy. Fracking has potential impacts both at a local (environmental pollution, job creation, etc.) and global level (greenhouse gas (GHG) emissions, economic competition, etc.). In the UK and in Austria, the contestation of fracking started from a local perspective (negative impacts on homeland/living environment) but participating actors also introduced global aspects. Fracking is subjected to a range of existing regulations for oil and gas production in general, especially regarding safety of operations and environmental protection. However, whether or not these are sufficient and effective for the specifics of fracking and shale gas production is disputed. Besides the nature of the technology (old vs. new) and its regulation, the validity and range of the knowledge base in regards to its mode of operation and impacts is at issue.

The study at hand examines the processes surrounding fracking and shale gas development in the UK. It covers similar areas as the Res-AGorA case study on fracking in Austria (Lang 2014) – i.e. the actor landscape, the framing of the issue, existing RRI governance arrangements and the de-facto governance of fracking – and provides a comparative perspective on the issue.

## Fracking in the UK

In the UK, fracking has been used “for non-shale gas applications” for three decades (RS/RAE 2012: 17) but it is only in recent years and in the wake of technological developments and the subsequent US shale gas boom that fracking has come onto the political agenda in the UK as a means of producing shale gas (Selley 2012: 108-109). Cuadrilla Resources Ltd. was the first company to apply fracking in the search for shale gas in April and May 2011, causing earthquakes (1.5 M<sub>L</sub>, 2.3 M<sub>L</sub>) in the Blackpool area (RS/RAE 2012: 17-18; Green et al. 2012). This led to a suspension of operations by the Department of Energy & Climate Change (DECC) (The Guardian 01.06.2011), which in December 2012 was lifted with reference to scientific assessments and the implementation of a monitoring scheme (Davey 2012; DECC 2013a).

In February 2013, the United Kingdom Onshore Operators Group (UKOOG) published guidelines for the exploration and appraisal phase of unconventional gas production operations

---

<sup>2</sup> Depending on the perspective, it can be assessed as either new or as old. The mechanism (creating rock fractures by high pressure injection of liquid) has been used for several decades but the way of implementing this technology has changed over time (higher volumes, combination of different technologies/techniques, etc.). The question of whether it is a new or old technology is one important aspect of the public discussion.

including fracking (UKOOG 2013). And in March 2013, a new Office of Unconventional Oil and Gas (OUGO) was established as part of the DECC<sup>3</sup>.

In June 2013, the UKOOG published a “Community Engagement Charter” for unconventional oil and gas operations. Besides compliance with best practice guidelines and regulations, risk management, environmental protection and community and stakeholder engagement, financial benefits for local communities were determined – 100,000 GBP for local communities when operations start and one percent of revenue from production.

But public concerns persisted and grew. Protests against fracking and oil and gas companies reached their (preliminary) peak in August 2013, when thousands of protesters demonstrated against fracking nationwide and at Cuadrilla’s Balcombe drilling site (The Guardian 19.08.2013; The Telegraph 19.08.2013). Protest against fracking in Balcombe and the surrounding media coverage were seen as a sign for a “shift in public awareness” of the issue (The Guardian 19.08.2013a). Nonetheless, the government continued to speak out in favor of fracking and the shale gas industry and to reassure their support (The Guardian 05.08.2013, 12.08.2013, 14.01.2014; The Telegraph 11.08.2013, 02.10.2013; Osborn 2013).

Between October 2012 and January 2014, Cuadrilla abandoned plans for several drilling sites in the UK for a number of reasons (wintering birds, inappropriate geological conditions or other technical issues), some of which were questioned by opponents (BBC News 04.10.2013; BBC News 17.12.2013 Refracton 2013; The Guardian 23.01.2014). But in February 2014, Cuadrilla announced their intention, to apply for permission for fracking at two sites in Roseacre Wood and Preston New Road, Lancashire (The Telegraph 04.02.2014; The Guardian 04.02.2014).

In January 2014, David Cameron announced that local councils could keep 100% of business rates from fracking operations on top of other financial incentives, such as 1% of revenue from gas production and 100,000 GBP for initial well drilling (The Telegraph 12.01.2014; The Independent 08.01.2014). Opponents of fracking depict these financial incentives as “bribes” to local councils and expressed concern that decision makers might neglect environmental and health risks of fracking operations and shale gas production as a result of these (The Independent 13.01.2014).

In February 2014, fracking opponents started to form legal blockades against shale gas explorations. They have been trying to convince landowners to deny permission for horizontally drilling underneath their land, thereby blocking shale gas exploration and production (Greenpeace UK web).

As of spring 2014, public debate around fracking and shale gas are ongoing, i. a. about change in legislation that would allow companies to drill underground even without permission of

---

<sup>3</sup> Its objectives are to “promote the safe, responsible and environmentally sound recovery of the UK’s unconventional reserve of gas and oil” (DECC 2013: 5) and to help the industry” by providing “a single point of contact” and by ensuring “a simplified and streamlined regulatory process (DECC 2012a: 57).

property owners (The Daily Mail 01.04.2014), environmental concerns (The Independent 13.03.2014), but also in regards to the crisis in the Ukraine and the dispute with Russia that (re-)evoked demands for greater independence from foreign oil and gas (The Guardian 26.03.2014; The Independent 25.03.2014). The consultation on the Strategic Environmental Assessment (SEA) report on the onshore oil and gas licensing in the UK (AMEC 2013) closed at the end of March 2014 (DECC 2013d). There has been a public consultation on an EIA scoping report ordered by Cuadrilla and community consultations are ongoing (ARUP/Cuadrilla 2014)). Furthermore, the tabloid *The Sun* is conducting a pro-fracking campaign by offering an online and print form to be sent to David Cameron (The Sun 26.03.2014).

## Actor Landscape

There are several actor groups involved in the discussions and activities around fracking and shale gas development in the UK. On the one side, there are clear proponents of producing unconventional gas by conducting fracking. Although they acknowledge certain risks and insecurities related to fracking, they assess these as manageable and come out in favor of the implementation of fracking and the development of a shale gas industry in the UK. Besides the oil and gas companies themselves (Cuadrilla Resources Ltd., IGas, Total, etc.), the Federal Government is the major supporter of shale gas development in the UK. This is a noticeable difference to Austria, where the Federal Government took an intermediate position.

On the other side, there are clear opponents of fracking. They reject fracking and shale gas in general for different reasons and based on different assumptions. These include environmental organizations (Greenpeace UK, Friends of the Earth UK), think tanks (Green Alliance), local and national citizen groups (Frack-Off UK; Frack Free Greater Manchester/ Llantrisant/ Isle of Wight/...) and political parties (Green Party UK).

Between these positions, there are actors that are more cautious than the proponents but not categorically refusing the possibility of using fracking for unconventional gas production. In some cases – e.g. local politicians – it is hard to assess whether their expressed concerns are authentic or strategic so as to maximize revenue. Furthermore, these *undecided* include organizations that have to take a non-partisan or non-normative standpoint due to their constitution (e.g. scientific societies, research organizations) – although their alleged neutrality is also questioned by other actors.

The role of the media is also noteworthy. In the UK, the media landscape is much more divided on the issue and more polarizing in its narratives. In Austria, although there are normative tendencies in the coverage of the topic by different newspapers, the narratives are much more balanced and homogeneous.

## Proponents of Fracking

The UK government<sup>4</sup> has taken several steps to support shale gas developments in the UK. On the one hand, they are trying to make investments in UK shale gas more attractive for companies by adapting a new tax regime in favor of the industry, that should "support the early development of onshore oil and gas projects" (HM Revenue & Customs 2013) including shale gas (The Telegraph 05.12.2013). Furthermore, they want to simplify planning and application procedures by developing planning guidance (DECC 2013). For this purpose, they also established the OUGO (DECC 2013a: 7). On the other, they are supporting the companies' activities by seeking public acceptance for fracking operations, e.g. by appointing community incentives but also by publicly promoting their energy strategy that includes shale gas.

Several oil and gas companies are planning to engage in the UK for unconventional gas and oil and some are already active, including *Island Gas Energy* (IGas; The Telegraph 12.09.2013). And in January 2014, the first major oil and gas company *Total* announced that it would become active in the UK's shale gas developments by cooperating with other companies – *Dart Energy*, IGas, *Egdon Resources*, and *Ecorp*<sup>5</sup> (Financial Times 10.01.2014). But at the moment, the "one big player" (The Guardian 12.03.2013) in the UK's unconventional gas industry remains *Cuadrilla Resources Ltd.* Until now (April 2014), Cuadrilla has been the only company to conduct fracking in exploration operations for shale gas. *Lord Browne*, i.a. Member of the House of Lords, former CEO of British Petroleum (BP) and between 2006 and 2011 president of the Royal Academy of Engineering (RAE), is chairman of Cuadrilla<sup>6</sup>. Cuadrilla repeatedly attracted media attention, because of earthquakes that followed fracking operations (The Daily Mail 01.06.2011), trespassing on private land (Guardian 02.08.2013), and protests against its operations (i.a. The Guardian 23.09.2013).

There are other organizations that are supportive of fracking and shale gas developments in the UK. For example, the Institute of Directors, a business association, speaks out in favor of fracking, because of its alleged economic benefits, also addressed in their self-commissioned report about "Britain's shale gas potential" (Lewis et al. 2012).

## Opponents of Fracking

There are several environmental groups campaigning against fracking and shale gas developments in the UK including Friends of the Earth (FOE) and Greenpeace. In 2013, fracking was

---

<sup>4</sup> As of April 2014, the UK government consists of a coalition formed by the Conservative Party (Prime Minister: David Cameron) and the Liberal Democrat Party (Deputy Prime Minister: Nick Clegg). This coalition is in place (with some changes in personal) since 2010.

<sup>5</sup> Ecorp is holding an exploration license in the UK's Midlands.

<sup>6</sup> <http://www.parliament.uk/biographies/lords/lord-browne-of-madingley/2172>

one of the most prominent campaign topics of FOE<sup>7</sup>. FOE campaigns against fracking and shale gas in the UK by informing citizens and policy makers, monitoring developments around the country, with legal interventions, political lobbying and by supporting local groups that oppose fracking, e.g. by giving advice on how to start campaigns against fracking with guidelines (FOE 2013a) and “anti-fracking” training workshops (FOE 2014). Greenpeace employs similar means as FOE (e.g. informing, petitioning<sup>8</sup>, etc.) and also arranges political actions, such as putting up fake drilling rigs for fracking (Greenpeace UK 2013a) or occupying the constituency office of George Osborne as a fake fracking company (Greenpeace UK 2013). Greenpeace also started the *wrongmove* campaign with the objective of forming a legal blockade against shale gas operations. Greenpeace tries to get as many landowners as possible to refuse permission for horizontal drilling to take place underneath their land, thus making it impossible for companies to operate (Kahya 2014; Greenpeace UK web). As of 10 April 2014, 44,479 people are supporting wrongmove.

But not only existing environmental groups are protesting against fracking. Several grassroots anti-fracking groups have emerged in the last years and a nationwide campaigning network – *Frack-off* (web) – was founded. These anti-fracking groups are active in several ways. They conduct and support public protest events, physically block drilling sites or access roads (e.g. in Barton Moss<sup>9</sup>), voice their opinion on the Internet and in the media, make inquiries to political bodies, and respond to public consultations (e.g. Frackfreetameside (web) on the DECCs’ SEA (AMEC 2013)). Furthermore, they gather information on shale gas operations throughout the UK, research and highlight different issues related to fracking (e.g. questioning scientific assessments of fracking), and provide information to the public (i.a. Frack-off web; Refractation web).

Besides NGOs and grassroots groups, there are also politicians who protest against fracking and shale gas developments in the UK. The Green Party facilitates political pressure on government authorities (i.a. Environment Agency (EA), DECC), e.g. they put the issue on the agenda in parliament (Parliament UK 2013) and made FOI requests regarding communication between the government and oil and gas companies (DECC 2013c). Green MP Caroline Lucas was also amongst the protesters in Balcombe who were arrested by the police (The Daily Mail 19.08.2013).

---

<sup>7</sup> 24 documents were tagged with “fracking”. The category with the highest number of tags was “climate change”, which also contains documents on shale gas and fracking.

<sup>8</sup> Greenpeace is hosting an online petition against fracking directed at David Cameron that received over 140,000 signatures yet. <https://secure.greenpeace.org.uk/page/s/frack-free-uk>; accessed 10 April 2014

<sup>9</sup> <http://frack-off.org.uk/barton-moss-latest-news/>; accessed 12 April 2014.

## **In-Betweens and Undecided**

Other than opponents, the “in-betweens” and “undecided” do not in general reject fracking. But they also stronger emphasize the conditions that have to be fulfilled before fracking is conducted than proponents of fracking.

The Labour Party is not against fracking in general, but they link specific demands to its implementation like guarantees for safety and the protection of the environment (BBC 13.12.2012). Furthermore, they demand higher profit participation for the local councils (Parliament UK 2014: 980-981); this demand is also backed by some conservative politicians (The Telegraph 15.08.2013, 15.01.2014).

The National Environment Research Council (NERC) is funding research into shale gas and fracking because, according to its director of science, “oil and gas are inevitably going to provide strong elements of our energy future for some years to come” (quote from Sarchet 2013). The NERC proceeds from the government’s pro-fracking energy strategy and wants to positive-ly contribute to the “inevitable” course of events by making fracking operations more respon-sible, but it also wants to push innovation and produces skilled workers for industry.

Organizations conducting assessments of fracking and shale gas in the UK can be seen as rele-vant actors in the debate. They deliver the scientific basis for argumentation in favor or against fracking and make recommendations themselves. Whereas some of them are cautiously sup-portive of fracking (RS/RAE 2012), stating that risks are manageable by best practice, strong regulation and continuous monitoring, others are more reluctant (RSPB 2014) and want proof that regulation is effective. The latter state that “further independent evidence” (ibid. 4) is necessary before making a decision for or against fracking.

## **The media**

Looking at the media, both in Austria and the UK, one difference is obvious. Whereas in the UK, there are clearly pro- and anti-fracking media, news reports are more differentiated in Austria.

In Austria, proponents and opponents of fracking are present in the media and there are single newspaper comments that take a stance. However, there were no straightforward pro or anti fracking campaigns. Most often, reports give a rather sober account of the debate and inci-dents around fracking and give voice to proponents as well as opponents of fracking. This as-sessment is not shared by opponents who see a clear agenda of “keeping the topic alive” in the media and thus as a remaining future possibility.

In the UK, different newspapers tend to adopt the side of proponents or of opponents of frack-ing in their coverage of fracking. The narrative of several media can be seen as being pro-fracking. In the case of the tabloid *The Sun*, a part of Rupert Murdoch’s News Corporation, this

attitude is not only obvious in that it is in favor of fracking in its coverage, which depicts anti-fracking groups in a negative light, but also in the fact that *The Sun* launched a pro-fracking petition, titled “Frack to the Future” (The Sun 26.03.2014). The stance of other conservative newspapers, such as *The Daily Mail* or *The Times*, can be described as “more sympathetic towards fracking”; they “are constructing positive social representations of the practice of fracking” (Jaspal/Nerlich 2014: 358). For example, the Daily Mail directly attacked fracking opponents by describing them as “Green zealots” using “dirty tricks” to stop fracking and thus obstructing the “energy revolution”. At the same time, they provide room for fracking proponents, such as David Davis, who was Tory shadow home secretary (The Daily Mail 30.06.2013).

The pro-fracking attitude and the support of fracking in the UK by certain media is a target of criticism. For example, opponents depict the Sun’s pro-fracking campaign as propaganda using *astrourfing* – that is “the practice of building up a fake grass roots movement” – as a means for political agitation (Frack Free Fernhurst 2014).

Counterparts to the fracking supportive position taken by *The Sun*, *The Daily Mail* and *The Times* can also be found in the media landscape. In articles published by *The Guardian* and *The Independent* “fracking is widely represented as posing a threat to the environment and to ‘climate change’” (Jaspal/Nerlich 2014: 358).

Without suggesting a clear causality between the mass media discourse and the public contestation of fracking, the assumption that the media discourse not only mirrors but also affects public controversies to a certain degree seems to be legitimate. Furthermore, the media themselves, the way they frame and deal with a topic, can become an object of controversy as is evident in both the Austrian and the UK fracking case. Depending on the structure of the media landscape and the characteristics of its actors, the influence on contestation and controversy might differ. In order to manage contestation, a RRI governance framework has to consider the specifics of the media landscape in a national/international context and actively addresses the media discourse or certain elements of it. However, further research is necessary.

## **Framing of Fracking and shale gas**

The framings of fracking and shale gas by various actors are similar to those in Austria. In favor of fracking, (1) the economic benefits of shale gas production, (2) its contribution to energy security from fossil fuels, (3) the reduction of greenhouse gas (GHG) emissions and, thus, (4) the role of shale gas as a bridge energy are highlighted. David Cameron also depicts fracking as a necessary innovation for the UK to remain a progressive and future oriented country<sup>10</sup> (The

---

<sup>10</sup> “For centuries, Britain has led the way in technological endeavour: an industrial revolution ahead of its time, many of the most vital scientific discoveries known to mankind, and a spirit of enterprise and innovation that has served us well down the decades. Fracking is part of this tradition, so let’s seize it.”

Telegraph 11.08.2013). Fracking is not only constructed as a means of energy production but also as a means of preserving a certain national identity that lies in technological progressiveness as well as in manufacturing and industrial production. Cameron is talking about “re-shoring” – i.e. the reversal of offshoring and the return of companies that have gone to the east, where prices are lower –; he believes that the re-shoring has to be supported also through the development of the shale gas industry (Cameron 2014).

As downsides of fracking, (1) potential environmental risks, (2) the destruction of the landscape, (3) negative economic impacts on tourism and agriculture, but also in regards to property value, (4) overall higher GHG emissions, and (5) the delay of energy transition as part of a false energy strategy are emphasized. Due to the specific history of fracking in the UK, the danger of earthquakes is a more prevalent topic than in Austria but as is the case in Austria, opponents foster the image of fracking as a destructive force that destroys landscape. The anti-fracking network Frack-Off, describes fracking as an “extreme” form of energy extraction that is more intrusive and inflicts greater damage to the natural environment. In this regard, fracking is depicted as a symptom of a much greater systemic problem – “destruction is being driven by man-made social systems that demand never-ending growth on a finite planet”<sup>11</sup> – that also finds expression in a false energy strategy; “drilling more fossil fuels, such as shale gas, is the wrong direction for UK energy policy” (FOE 2013).

As is the case in Austria, proponents and opponents do not completely negate the considerations of the other side. For example, proponents of shale gas development acknowledge the potential risks deriving from fracking, but they depict them as manageable. For them, the regulation of operations is sufficient and effective for the time being – given the scientific knowledge base and experiences in regards to fracking. Proponents also state that legislation will adapt according to insights gained from conducting fracking for shale gas extraction.

Another issue that is used as an argument in favor of fracking is that it is an old and commonly used technology. Proponents state that there is wide experience with fracking, that environmental and other risks are low and that it is overall beneficial (The Daily Mail 18.08.2013). In citing these experiences with fracking, they often refer to the fracking of vertical wells for conventional gas production. Opponents criticize the view that fracking is an old technology and state that fracking a horizontal well, using high volumes of fluids and multi-well drilling pads, is “a relatively novel technology, whose risks should be assessed as such” (FOE 2013b: 1).

The assessment of scientific evidence and of knowledge about fracking is itself a contested topic and one major aspect in regards to the framing of fracking.

---

<sup>11</sup> [frack-off.org.uk/fracking-hell/climate-chaos](http://frack-off.org.uk/fracking-hell/climate-chaos); accessed 14 April 2014.

## Governance of Fracking in the UK

In the UK, there are several governance arrangements in place that apply to fracking and shale gas. Some of them are hard law<sup>12</sup>, others are soft law, such as best practice guidelines<sup>13</sup> that are not legally binding.

Operators have to obtain a Petroleum Exploration and Development License (PEDL) from the DECC. Furthermore, they have to gain several other permissions from the Minerals planning authority (MPA), the Environment Agency (EA), the Health and Safety Executive (HSE), and, in some cases, from the Coal Authority. They also have to inform the British Geological Survey (BGS) about some aspects of their activities and in certain cases Natural England (DECC 2013).

Safety of operations and protection of the environment can be identified as major objectives underlying most of the regulations in place. On the basis of the respective piece of legislation, the competent authority has to assess the proposals submitted by companies and to monitor the compliance of the subsequent operations with the permission. Proposals and plans, as delivered by the operating company, are reviewed by the respective authority (MPA, EA, and HSE). The actual conduct of operations, including compliance with best practice (well construction and integrity, monitoring, etc.), are monitored by an independent well examiner that is appointed by the company and are reviewed by the HSE (DECC 2013b; HSE web). There is also a working agreement between the EA and the HSE on “inspecting new exploratory shale gas explorations” (EA/HSE 2012).

The UK’s approach to regulating fracking is oriented towards the outcome of operations that have to be *ALARP* – “as low as reasonably practicable” (DECC 2013: 7). This also includes the consideration of the economy of certain operations that might reduce the environmental impact of operations<sup>14</sup>. There are few legal requirements on how operations have to be carried out, but there are references to best practice guidelines by the industry (i. a. UKOOG 2013, 2013a).

At the moment, regulatory efforts by the government are focused on the exploratory stage of shale gas production. It is stated, that new regulations or changes will be made according to the experiences with fracking and the companies conducting it, and in line with new evidence on the size of unconventional gas resources in the UK, the extent of gas production, and its actual effects in terms of environmental impacts, methane emissions, etc. (Davey 2012).

---

<sup>12</sup> i.a. the Environment Act 1995, the Petroleum Act 1998, the Town and Country Planning (Environmental Impact Assessment) Regulations 2011, the Environmental Permitting Regulations 2010, the Borehole Sites and Operations Regulations 1995, the Mining Industry Act 1926, the Water Resources Act 1991, the Energy Act 1976, etc.

<sup>13</sup> UKOOG Onshore Shale Gas Well Guidelines, UKOOG Community Engagement Charter, DCLG Planning Practice Guidelines, etc.

<sup>14</sup> For example, Edward Davey (2012) from the DECC stated that “flaring of methane” has to be “reduced to the economic minimum”.

Unlike in Austria after the 2012 Amendment of the EIA-Act, in the UK, an EIA for fracking or shale gas operations is not mandatory in every case. Exploratory operations including drilling and fracking only fall under Schedule 2 developments to the Town and Country Planning (Environmental Impact Assessment) Regulations 2011, if they exceed certain threshold or are being conducted in a sensitive area. Then the local planning authority has to perform a screening and has to decide, whether or not an EIA is required. Production of unconventional gas and oil might fall under Schedule 1 developments at certain production volumes. If so, an EIA is required in every case.

The UKOOG (2013, 2013a) published a guideline for onshore shale gas wells that was worked out in cooperation with the DECC, HSE and EA. It contains best practice recommendations that are not legally binding, but is also referring back to obligatory legal regulations and other industry standards.

## **Pushing or Dodging: the role of the government**

There are differences between the Austrian and UK governments' approaches towards fracking and shale gas development.

In Austria, the government tried to find a consensus between proponents and opponents by making an EIA mandatory for all fracking operations. Now, impacts of operations have to be assessed and different stakeholders are given a voice in the planning and permission process, while the possibility to conduct fracking is not off the table altogether. Thereby, the government postponed the final decision on whether or not fracking should be allowed to a later point in time; the government *dodged* the issue. Without the backing of the government and confronted with new requirements, the OMV abandoned its plans for shale gas development in Austria using new clean fracking approach they were developing together with an Austrian University.

In the UK, on the other hand, the government is *pushing* fracking and shale gas production with different means and trying to maintain the regulatory status quo at an international level rather than allowing it to become stricter. The UK government depicts shale gas as an integral necessity in their energy strategy, whereas in Austrian politics, the notion of an energy transition towards a renewable energy system is more prevalent. Furthermore, in regards to gas, the diversification of sources from abroad is at the center of the debate in Austria.

Although the government has a bad reputation among opponents of fracking in both cases, the Austrian government was able to calm the debate and implement an instrument (EIA) that has the potential to make prospective implementation processes of fracking more responsible in terms of actor inclusion and transparency, among other areas. In the UK, on the other hand, the government's actions have been heating the controversy. Furthermore, regulations are maintained or even loosened (e.g. trespassing law). Personal links and possible conflicts of

interest are further aspects that have caused suspicion among fracking opponents (The Independent 14.07.2013)

## **De-facto governance: well doing?**

In the case of fracking in the UK, several factors can be identified that have the potential to contribute to the “well-doing” of the governance of fracking in terms of responsabilisation and managing contestation. Following, the robustness of the knowledge base, the trust in existing regulation and their implementation, the EIA as one specific governance instrument, and the means of profit participation (financial incentives) are analyzed in regards to their outcome.

## **A solid knowledge base?**

In Austria, little information is publically available on shale gas or fracking. If there were any assessments of or reports on issues related to fracking, they would not have to be published because in Austria, official secrecy has constitutional status (B-VG Art.20 Nr. 3&4). This is criticized because it creates a lack of transparency of processes and decisions. Furthermore, documents, such as reports commissioned by governmental bodies, are not always publicly available. As is the case in the UK, opponents of fracking criticize large parts of existing reports, that deal with fracking in general rather than with the specifics of Austria, and assessments as positively biased towards fracking.

Compared to Austria, there is a lot of information about different aspects of fracking and shale gas available in the UK. Two main reasons for this difference can be identified. (1) There is a greater need for information on different aspects of fracking and shale gas because of the government push for shale gas and the stronger engagement of companies over a longer time period in the UK. (2) In the UK, a Freedom of Information Act (FOI) (2000) exists, that makes it possible to raise information requests to public authorities and that makes it mandatory for public authorities to implement a proactive publication scheme for documents and reports (Art. 19-20). Therefore, reports and assessments about shale gas and fracking that have been conducted or commissioned by public authorities also have to be published. On the basis of FOI legislation, media and opponents of fracking also demanded information about otherwise enclosed interaction between members of the oil and gas industry and the government. Opponents used these information as point of reference for critique on the government’s pro-fracking attitude and provisions (The Guardian 17.01.2014; Kahya 2013).

Several reports and assessments are available from different organizations such as the RS and RAE (2012), the RSPB (Moore et al. 2014; RSPB 2014), or the Institute of Directors (Taylor et al.

2012), and from public authorities like the EA (2013), the DECC (Andrews 2013<sup>15</sup>), or Public Health England (PHE) (Kibble et al. 2013). Reports are either concerned with particular issues regarding fracking, like its effects on human health or the possibility of earthquakes, or try to give a more comprehensive assessment on environmental effects.

In the UK case, regarding the underlying knowledge base proponents and opponents of fracking point to different scientific assessments or question the data basis and the validity of information used by the other side. Opponents negate claims made by proponents of fracking and also question studies that cautiously speak out in favor of fracking and shale gas production (i.a. FOE 2013b).

The report on “Getting Shale Gas Working” by the Institute of Directors (Taylor et al. 2012) was sponsored by Cuadrilla (ibid. 5). This fact and the “wildly optimistic forecast” for economic benefits of shale gas caused criticism (Greenpeace UK 2013c). There is also distrust in the often cited study by the prestigious RS/RAE (2012), because Lord Browne was the president of the RAE between 2006 and 2011, is the chairman of Cuadrilla and has had other affiliations with oil and gas industry (e.g. BP). The RAE also receives funding from different oil and gas companies (RAE 2013). Opponents link these circumstances with an allegedly positive bias of the report in favor of fracking – that assesses the risks imposed by fracking as manageable<sup>16</sup>.

Furthermore, the data used in the assessment of the risks and benefits of fracking and shale gas is often regarded with suspicion, because data is often provided by oil and gas companies themselves and not independently verified. And even though a lack of data on several issues is admitted by the authors, some reports take up a rather permissive position on behalf of fracking. Opponents of fracking have a degrading term that they use to refer to the direct or indirect funding of scientific research into risks and benefits of fracking by the oil and gas industry or other related businesses’: *Frackademia*; researchers are labeled as *Frackademics*<sup>17</sup>.

Also beyond the question of neutrality of organizations and data, different issues in reports on fracking are highlighted as problematic. One crucial aspect for opponents (Refracktion 2013a; The Guardian 29.06.2012; Frack Free Chew Valley 2013) is the narrow scope of risk assessments that disregards some problems posed by fracking and shale gas. For example, the RS/RAE’s (2012) and the PHE’s reports do not consider the impacts of fracking and shale gas developments on climate change.

These and other concerns are also voiced by members of organizations that are publishing studies on fracking. Employees of Public Health England criticize their organizations report (Kibble et al. 2013) for “the exclusion of climate change from the analysis of the health impacts

---

<sup>15</sup> Conducted by the British Geological Survey.

<sup>16</sup> <http://frack-off.org.uk/fracking-report-ex-president-is-cuadrilla-ceo/>;  
<http://www.refracktion.com/index.php/tag/the-royal-society/>; accessed 4 April 2014.

<sup>17</sup> <http://www.sourcewatch.org/index.php/Frackademia>; accessed 21 April 2014; <http://frack-off.org.uk/frackademicals-in-uk-are-pushing-industry-spin/>; accessed 20 April 2014.

of fracking”, because this “limited analysis give out harmful messages that can be easily misinterpreted”. Furthermore, they also question the independence of PHE in general because of its political links (Tillmann et al. 2014).

Opponents of fracking not only criticize the existing knowledge base itself, but also how decision makers deal with the available information. They highlight the selective reception and use of information and the lack of far reaching political decisions drawn from it (Davey 2014; Hill 2013; Tootill 2013: 155ff.)

Besides existing studies, future research on fracking and shale gas is being conducted. The NERC is funding a Centre for Doctoral Training (CDT) on oil and gas, including shale gas and fracking with 2.8 million GBP. Besides conducting research, one objective of the NERC CDT in oil and gas is to produce a “highly skilled workforce” and thus to “equip the industry with the skills needed to reduce the environmental impact of oil and gas extraction” (NERC 2013a). The CDT is co-funded by universities and companies (Sarchet 2013). Beyond that, the NERC is also funding a research consortium on fracking (ReFINE web) and individual projects that “will help the industry use environmental science to accelerate economic growth while at the same time ensuring responsible environmental management” (NERC 2013a); an “oil and gas innovation funding call” closed on 8 May 2014 (NERC 2014). In February 2014, the NERC also signed a Memorandum of Understanding with oil and gas company Shell (NERC 2014a). The NERC’s funding of oil and gas projects and the CDT is criticized, because money is spent for fossil fuel rather than renewable energy technologies (Bell 2013; The Guardian 07.02.2014).

Especially opponents from the local population (citizen groups) assess the existing knowledge base as too limited and compare their situation to a laboratory, where a new technology with unknown effects and impacts is tested on animals: “we are guinea-pigs in a dangerous experiment being promoted by the government.” (FFBRA 2014: 1)<sup>18</sup>

## **Safety regulations: Lack of control?**

As shown, there are several safety regulations concerning fracking and the production of unconventional gas in place. Proponents of fracking and shale gas assess these existing regulations as sufficient and effective for protecting the environment, workers and citizens from any potential danger deriving from operations. The notion that the UK “has a strong regulatory regime” for fracking, but that there is nonetheless the will to “continuously improve it” (DECC web) is recurring in variation and in superlative: “We have the strongest environmental controls in this country, nothing would go ahead if there were environmental dangers” (David Cameron – The Guardian 13.01.2014).

---

<sup>18</sup> This image is also made use of by activists in Austria.

But the present regulatory regime and the government's approach of changing it ex post are under critique due to several reasons: (1) Critics state that there is a lack of factual control, because (a) governmental bodies in charge are underequipped, both in terms of personal and of technical skills to adequately monitor and control drilling and fracking operations, (b) monitoring is done to a large extent by the operating companies themselves or by firms commissioned and paid by them, and (c) data and information sent to authorities are not verified by an independent authority (Moore et al. 2014: 45-46; RSPB 2014: 19, 22-23; Hill 2013; EA 2013a; Investigating Balcombe and Cuadrilla 2013; FFBR 2014). "There's no enforcement, no verification" and nothing is there but the "individual operators morality" (Hill 2013: 8). Also the RS and RAE (2012: 56) point to "increasing capacity" for the regulation of the shale gas industry.

(2) The government's outcome based approach – they determine what to achieve, but not how to do it – by itself is criticized. Thus, certain best practices (e.g. testing of casing integrity) might not be implemented (Hill 2013: 9; Moore et al. 2014: 46).

(3) Regulation often refers to best practice guidelines by the industry (UKOOG), but these are not clear and lack of details on different technical issues. (Hill 2013: 8)

In the "planning practice guidelines for onshore oil and gas" which should help local councils in decision making on shale gas developments, the Department for Communities and Local Government (DCLG) outlines that "minerals planning authorities should give great weight to the benefits of minerals extraction, including to the economy, when determining planning applications" (DCLG 2013: 15) and also, that they "should not [...] consider alternative to [...] oil and gas resources when determining planning applications" (ibid.). The guidelines have been criticized as having a positive bias towards shale gas developments and fracking, following the governments supporting stance for shale gas (Planning Resource 26.06.2013).

Furthermore, the knowledge base and regulation of fracking are linked in the debate; opponents of fracking regularly criticize that policy makers do not incorporate all available (trusted) scientific evidence into decision-making and accuse them of being selective so as to support the governments' political agenda.

## **Environmental Impact Assessment (EIA)**

The EIA is contested in a similar way as safety regulations in general.

Whereas in Austria an EIA for fracking is mandatory in every case since the 2012 amendment of the EIA Act, in the UK, an EIA is only necessary under certain circumstances.

In October 2013, the European Parliament passed<sup>19</sup> a proposal to make EIA mandatory for fracking by issuing an Amendment to the EIA Directive (EP 2013). However, in the end, the EC issued a non-binding recommendation (EC 2014). According to leaked documents, this turn is linked to lobbying by shale gas proponents – i.a. by David Cameron and other UK officials – who feared that a binding Amendment of the EIA Directive would have had negative effects on the shale gas industry in the UK (The Telegraph 15.12.2013, 13.01.2014; The Guardian 14.01.2014a). The EC itself justified their decision for a Recommendation instead of a Directive by time pressure. They argue, that a Recommendation “has the advantage of being applied faster, while providing a reference for action at national level”. Furthermore, they state that they will issue binding legislation, if necessary, after assessing if and how member states have adopted national legislation and practice to the Recommendation (EC 2014a).

Despite the fact that there is no explicit obligation to conduct an EIA for fracking operations in every case but only if operations exceed certain thresholds, Cuadrilla appointed ARUP, a consultancy company, to conduct EIA for drilling sites in Roseacre Wood and Preston New Road, Lancashire. In early 2014, they published first results from the EIA for the Roseacre Wood site, where Cuadrilla wants to use fracking and run a public consultation on it (ARUP/Cuadrilla 2014). Despite these efforts, there is distrust in Cuadrilla and ARUP because of past incidents (The Guardian 04.02.2014).

Opponents of fracking are ambivalent towards EIA as a regulatory means of dealing with fracking and shale gas production. An EIA for fracking operations is not enough for them; they demand a total ban of fracking. However, as Keith Taylor from the Green Party UK put it, “in the meantime, requiring a full environmental impact assessment on every shale gas or oil project is an important safeguard” (Keith Taylor MEP 2013). Opponents of fracking see EIAs as “a bare minimum regulatory requirement” (Refracktion web) and necessary to get baseline data on operations and offering possibility for participation. This is also outlined in a petition created by a member of a local anti-fracking group<sup>20</sup>.

The debate over whether or not it is possible to conduct fracking and shale gas production in a safe and environmental friendly manner also crosses the discussion about the necessity of an EIA. Although the positions of proponents and opponents appear to be irreconcilable when it comes to the question of the manageability of risks, both groups partially accept EIAs as a means of regulating fracking operations. However, in the end, the well-doing of an EIA, in terms of managing contestation, depends on the extent of trust in the authority or organization that conducts the EIA and how it is realized.

Time will tell whether different stakeholders will accept the EIA that is conducted by Cuadrilla and ARUP once it is finished and published in the course of 2014.

---

<sup>19</sup> 332 to 311 votes, 14 abstentions. UK members of the Conservatives and Reformists Group as well as members of the Freedom and Democracy Group voted against the proposal.

<sup>20</sup> <http://epetitions.direct.gov.uk/petitions/58326>; accessed 10 May 2014.

## Financial incentives

Private land and mineral rights ownership is often highlighted as one factor that contributes to the development of a shale gas industry and as one reason for the shale gas boom in the US (Wang and Krupnick 2013). In the UK, mineral rights are state property. However, as outlined above, in the UK, the government and the involved companies offer financial incentives to local councils and communities if fracking operations and shale gas production are conducted. But this strategy to heighten acceptance of communities and landowners affected by fracking operations does not play out well.

The “in-betweens” in regards to fracking regard the profit participation scheme presented by the government and companies as insufficient. However, they do not reject the financial incentives or fracking in general but demand a bigger share of profits deriving from shale gas production; they demand 10% instead of 1% (BBC 14.01.2014).

Opponents of fracking meet these financial offers with refusal. The financial incentives are depicted as a bribe to local councils to permit fracking operations because in times of financial scarcity communities do not have many options to increase their income and to finance their needs. There are worries that, due to the fact that local councils often suffer from limited resources, local councils may be pressured into neglecting possible environmental risks and health concerns linked to fracking. Furthermore, in the long term, fracking and shale gas production is seen as a loss-making business. According to critics, fracking operations will only yield profits in the short term, most of which goes to the companies involved. However, after shale gas production ends, communities are left with the costs deriving from environmental pollution and the necessary preservation of abandoned wells: “short term boom, long term bust...” (Frack-Off 2013: 2).

With the financial incentives, the core of contestation is not addressed, thus the conflict remains. For opponents of fracking, the integrity of the (immediate) environment and the landscape has a higher priority than (uncertain) financial profit. Beyond that, this approach of the government and companies rather fuels the distrust in the safety of operations, because the financial contributions are interpreted as compensations for negative impacts of operations.

## Conclusions and Lessons

The process of introducing and debating fracking in the UK is still ongoing. Therefore, the effectiveness and “well-doing” of certain governance arrangements or instruments might in the end play out differently as depicted here.

The conflict over fracking arises from (1) different assessments of the technology at hand (safe/unsafe; old/new), of the current situation (sufficient/insufficient regulation; affirmative and robust/alerting and deficient knowledge base), and of future developments, (2) but also from different normative orientations (economy/environment) and priorities (local/national economy).

The introduced elements of de-facto governance are not doing-well, because they fail to address these underlying differences in an adequate way. Some of them rather fuel the controversy, by incorporating certain flaws that are already criticized. Financial incentives do not react to the opponents’ dominant framings of environmental pollution or health risks, but breaks the issue down to its economic aspect. Furthermore, with these measures only a part of fracking opponents are – not effectively – addressed (local councils and communities), others (environmental groups) are rather alienated. Further research into mechanics and impacts of fracking, even though addressing critical questions, is neither well-doing, because the critique (lack of scientific independence), that they are financed by oil and gas companies or conducted by persons with links to the industry, is ignored.

From the analysis of both the Austrian and the UK fracking case, several lessons can be drawn for the Res-AGorA project and RRI governance in general:

- In contrast to Austria, much more country specific data and reports about fracking and shale gas are publicly available in the UK. However, due to several reasons, opponents of fracking distrust and contest this corpus of knowledge. They do not consider these reports and studies as impartial evidence, because of personal and financial links between the researchers/organizations that produced these reports (“*Frackademia*”) and the oil and gas industry. *A Responsible Research and Innovation (RRI) governance framework has to ensure, that there is an accepted knowledge base in order to manage contestation. The neutrality of researchers and research organizations is crucial for the acceptance of produced knowledge. Thus, independent funding of research – i.e. by a trusted body that is not serving particular interest (of the industry, the government, etc.) – is required. One problem in this regard is that in some fields – e.g. geosciences or mining – personal and financial links between industry and research are common, even at universities.*
- Furthermore, there is a substantial critique of available assessments. Different studies on fracking and shale gas are seen as selective in their scope, using deficient data, and leaping to premature conclusions. Thus, *assessments of a technology and its impacts*

*should have a broad focus that is discussed and aligned with involved and affected stakeholders to ensure that these are broadly accepted.*

- Although proponents of fracking in the UK claim, that regulation is sufficient and effective – and in fact, there is regulation applicable to fracking and shale gas regulations – opponents call for stricter regulation or often demand a ban. A major point of critique is targeted at the lack of monitoring and control on compliance of operators with statutory provisions by public authorities. There is little trust in the de-facto governance process, because in the opponents’ view operators can “mark their own homework” (Greenpeace UK 2013b). *It is crucial that there are control mechanisms in place that ensure the independent verification of the information that is supplied by operating companies. Therefore, as several actors point out, sufficient financial means as well as qualified inspectors for supervisory bodies are necessary.*
- *An Environmental Impact Assessment (EIA) is an established governance arrangement that could be applied to certain types of innovation such as fracking. Although all actors do not regard the EIA as sufficient, it is accepted to a certain extent. However, it is crucial to facilitate and maintain trust in the EIA process. Therefore, the independence of the commissioned authority as well as transparency and inclusiveness (at an early stage) of the process are important.*
- In Austria, the government took up an intermediate position between proponents and opponents of fracking. In contrast, government in the UK pushes shale gas development and fracking. Although the Austrian governments’ position was criticized by fracking opponents, it cooled down the conflict, whereas the lack of a powerful intermediary actor in the UK fuels the debate and aggravates the controversy. Similar as in regards to research and monitoring/control, *an independent, mediating instance (such as a government) that has agency in policy-making might be a way of dealing with contested matters due to different normative positions.*
- The role of the media landscape in structuring public debate should not be underestimated alas. Other than in Austria, in the UK different newspaper advocate rather clear certain agendas, like the Sun with its pro-fracking petition or The Daily Mail with negative reports about anti-fracking activists, and others represent a rather critical position on fracking (e.g. The Guardian). *An RRI governance arrangement has to consider the role of the media landscape and its possible influences (e.g. on deliberative processes), which may differ depending on the context, and directly address the way various actors in the media landscape deal with RRI issues.*
- Although the dimension “locality vs globality” in the Res-AGorA “situation paper” (Edler et al. 2014) can be understood as a continuum, *it might be beneficial to explicate the “mid-range” level (state/country level) to categorize certain situations in which RRI (or non-RRI) takes place because several impacts, such as the increase in tax*

*revenues or lower energy prices, are effective at this level. Furthermore, “nation” or “state” is an important point of reference for different actors in the discourse.*

- Another “substantive dimension” (Edler et al. 2014) could be “time” or “timing”. On the one hand, different actors consider different timeframes in their assessments. For example, proponents of fracking claim that shale gas industry will create jobs in the region, but they will exist only for several months to years (short-term-estimation). Opponents highlight the negative effects on employment by looking at other branches of the economy (agriculture, tourism) with long term perspectives (“sustainability”, long-term-estimation). On the other hand, the temporality of effects/impacts of research or innovation might differ according to the techno-scientific domain/technology when assessed analytically by an “outside” perspective.

## Literature and Sources

- AMEC Environment & Infrastructure UK Limited (AMEC 2013): Strategic Environmental Assessment for Further Onshore Oil and Gas Licensing. Report for the Department of Energy & Climate Change. [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/273997/DECC\\_SEA\\_Environmental\\_Report.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/273997/DECC_SEA_Environmental_Report.pdf); accessed 1 April 2014.
- Andrews, I.J. (2013): The carboniferous Bowland Shale gas study: geology and resource estimation. British Geological Survey for Department of Energy and Climate Change, London.
- ARUP/Cuadrilla (2014): Emerging Findings of the Environmental Impact Assessment. Roseacre Wood. <http://www.cuadrillaresources.com/wp-content/uploads/2013/02/Emerging-Findings-of-the-Environmental-Impact-Assessment-Roseacre-Wood.pdf>; accesses 1 May 2014.
- Bell, Alice (2013): Should public money be used to fund PhDs in fracking? Or why science funding matters. <http://www.greenpeace.org.uk/newsdesk/energy/analysis/should-public-money-be-used-fund-phds-fracking-or-why-science-funding-matters>; accessed 1 March 2014.
- Bundes-Verfassungsgesetz (B-VG). BGBl. Nr. 1/1930 (WV) idF BGBl. I Nr. 194/1999. Date of version: 14.05.2014.
- Cameron, David (2014): Speech at the World Economic Forum (Davos) 2014. <https://www.gov.uk/government/speeches/world-economic-forum-davos-2014-speech-by-david-cameron--2>; accessed 21 April 2014.
- Davey, Brian (2014): getting real about regulation – why it won't make fracking safe. The Foundation for the Economics of Sustainability. <http://www.feasta.org/2014/02/11/getting-real-about-regulation-why-it-wont-make-fracking-safe/>; accessed 1 April 2014.
- Davey, Edward (2012): Written Ministerial Statement by Edward Davey: Exploration for shale gas. <https://www.gov.uk/government/speeches/written-ministerial-statement-by-edward-davey-exploration-for-shale-gas>; accessed 1 March 2013.
- Department for Communities and Local Government (DCLG 2013): Planning practice guidance for onshore oil and gas. [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/224238/Planning\\_practice\\_guidance\\_for\\_onshore\\_oil\\_and\\_gas.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/224238/Planning_practice_guidance_for_onshore_oil_and_gas.pdf); accessed 01 March 2014.
- Department of Energy & Climate Change (DECC web): Developing shale gas and oil in the UK – Providing regulation and licensing of energy industries and infrastructure- <https://www.gov.uk/government/policies/providing-regulation-and-licensing-of-energy-industries-and-infrastructure/supporting-pages/developing-shale-gas-and-oil-in-the-uk>; accessed 1 March 2014.
- Department of Energy & Climate Change (DECC 2012): The Unconventional Hydrocarbon Resources of Britain's Onshore Basins – Shale Gas.

- [https://www.og.decc.gov.uk/UKpromote/onshore\\_paper/UK\\_onshore\\_shalegas.pdf](https://www.og.decc.gov.uk/UKpromote/onshore_paper/UK_onshore_shalegas.pdf);  
accessed 1 March 2014.
- Department of Energy & Climate Change (DECC 2012a): Gas Generation Strategy. Presented to Parliament by the Secretary of State for Energy and Climate Change by Command of Her Majesty. December 2012. [http://www.decc.gov.uk/en/content/cms/meeting\\_energy/oil\\_gas/gasgenstrat/gasgenstrat.aspx](http://www.decc.gov.uk/en/content/cms/meeting_energy/oil_gas/gasgenstrat/gasgenstrat.aspx); accessed 1 April 2014.
- Department of Energy & Climate Change (DECC 2013): Onshore oil and gas exploration in the UK: regulation and best practice. [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/265988/Onshore\\_UK\\_oil\\_and\\_gas\\_exploration\\_England\\_Dec13\\_contents.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/265988/Onshore_UK_oil_and_gas_exploration_England_Dec13_contents.pdf); accessed 1 March 2014.
- Department of Energy & Climate Change (DECC 2013a): Traffic light monitoring system. [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/270676/DECC\\_infographic\\_Traffic-light-system\\_finaldec13.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/270676/DECC_infographic_Traffic-light-system_finaldec13.pdf); accessed 1 March 2014.
- Department of Energy & Climate Change (DECC 2013b): About shale gas and hydraulic fracturing (fracking). <https://www.gov.uk/oil-and-gas-onshore-exploration-and-production>; accessed 15 February 2014.
- Department of Energy & Climate Change (DECC 2013c): Request for Information under the Environmental Information Regulations 2004 and Freedom of Information Act 2000. 13/0367.
- Department of Energy & Climate Change (DECC 2013d): Consultation on the Environmental Report for further onshore oil and gas licensing. Published 17 December 2013. <https://econsultation.decc.gov.uk/decc-policy/consultation-env-report-further-oil-gas-licensing/>; accessed 2 April 2014.
- Edler, Jakob; Randles, Sally; Gee, Sally; Kuhlmann, Stefan; Walhout, Bart (2014): Governance Situations and Challenges. Conceptualising variety to underpin a socio-normative RRI governance framework. Res-AGorA Deliverable D2.3. [http://res-agera.eu/assets/Res-AGorA\\_del\\_2.3.pdf](http://res-agera.eu/assets/Res-AGorA_del_2.3.pdf); accessed 1 May 2015.
- Environment Agency (EA 2013): Onshore oil and gas exploratory operations: technical guidance. <https://consult.environment-agency.gov.uk/file/2582905>; accessed 1 April 2014.
- Environment Agency (EA 2013a): Onshore oil and gas exploratory operations: technical guidance. A summary of consultation responses. <https://consult.environment-agency.gov.uk/file/2810925>; accessed 1 April 2014.
- Environment Agency; Health and Safety Executive (EA/HSE 2012): Working together to regulate unconventional oil and gas developments.
- European Commission (EC 2014): Commission Recommendation of 22 January 2014 on minimum principles for the exploration and production of hydrocarbons (such as shale gas) using high-volume hydraulic fracturing. 2014/70/EU.
- European Commission (EC 2014a): Environment: European Commission recommends minimum principles for shale gas. Brussels. Press Release, Brussels, 22 January 2014. [http://europa.eu/rapid/press-release\\_IP-14-55\\_en.htm](http://europa.eu/rapid/press-release_IP-14-55_en.htm); accessed 23 January 2014.

- European Commission (EC 2014b): Questions and answers on the shale gas initiative. Memo, 22 January 2014, Brussels. [http://europa.eu/rapid/press-release\\_MEMO-14-42\\_de.htm](http://europa.eu/rapid/press-release_MEMO-14-42_de.htm); accessed 1 May 2014.
- European Parliament (EP 2013): Shale gas: new fracking projects must pass environmental test. Plenary sessions 09.10.2013. Press release. <http://www.europarl.europa.eu/news/en/news-room/content/20131004IPR21541/html/Shale-gas-new-fracking-projects-must-pass-environmental-test>; accessed 1 May 2014.
- Frack Free Balcombe Residents Association (FFBRA 2014): Community Evidence to the Lords Select Committee on the Economic Impact on UK Energy Policy of Shale Gas and Oil. Balcombe, January 21st, 2014. <http://www.frackfreebalcombe.co.uk/page7.php>; accessed 1 April 2014
- Frack Free Chew Valley (2013): Science, Fracking & the Royal Society. <http://frackfreecv.wordpress.com/2013/07/05/science-fracking-the-royal-society/>; accessed 20 April 2014.
- Frack Free Fernhurst (2014): Fracking, The Sun, Lobbying, Fernhurst, and...Astroturfing? 6 April 2014. <http://www.frackfreefernhurst.com/news/2014/4/6/fracking-lobbying-fernhurst-andastro-turfing>; accessed 10 May 2014.
- Frackfreetameside (web): DECC Consultation Reply-Urgent. <http://frackfreetameside.wordpress.com/decc-consultation-reply-urgent/>; accessed 11 April 2014.
- Frack-Off (2013): Briefing Sheet. UK Extreme Energy, July 2013. <http://frack-off.org.uk/wordpress/wp-content/uploads/2013/08/ExtremeEnergyBriefingAug2013e.pdf>; accessed 1 May 2014.
- Frack-off (web): Extreme Energy Action Network. <http://frack-off.org.uk/>; accessed 10 April 2014.
- Freedom of Information Act 2000 (FOI 2000): An Act to make provision for the disclosure of information held by public authorities or by persons providing services for them and to amend the Data Protecting Act 1998 and the Public Records Act 1958; and for connected purposes. C36.
- Friends of the Earth (FOE 2013): Unconventional, unnecessary and unwanted: why fracking for shale gas is a gamble the UK shouldn't take. [http://www.foe.co.uk/sites/default/files/downloads/shale\\_gas.pdf](http://www.foe.co.uk/sites/default/files/downloads/shale_gas.pdf); accessed 1 March 2014.
- Friends of the Earth (FOE 2013a): Campaigning on fracking – a guide for beginners. Briefing. <http://www.foe.co.uk/sites/default/files/downloads/campaigning-fracking-guide-beginners-45588.pdf>; accessed 7 April 2014.
- Friends of the Earth (FOE 2013b): Public Health England 'Review of the potential public health impacts of exposures to chemicals and radioactive pollutants as a result of shale gas exploration'. Response from Friends of the Earth England, Wales & Northern Ireland. <http://www.foe.co.uk/sites/default/files/downloads/response-public-health-englands-fracking-health-report-21878.pdf>; accessed 1 March 2014.

- Friends of the Earth (FOE 2014): Power Up! Anti-fracking training day – legal and planning skills. <http://www.foe.co.uk/sites/default/files/downloads/agenda-anti-fracking-training-05/04/2014-46171.pdf>; accessed 7 April 2014.
- Green, Christopher A.; Styles, Peter; Baptie, Brian J. (2012): Preese Hall Shale Gas Fracturing. Review & Recommendations for Induced Seismic Mitigation. [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/15745/5075-preese-hall-shale-gas-fracturing-review.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/15745/5075-preese-hall-shale-gas-fracturing-review.pdf); accessed 1 March 2014.
- Greenpeace UK (web): wrongmove. The UK's one big fracking site. <http://wrongmove.org/>; accessed 1 April
- Greenpeace UK (2013): Frack&Go. <http://www.greenpeace.org.uk/frack-go>; accessed 10 April 2014.
- Greenpeace UK (2013a): Greenpeace “fracks” Lancashire County Council. Press Release 04 September 2013. <http://www.greenpeace.org.uk/media/press-releases/greenpeace-%E2%80%9Cfracks%E2%80%9D-lancashire-county-council-20130904>; accessed 10 April 2014.
- Greenpeace UK (2013b): Report timely reminder of fracking health risks. Press Release 31 October 2013. <http://www.greenpeace.org.uk/media/press-releases/report-timely-reminder-fracking-health-risks-20131031>; accessed 20 April 2014.
- Greenpeace UK (2013c): IoD report fantastical and funded by Cuadrilla. Press Release 22 May 2013. <http://www.greenpeace.org.uk/media/press-releases/iod-report-fantastical-and-funded-cuadrilla-20130522>; accessed 20 April 2014.
- Health and Safety Executive (HSE web): Shale gas and hydraulic fracturing (fracking) Q&A. <http://www.hse.gov.uk/shale-gas/assets/docs/shale-gas.pdf>; accessed 4 April 2014.
- Hill, Michael (2013): How effective are the regulations on fracking? Based on guidelines issued By: The United Kingdom Onshore Operators Group. Friends of the Earth.
- HM Revenue & Customs (2013): UK oil and gas fiscal regime: new onshore allowance. [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/263643/Shale\\_gas.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/263643/Shale_gas.pdf); accessed 2 March 2014.
- House of Commons – Energy and Climate Change Committee (2011): Shale Gas. Fifth Report of Session 2010-12. Volume I. London. <http://www.publications.parliament.uk/pa/cm201012/cmselect/cmenergy/795/795.pdf>; accessed 25 January 2014.
- Investigating Balcombe and Cuadrilla (2013): Shale environmental assessment high on uncertainty and assumptions. <http://investigatingbalcombeandcuadrilla.com/2013/12/24/shale-environmental-assessment-high-on-uncertainty-and-assumptions/>; accessed 20 April 2014.
- Jaspal, Rusi; Nerlich, Brigitte (2014): Fracking in the UK press: Threat dynamics in an unfolding debate. Public Understanding of Science 23/3, 348-363.
- Kahya, Damian (2013): Fracking in the UK: FOI's show Lord Browne intervened to try and water down environmental regulations for Cuadrilla. 19 August 2013. Greenpeace UK, Energydesk. <http://www.greenpeace.org.uk/newsdesk/energy/investigations/fracking-uk->

- foi%E2%80%99s-show-lord-browne-intervened-try-water-down-environmental-regulations-cuadrilla; accessed 10 May 2014.
- Kahya, Damian (2014): Q&A: Fracking and Trespass. Greenpeace UK., Energydesk. <http://www.greenpeace.org.uk/newsdesk/energy/analysis/fernhurst-map>; accessed 10 April 2014.
- Keith Taylor MEP (2013): MEPs endorse environmental impact assessments for fracking. <http://www.keithtaylormep.org.uk/2013/10/09/meps-endorse-environmental-impact-assessments-for-fracking/>; accessed 20 April 2014.
- Kibble, A.; Cabianca, T.; Daraktchieva, Z.; Gooding, T.; Smithard, J.; Kowalczyk, G.; McColl, N.P.; Singh, M.; Vardoulakis, S.; Kamanyire, R. (2013): Review of the Potential Public Health Impacts of Exposure to Chemical and Radioactive Pollutants as a Result of Shale Gas Extraction: Draft for Comment. Public Health England.
- Lang, Alexander (2014): Fracking in Austria. Case Study. <http://res-agera.eu/case-studies/>; accessed 20 May 2014.
- Lewis, Dan; Taylor, Corin (2012): Britain's shale gas potential. Infrastructure for Business 2012/3. Institute of Directors.
- Mobbs, Paul (2014): Shale gas and public health – the whitewash exposed. The Ecologist.
- Moore, Veronika; Beresford, Alison; Gove, Benedict (2014): Hydraulic fracturing for shale gas in the UK: Examining the evidence for potential environmental impacts. Sandy, Bedfordshire, UK: The Royal Society for the Protection of Birds. [http://www.rspb.org.uk/Images/shale\\_gas\\_report\\_evidence\\_tcm9-365779.pdf](http://www.rspb.org.uk/Images/shale_gas_report_evidence_tcm9-365779.pdf); accessed 30 March 2014.
- National Environment Research Council (NERC 2014a): Memorandum of Understanding. 7th February 2014. <http://www.nerc.ac.uk/press/releases/2014/03-shell/shell-nerc-mou.pdf>; accessed 20 April 2014.
- Natural Environment Research Council (NERC 2013): Annual Report and Accounts 2012-2013. London. <http://www.nerc.ac.uk/publications/annualreport/2013/annualreport.pdf>; accessed 10 March 2014.
- Natural Environment Research Council (NERC 2013a): NERC supports growth with responsible environmental management in energy sector. Press release, 28 November 2013. <http://www.nerc.ac.uk/press/releases/2013/86-energy/>; accessed 20 April 2014.
- Natural Environment Research Council (NERC 2014): Oil and gas innovation funding call. <http://www.nerc.ac.uk/innovation/activities/naturalresources/oilandgas/>; accessed 24 April 2014.
- Osborne, George (2013): Autumn Statement 2013 on 5 December 2013. <https://www.gov.uk/government/speeches/chancellor-george-osbornes-autumn-statement-2013-speech>; accessed 1 April 2014.
- Parliament UK (2013): Hansard of the House of Commons Debate on 18 July 2013. <http://www.publications.parliament.uk/pa/cm201314/cmhansrd/cm130718/hallindx/130718-x.htm>; accessed 16 April 2014.

- Parliament UK (2014): Hansard of the House of Commons Debate on 16 January 2014. <http://www.publications.parliament.uk/pa/cm201314/cmhansrd/cm140116/debindx/140116-x.htm>; accessed 16 April 2014.
- ReFINE (web): Researching Fracking IN Europe. <https://www.dur.ac.uk/refine/>; accessed 1 April 2014.
- Refracktion (2013): What really made Cuadrilla abandon Anna's Road. <http://www.refracktion.com/index.php/tag/annas-road-2/>; accessed 1 April 2014.
- Refracktion (2013a): You'd think you could trust the Royal Society. <http://www.refracktion.com/index.php/tag/the-royal-society/>; accessed 1 April 2014.
- Refracktion (web): Environmental Impact Assessments. What are they and why do we need them. <http://www.refracktion.com/index.php/why-be-concerned/environmental-impact-assessments/>; accessed 1 April 2014.
- Royal Academy of Engineering (RAE 2013): Financial Report and Accounts. For the year ended 31 March 2013. [http://www.raeng.org.uk/about/annrev/pdf/2013/Financial\\_Report.pdf](http://www.raeng.org.uk/about/annrev/pdf/2013/Financial_Report.pdf); accessed 21 April 2014.
- Sarchet, Penny (2013): NERC claims it can make oil industry greener. Council defends doctoral training centre for oil and gas. Research Fortnight 16.10.2013. [http://www.researchresearch.com/index.php?option=com\\_news&template=rr\\_2col&view=article&articleId=1338873](http://www.researchresearch.com/index.php?option=com_news&template=rr_2col&view=article&articleId=1338873); accessed 20 April 2014.
- Selley, Richard C. (2012): UK shale gas: The story so far. Marine and Petroleum Geology 31, 100-109.
- The Royal Society for the Protection of Birds (RSPB 2014): Are we fit to frack? Policy recommendations for a robust regulatory framework for the shale gas industry in the UK.
- The Royal Society; The Royal Academy of Engineering (RS/RAE 2012): Shale gas extraction in the UK: a review of hydraulic fracturing. London. <http://royalsociety.org/policy/projects/shale-gas-extraction>; accessed 20 December 2013.
- Tillmann, Taavi; Baker, Peter; Crocker-Buque, Tim; Rana, Sangeeta; Bouquet, Benjamin (2014): Shortage of public health independence and advocacy in the UK. The Lancet Vol. 383, 213.
- Tootill, Alan (2013): Fracking the UK. The storm gathering over our countryside. CreateSpace Independent Publishing Platform.
- United Kingdom Onshore Operators Group (UKOOG 2013a): Community Engagement Charter. Oil and Gas from Unconventional Reservoirs.
- United Kingdom Onshore Operators Group (UKOOG 2013): UK Onshore Shale Gas Well Guideline. Exploration and appraisal phase. Issue 1 February 2013. <http://www.ukoog.org.uk/images/ukoog/pdfs/ShaleGasWellGuidelines.pdf>; accessed 10 December 2013.
- Wang, Zhongmin; Krupnick, Alan (2013): A Retrospective Review of Shale Gas Development in the United States. What Led to the Boom. Resources for the Future DP 13-12.



## Newspaper-Articles

- BBC News (13.12.2012): Gas fracking: Minister approve shale gas extraction. Article by Roger Harrabin. <http://www.bbc.com/news/uk-20707574>; accessed 10 May 2014.
- BBC News (04.10.2013): Cuadrilla pulls out of Lancashire fracking site. <http://www.bbc.com/news/uk-england-lancashire-24390753>; accessed 2 April 2014.
- BBC News (17.12.2013): Fracking firm Cuadrilla pulls out of Lancashire 'quake' site. <http://www.bbc.com/news/uk-england-lancashire-25415187>; accessed 01 April 2014.
- BBC News (14.01.2014): Lancashire communities need 10% fracking profit-share, say MPs. <http://www.bbc.com/news/uk-england-lancashire-25727750>; accessed 10 May 2014.
- Der Standard (23.03.2014): Neues Transparenzgesetz: "Viele Hintertüren eingebaut". Article by Katrin Burgstaller.
- Planning Resource (26.06.2013): Warning of fracking guidance 'bias'. Article by Catherine Early. <http://www.planningresource.co.uk/article/1192695/warning-fracking-guidance-bias>; accessed 2 April 2014.
- The Daily Mail (01.06.2011): 'Man-made' earthquake strikes Blackpool... and consequences could be severe for UK's gas drilling industry. Article by Daily Mail Reporter.
- The Daily Mail (30.06.2013): Dirty tricks of the fracking deniers: How Green zealots peddle cynical propaganda to stop Britain mining £3trillion of shale gas...enough to keep the lights on for 141 YEARS. Article by David Rose. <http://www.dailymail.co.uk/news/article-2351759/Dirty-tricks-the-fracking-deniers-How-Green-zealots-peddle-cynical-propaganda-stop-Britain-mining-3trillion-shale-gas-lights-141-YEARS.html>; accessed 25 April 2014.
- The Daily Mail (18.08.2013): 50-year-old fracking site that makes a mockery of the Balcombe zealots: It's next to a nature reserve – and has fracked enough gas and oil to power 21,000 homes every day... with no complaints from locals. Article by Adam Lusher and Wayne Francis.
- The Daily Mail (19.08.2013): Green MP held as police finally move in on the fracking mob: Caroline Lucas among more than 30 arrests after activists block entrance to site. Article by Ryan Kisiel and Nick Fagge.
- The Daily Mail (01.04.2014): Trespass law overhauled to make it easier for frackers: Firms will be able to access underground gas without asking landowners for permission. Article by James Chapman.
- The Financial Times (10.01.2014): Total joins UK's pursuit of shale boom. Article by Guy Chazan. <http://www.ft.com/cms/s/0/13f9de58-7a20-11e3-a3e6-00144feabdc0.html#axzz2xcdPdfEx>; accessed 1 April 2014.
- The Guardian (01.06.2011): Blackpool earthquake tremors may have been caused by gas drilling. Article by Jonathan Paige.
- The Guardian (29.06.2012): Fracking: where's the debate about its climate change risks? Blog entry by Leo Hickman. <http://www.theguardian.com/environment/blog/2012/jun/29/fracking-debate-climate-change-risks>; accessed 1 April 2014.

- The Guardian (12.03.2013): Shale gas rush: the fracking companies hoping to strike it rich. Article by Ian Griffiths.
- The Guardian (13.03.2013): Fracking company Cuadrilla halts operations at Lancashire drilling site. Article by Fiona Harvey, Damian Carrington and Terry Macalister.
- The Guardian (24.04.2013): Cuadrilla censured by advertising watchdog over fracking safety claims. Article by Fiona Harvey.
- The Guardian (28.06.2013): Fracking the nation: the dash for gas beneath rural Britain. Article by John Harris.
- The Guardian (02.08.2013): Fracking firm Cuadrilla trespassed on private land for geological surveys. Article by Damian Carrington.
- The Guardian (05.08.2013): Fracking gets boost as George Osborn bangs drum for 'energy revolution'. Article by Patrick Wintour.
- The Guardian (12.08.2013): David Cameron: UK must accept the potential of fracking. Article by the Press Association.
- The Guardian (19.08.2013): Caroline Lucas among dozens arrested in Balcombe anti-fracking protest. Article by Fiona Harvey and Peter Walker.
- The Guardian (19.08.2013a): Anti-fracking protests in Balcombe signal major shift in public awareness. Article by Fiona Harvey.
- The Guardian (23.09.2013): Fracking protests restart after Cuadrilla seeks new drilling rights. Article by Benn Quinn.
- The Guardian (13.12.2013): Anti-fracking protesters clash with police at drilling site near Manchester. Article by Terry Macalister.
- The Guardian (13.01.2014): Fracking incentives will give councils 'contradictory roles'. Article by Adam Vaughan.
- The Guardian (14.01.2014): Fracking opponents are being irrational, says David Cameron. Article by Patrick Wintour.
- The Guardian (14.01.2014a): UK defeats European bid for fracking regulations. Article by Damian Carrington.
- The Guardian (17.01.2014): Emails reveal UK helped shale gas industry manage fracking opposition. Article by Damian Carrington.
- The Guardian (23.01.2014): Cuadrilla scraps plan to frack at Balcombe site. Article by Fiona Harvey.
- The Guardian (04.02.2014): Cuadrilla announces two new Lancashire fracking sites. Article by Fiona Harvey and Adam Vaughan.
- The Guardian (07.02.2014): UK environmental science in association with Shell. Blog entry by Alice Bell. <http://www.theguardian.com/science/political-science/2014/feb/07/uk-environmental-science-in-association-with-shell-alice-bell>; accessed 20 April 2014.
- The Guardian (11.03.2014): Anti-fracking campaigners in Salford can stay, court rules. Press Association.

- The Guardian (26.03.2014): Fracking 'good for the UK', says David Cameron. Article by Press Association.
- The Guardian (04.04.2014): Fracking firm to drill on former explosives site. Article by Damian Carrington.
- The Independent (14.07.2013): Revealed: Fracking industry bosses at heart of coalition. Article by Mark Leftly.
- The Independent (08.01.2014): People living in fracking areas set to get more compensation. Article by Nigel Morris.
- The Independent (13.01.2014): Government accused of 'bribing local councils' on controversial fracking projects. Article by Tom Bawden.
- The Independent (13.03.2014): Fracking shame: Full threat to British wildlife is laid bare in a new report showing up to half the country could be licensed for shale gas extraction. Article by Tom Bawden.
- The Independent (25.03.2014): Ukraine crisis: David Cameron pushes for fracking to lessen reliance on Russian oil. Article by Nigel Morris.
- The New York Times (NY Times 18.10.2013): Britain Looks to Fracking as North Oil Dwindles. Article by Stanley Reed. [http://www.nytimes.com/2013/10/19/business/energy-environment/britain-looks-to-fracking-as-north-sea-oil-dwindles.html?ref=international&\\_r=0](http://www.nytimes.com/2013/10/19/business/energy-environment/britain-looks-to-fracking-as-north-sea-oil-dwindles.html?ref=international&_r=0); accessed 1 April 2014.
- The Sun (26.03.2014): You fracking hypocrite. Article by Lynn Davidson. <http://www.thesun.co.uk/sol/homepage/news/5531421/oil-heir-lord-cowdray-campaigning-against-fracking-in-sussex.html>; accessed 2 April 2014.
- The Telegraph (11.08.2013): We cannot afford to miss out on shale gas. Comment by David Cameron.
- The Telegraph (15.08.2013): Tory and Labour MPs join forces to demand more money for fracking. Article by Steven Swinford.
- The Telegraph (19.08.2013): Fracking protests: police arrest Green MP Caroline Lucas. Article by Olivia Goldhill and Sam Marsden.
- The Telegraph (12.09.2013): Shale gas explorer IGas Energy prepares to drill near Manchester. Article by Emily Gosden.
- The Telegraph (02.10.2013): David Cameron's speech – in full. Speech by David Cameron.
- The Telegraph (05.12.2013): Autumn Statement: Shale gas tax breaks to attract 'billions of pounds of investment'. Article by Emily Gosden.
- The Telegraph (15.12.2013): EU plan for fracking law threatens UK's shale gas boom. Article by Tim Ross.
- The Telegraph (12.01.2014): Fracking tax millions will go to communities, says David Cameron. Article by James Kirkup.
- The Telegraph (15.01.2014): Blow for George Osborn as Tory council chiefs oppose fracking in Chancellor's constituency. Article by Emily Gosden.
- The Telegraph (26.01.2014): Fracking could be allowed under homes without owners' permission. Article by Emily Gosden.

The Telegraph (04.02.2014): Cuadrilla names two new Lancashire fracking sites. Article by Emily Gosden.

The Telegraph (05.02.2014): Fracking: Lancashire community divided over Cuadrilla plans for shale gas exploration. Article by Paddy Mulchrone.

## Abbreviations

ALARP	as low as reasonably practicable
BGS	British Geological Survey
BVG	Bundes-Verfassungsgesetz
CDT	Centre for Doctoral Training
DECC	Department of Energy & Climate Change
EA	Environment Agency
EC	European Commission
EIA	Environmental Impact Assessment
FFBRA	Frack Free Balcombe Residents Association
FOE	Friends of the Earth
FOI	Freedom of Information
GHG	Greenhouse Gas
HSE	Health and Security Executive
MPA	Minerals planning authority
NERC	National Environment Research Council
OMV	former Österreichische Mineralölverwaltung (Austrian Mineral Oil Administration)
PEDL	Petroleum Exploration and Development License
PHE	Public Health England
RAE	Royal Academy of Engineering
RRI	Responsible Research and Innovation
RS	Royal Society
RSPB	Royal Society for the Protection of Birds
UKOOG	United Kingdom Onshore Operators Group

# Towards Anticipatory Governance of Responsible Research and Innovation



The objective of the Res-AGorA project is to develop a comprehensive governance framework for responsible research and innovation (RRI). This will be a contribution to the EU ambition of becoming a genuine Innovation Union by 2020 striving for excellent science, a competitive industry and a better society without compromising on sustainability goals as well as ethically acceptable and socially desirable conditions.

The goal of the Res-AGorA project will be achieved through extensive case study research about existing RRI governance across different scientific technological areas, continuous monitoring of RRI trends in 16 European countries, and constructive negotiations and deliberation between key stakeholders. This comprehensive empirical work will be the building blocks of the creation of a governance framework for RRI.

The case study summarised in this document is output of Res-AGorA's extensive empirical programme (Work Package 3).

More information at [www.res-agera.eu](http://www.res-agera.eu)

## **Contact for Res-AGorA's case study programme (WP3)**

Dr. Sally Randles  
Manchester Institute of Innovation Research MIOIR  
[Sally.Randles@mbs.ac.uk](mailto:Sally.Randles@mbs.ac.uk)

Prof. Dr. Jakob Edler  
Manchester Institute of Innovation Research MIOIR  
[Jakob.Edler@mbs.ac.uk](mailto:Jakob.Edler@mbs.ac.uk)

## **Res-AGorA Co-ordinator**

Prof. Dr. Ralf Lindner  
Fraunhofer Institute for Systems and Innovation Research ISI  
[Ralf.Lindner@isi.fraunhofer.de](mailto:Ralf.Lindner@isi.fraunhofer.de)

## **Acknowledgement**



Co-funded by the  
European Union

This project is receiving funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 321427.