

## Master thesis

# Understanding the Dynamics of the Renewable Energy Discourse: The Framing Practices of Heterogeneous Actors

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# Context

## MASTER'S PROGRAMME ENERGY SCIENCE

I am enrolled in the master's programme Energy Science which is offered by the faculty of Geosciences Department of Innovation, Environmental, and Energy Sciences at the faculty of Geosciences of Utrecht University. The master programme provides insight into the way the energy system works and discusses how new technologies can contribute to the transition towards a more sustainable energy system. I have successfully completed all mandatory courses and two elective courses: "Fossil Resources" and "Technology Related Venturing".

## CHAIR OF SUSTAINABILITY AND TECHNOLOGY

I conducted this research at the chair of Sustainability and Technology at ETH Zürich. The group focuses on organizational, technological and institutional change in the energy sector. It aims to improve understanding of technological innovation, institutional dynamics and organizational strategies as drivers for decarbonization of the economy.

## CLIMATE-KIC MASTER PROGRAMME

Climate-KIC is one of the five Knowledge Innovation Communities founded by the European Institute of Innovation and Technology. Climate-KIC tries to stimulate innovation in the field of climate change adaptation and mitigation by bringing together higher education, research and business. This master's thesis is performed as part of the mobility program of the Climate-KIC master programme. This master's thesis is relevant for the Climate-KIC theme "sustainable production systems", by addressing the framing practices of actors on renewable energy. Analysing the dynamics of the framing practices on renewable energy gives insights in how to accelerate the integration of renewable energy and the move towards a sustainable energy system.



## Summary

Integrating renewable energy into the energy system is one of the main challenges countries are facing on their way to reduce the GHG emissions. This integration of renewables can be done in several ways and has the potential to influence a lot of different actors. Based on issue, a discourse emerges in which all stakeholders frame their interpretation on renewable energy. These framing practices affect the actions taken by the actors and hence influence if and how renewables are integrated. This research aims to describe the evolution of the discourse, focussing on the framing practices of the actors. The discourse on renewable energy in the UK has been assessed using quotes of actors in newspaper articles. By applying two automated content analysis methods to the dataset the framing practices of the different actor type could be assessed. According to the results, it can be concluded that every actor framed problems and solutions which were related to their own interest and for which they tried to influence the interpretations of others. This mechanism leads to a variety of topics which were included in the discourse related to, for instance, policy, specific technologies or business aspects. The occurrences of these topics in the framing practices varied over time and part of this variation can be explained by the developments in the field. If an actor senses that a development creates an opportunity or a need for another actor to act, it will adapt their framing practices to motivate others. Based on the content of the framing practices and the variation over time a framework has been created, including different “levels” of framing. Every level represents a type of problem which could be diagnosed and the related solutions. A solution is related to the problem on the next level. Actors differ in the level of framing they mainly address which might harm the effectiveness of their framing practices. The framework can be useful for practice, since actors can get insights in how to optimize the effect of their framing, and for theory, since it might help the understanding framing practices in other types of discourses too. Finally, this research also contributes to content analysis by applying an innovative approach for the analysis of framing practices.

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# 1 Introduction

Over the last decades policy makers all over the world have recognised the need for a more sustainable energy system in order to reduce the consequences of GHG emission. Several countries have established specific energy targets to stimulate the transition towards sustainability. The integration of renewable energy sources into the energy system is an important aspect of many of these targets. For instance, the renewable energy directive of 2007 by the European Union (EU) states the total share of energy consumption of renewable sources should exceed 20% by 2020 within the EU. The integration of renewable energy sources has been undertaken by EU member states with varying degrees of success since then. Some countries have already reached their specific target while others struggle and are far away from reaching the 2020 target (Eurostat, 2015). According to the latest comparison of members states by Eurostat in 2013, the UK was among the worst performing with only 5.6 percent of their total energy consumption coming from renewable sources (Eurostat, 2015).

All countries with renewable energy targets are facing significant challenges related to integrating renewables (Wiersma & Devine-Wright, 2014). Over the years, industrial economies such as the UK have been locked into centralised, fossil fuel based, energy systems. These types of centralised systems suited the predictable and large-scale generation coming from fossil fuel and nuclear power plants (Alanne & Saari, 2006; Unruh & Einstein, 2000). The process of integrating renewables is challenging this system architecture. Academics and advocacy groups have argued that a sustainable energy system will be a combination of centralised and different types of decentralized sub-systems (Watson & Devine-Wright, 2011; Alanne & Saari, 2006; Adams & Berry, 2008). These decentralized sub-systems are formed around renewable energy sources such as wind, solar, biomass power which all differ in their scale and their impact on the system (Müller, Stämpfli, Dold, & Hammer, 2011). The contributions that certain technologies might have in the energy system of the future is very hard to predict and will differ per region but it is likely that a wide mix of (renewable) energy sources is needed (Cooke et al., 2013). Hence, the integration of renewables can be undertaken in several ways and it is not straightforward which path should be chosen (Watson and Devine-Wright, 2011).

Whatever way the integration of renewables will take place, it is going to have a large impact on several actors inside and outside the energy sector (Woodman & Baker, 2008). Governments have to find a way to stimulate renewable energy to reach international targets without harming the industry too much (Jacobsson and Bergek, 2004). The traditional energy companies might need to change their core business and adapt to a changing environment. Fox-Penner (2010) argues that energy suppliers should shift from delivering energy to providing “energy services”. At the same time, new entrants are entering the industry offering new products or services benefitting from and contributing to a changing energy system (Unruh & Einstein, 2000). Also, other actors which did not have a direct link with energy, such as local communities, might be affected due to a possible decentralization of the energy system (Strachan et al, 2015). All of these actors have a different background and different interest which influences their view on the need for the integration of renewables and the way of integrating. The complexity of the issue and the large heterogeneity of the actors involved makes the integration of renewables a very complicated process.

The emergence of renewable energy stimulates interaction between all these actors. (Woodman & Baker, 2008). Hoffman (1999) has argued that organisational fields form around such issues, “important to the interests and objectives of a specific collective of organisations”. Based on this concept of ‘issue-based’ fields, it can be argued that an organisational field is formed around renewable energy. This field should be seen as “the centre of common channels of dialogue and discussion” rather than “just a collection of influential organisations” (Hoffman, 1999). The issue brings

together various field constituents with opposing perspectives and the debate is likely to result in a discursive war rather than a converging dialogue (Hoffman, 1999). The interaction between the actors can be seen as a discourse (Kaplan, 2008). I interpret a discourse in line with Hajer and Versteeg (2005) as a collection of expressions that provide meaning to a certain issue. Such a discourse is formed by the framing or the framing practices<sup>1</sup> of actors in the field. Framing is the process of expressing an interpretation of an issue to mobilize support for their interest (Benford and Snow, 2000). The framing practices around renewable energy of all actors make up the discourse on renewable energy. According to this definition a discourse does not represent one meaning to an issue but is a collection of different interpretations (Gamson and Modigliani, 1989).

Framing is strongly connected to meaning construction and helps an actor to organise experience and “guide action” (Snow et al., 1986). Hence, framing is a very “action oriented” process and gives an indication which actions an actor is likely to pursue or which actions it would like to see from others. Getting insights in the dynamics of these framing activities provides an idea of the direction of the field (Fiss and Hirsch, 2005). Hardy et al. (2005) argued that the discourse which consists of all framing practices has influence on effective collaboration. Some kind of alignment about the issues facing the stakeholders has to be obtained in order to reach inter-organizational action that leads to innovative and widely supported solutions. This effect of the discourse on collaboration is especially interesting in the case of renewable energy since a higher deployment of renewable energy is likely to require more collaboration between different stakeholders in the energy industry.

Framing practices and interpretations of different stakeholders on renewable energy related issues have therefore been assessed in literature to explain and predict the activities in the field. Barry et al (2008) analyses the framing practices of opponents and supporters of a specific offshore wind project. They argue that there is a mismatch between the framing practices of both groups which leads to an increasing disagreement regarding the project. A research of Stauffacher et al. (2015) on geothermal energy focussed on the type of actor and their framing. The industry appeared to have a focus on the technological potential while scientist emphasized the risks of geothermal (Stauffacher et al., 2015). The consequences of these differences in interpretations among actors have been analysed regarding community energy projects (Walker and Devine-Wright, 2008). Walker and Devine-Wright (2008) showed that interpretation of the community aspects within a project could be quite different between actors, both in terms of outcome and process. Differences in the interpretation of the extent to which communities should be involved and benefit economically and socially from the project could harm the success of the project (Walker et al, 2010). Devine-Wright and Wiersma (2013) show that the interpretation of an aspect of decentralised energy, localness, might vary a lot between projects and between stakeholders. While private sector actors stressed the physical and technical aspects of ‘local’, community actors had a social, cultural and political point of view in the ‘localness discourse’.

These studies show a large variety in framing practices between different actors on specific elements of renewable energy. However, it remains unclear how these specific interpretations are embedded in the overall understanding of the issue of renewable energy. An overarching view on the renewable energy discourse could help to understand differences in interpretations on specific aspects of renewable energy. Moreover, due to the in-depth approach of the discussed studies, little attention has been paid to changes in interpretations over time. However, the field of renewable energy is very dynamic so actors might adapt their framing activities regarding renewable energy or related issues. Therefore, I argue that an analysis of framing practices on renewable energy at one point in time may

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<sup>1</sup> In this research framing and framing practices are considered as interchangeable. I use framing practices to clarify that the actor is the one that frames instead of the object that is being framed.

give a distorted picture. An analysis over time of the framing activities within the overarching discourse on renewable energy could be a valuable contribution to the existing literature.

Within the framing literature the changes in the context are also often ignored (Fiss and Hirsch, 2005). This is remarkable since framing is defined as a dynamic and evolving process which is likely to be the subject of change (Benford and Snow, 2000). Some scholars have addressed the influence of changes in the environment on framing activities (Clinton, 1987; Carvalho, 2000). These changes have been referred to as “structural changes” (Fiss and Hirsch, 2005). Although some research has been done to explore the influence of these structural changes, little is known about what type of structural changes influence the discourse and how actors adapt their framing activities based on them (Ferree et al. 2002, Fiss and Hirsch, 2005). Hence, an assessment of the changes over time taking into account “structural changes” could lead to interesting insights for the framing literature. Moreover, renewable energy is an interesting context for analysis on framing. The diverse aspects associated with this issue might lead to new or different insights on framing practices. The heterogeneity of the actors involved in the discourse on renewable energy makes the context also suited for an analysis on differences between framing practices.

To summarize all above, analysis on the renewable energy discourse as a whole has not been conducted yet although it can be valuable. The framing practices within this discourse represent some kind of pursued direction of the field by a certain actor. An understanding of the dynamics of these framing practices and the differences between actors gives insights in which direction the field might move. It could result in suggestions to accelerate the transition towards renewable energy by creating more alignment in the field. The following research question is therefore addressed:

***How did the framing practices of actors differ within the discourse on renewable energy in the UK between 2005 and 2015?***

This research question is answered by an exploratory approach to capture the dynamics of the discourse and the framing practices it consists of. Little is known about the presence of the actors and the topics they discuss. Therefore, I chose to not address specific actors or look for themes set beforehand but to explore which actors are present and which themes are discussed. To be able to conduct such an analysis, two automated content analysis methods have been used, quote/source detection for the occurrence of actors and topic modelling to analyse the content of the framing processes. The evolving character of the framing practices is taken into account by looking at changes over a long time period and address important changes in the structural context which are influencing the discourse. These aspects of the main research question are addressed by the following sub-questions:

- *How did the actor configuration in the discourse evolve over time?*
- *How did actors frame the issue of renewable energy over time?*
- *What were the major structural changes that impacted the renewable energy sector?*
- *How did the structural changes influence the framing practices of actors within the discourse?*

Answering the 4 sub-questions as they are stated above leads to an answer to the overall research question and a better understanding of the framing practices within the renewable energy discourse. The societal relevance of this goal is based on the idea that every country should try to integrate renewable energy as soon and as smoothly as possible. This process is very complex and requires collaboration between a lot of different actor. The focus on discourse and framing practices is therefore relevant since it represents pursued direction of the field by its actors and influences the success of collaborative activities. This thesis makes three main societal contributions. First, it provides insights into the extent of differences between actors and can offer suggestions improving alignment

in framing practices. Moreover, it shows how actors in favour of integrating renewables can adapt their framing practices to become more effective. Lastly, it highlights interesting themes that have had a huge impact on the industry and for which a further in-depth analysis can be justified. All these aspects of this research contribute to a fast and smooth integration of renewable energy in the energy system. From a theoretical perspective the contribution lies in the complexity of the object of framing and the strong focus on the dynamic and evolving aspect of framing. Some suggestions are made on how to approach the analysis of framing practices in the organisational literature.

This thesis continues with a theoretical background in which the theoretical concepts are discussed and the theoretical framework is presented. The methodology explains the new approach to framing practices applied in this research with a strong focus on the two automated content analysis methods. The results are presented in 4 parts, reflecting the sub-questions mentioned above. An interpretation of these results is given in the discussion along with some implications and limitations of this research. Finally, an answer to the overall research question is formulated in the discussion.

## 2 Theoretical background

### 2.1 Discourse

Discourse has been a popular subject for analysis to address some way of communication between individuals or organisations by research in various fields. However, in which way the concept of discourse is used by researchers differs significantly.

In some articles, discourse is seen as a synonym for discussion or debate using it just a way of referring to all communication about a certain issue. More often, especially in the political literature, the importance of meaning is stressed when defining discourse. Discourse, according to Philips and Lawrence (2004) is a “structured collections of meaningful texts”. Gill Seidel (1985) refers to a discourse as a site of struggle where meanings are both produced and challenged. However, most discourse scholar assume that discourse is constitutive of meaning on itself and in this way reflects this meaning (Loewenstein et al, 2012).

This emphasis on meaning is important in the way discourse is analysed in this research. To be more specific on what is understood by discourse, I borrow a definition from Hajer and Versteeg (2005) which defines discourse “as an ensemble of ideas, concepts and categories through which meaning is given to social and physical phenomena, and which is produced and reproduced through an identifiable set of practices”. So, a discourse does not equal a debate or discussion but can be extracted from a discussion or debate by tracing “linguistic regularity” (Hajer and Versteeg, 2005).

The production of these ideas, concepts and categories takes place via a variety actors which somehow engage in some kind of symbolic expression about a certain phenomenon. A discourse does not include just one interpretation but is likely to contain “a set of interpretive packages that give meaning to an issue” (Gamson, Modigliani, 1989). Such interpretive packages can be seen as the framing practices of the different actors involved. The concept of framing can be used to look in more details into the role of specific actors within the discourse (Hirsch & Fiss, 2005; Hoffman., 2001).

### 2.2 Framing

For the use of the concept of framing I draw mainly on the insights of the social movement literature. Social movement scholars have conceptualized framing as a form of meaning construction “to locate, perceive, identify and label” a phenomenon (Goffman, 1974, p.21). Framing refers to the expression of an interpretation and help to “organize experience and guide actions”. Actors engaged in framing activities try to influence understandings of others as a way to pursue their own interest (Kaplan, 2008). Through framing a meaning is constructed about a certain kind of issue by an actor. All framing practices together result therefore in an ensemble of ideas, concepts and categories which form the discourse.

The social movement literature distinguishes between three different tasks that could be included in framing practises (Cornelissen and Werner, 2014). Diagnostic framing defines problems and identifies who or what is to blame for it. The prognostic tasks is focusing on what should be done in response to those problems and involves the articulation of a strategy for tackling them. Motivational framing calls for action to address or tackle a certain problem and is providing rationale for engaging in some kind of action (Benford & Snow, 2000). These ways of framing often occur together, motivational framing, for example, “can constrain the range of possible reasonable solutions” (Benford & Snow, 2000, p. 616).

Though often ignored within research on framing, the context in which the meaning construction occurs is crucial to the framing process of actors. Before an interpretation can be expressed an actor should make sense of the situations it finds itself in (Weick, 1995). Providing structure to all cues that an actor gets from its environment is an important step in the framing process (Fiss and Hirsch, 2005). So, framing both includes the internal process of developing an understanding of what is happening and the external process of formulating meaning in line with an actor's interest (Fiss and Hirsch, 2005).

### 2.3 Structural change

Emphasizing sense making as a part of framing shifts the focus more towards the role of the actual phenomenon or issue that is framed. Framing does not revolve around clearly defined, invariable concepts. The phenomenon which is framed as well as the context in which it is established is likely to be the subject of change. Such changes might have a large impact on framing activities of actors and by that on the overall discourse.

The ability of changes in context to influence framing activities or discourse has been addressed by several studies. Some of them use the concept of "critical discursive moments" from Clinton (1987) to analyse events that have the ability to change the discursive opportunity structure and require actors to change their framing strategy (Ferree et al, 2002; Carvalho, 2000). Ocasio and Joseph (2005) mention critical events to refer to those changes in the context that provide opportunity for new ways of framing to emerge, providing new meanings. The concept of field-configuring events, mostly used to analyse field level changes, has also been examined for their impact on discourse (Hardy and Maguire, 2010). Field-configuring events are arenas in which people from diverse organizations and with diverse purposes assemble periodically, or on a one-time basis" (Lampel & Meyer, 2008: 1026). These events open up the discourse and allow for different "narratives" to be told, during or in the build up to such an event (Hardy and Maguire, 2010).

Steinberg (1999) combines the terms structure and event to emphasize the influence of the environment on the framing of actors. Hirsch and Fiss (2005) build further on this by introducing the concept of structural change. They define structural changes as changes that set the stage and open up the opportunity for meaning creation" (Hirsch and Fiss, 2005, p. 46). They help to explain how discourse evolves by indicating why certain ways of framing are gathering momentum and why actors get involved (Hirsch and Fiss, 2005). For their analysis on the discourse of globalization they looked specifically into the effect of changes in political and structural factors. They found that the effect of structural changes on the framing of globalization is different for different types of actors within the discourse.

## 2.4 Framework

In figure 1 the theoretical concepts introduced above and their relation to each other are presented. The central element of this framework is the concept of framing. Actors engage in framing practices. The content of the framing practices might be very different. Differences in background and interests can lead to different interpretations of the same issues. These differences in framing practices is the focus of this research. The arrows between the different framing boxes represent the interaction between the different actors and emphasize the dynamic and evolving character of the framing process. The concept of structural changes is used to reflect the changing environment which may explain differences in the framing activities of actors. The influence of structural change on framing might be different for each actor which is represented by the separate arrows. The framing practices of all actors on renewable energy form the discourse on renewable energy. This approach to the concept of discourse allows me to show the overall dynamics in framing practices on renewable energy and to assess how the framing practices of one actor relates to the rest of the field.

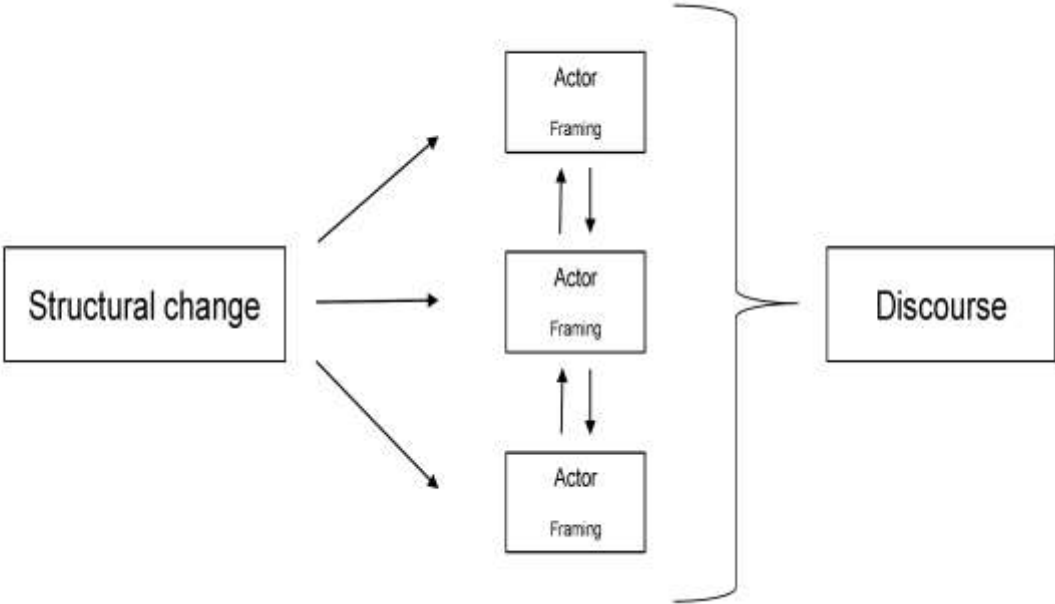


Figure 1; Theoretical framework



## 3 Methodology

### 3.1 Case selection

The analysis has been focussed on the UK context. The UK is considered as an interesting setting to analyse a renewable energy discourse since it represents a case in which the struggles related to the shift towards renewables are clearly present (Woodman and Baker, 2008; Chmutina and Goodier, 2013). One of these struggles is the uncertainty regarding government support and the regulations renewables face (Woodman and Baker, 2008). Policy measures have been inconsistent and not always as effective as intended (Walker, 2008). Moreover, the distribution network is relatively old and focused on a centralised power delivery which has already led to problems around the integration of renewables into the grid (Farrell, 2015). Large incumbents are dominating the market leaving little opportunities for innovative SME's to introduce renewable energy solutions (Strachan et al., 2015). Community acceptance of renewable energy projects such as onshore wind parks is also relatively low in the UK. These struggles are likely to trigger the debate around the integration of renewables. The UK can be considered as an "extreme case" in which the dynamics of the discourse can be distinguished clearly (Gerring, 2007).

### 3.2 Data collection

The newspaper articles used for the analysis are published from January 1 2005 till November 1 2015 in the British newspapers The Guardian (circulation 2015: 185,429) and The Times (circulation 2015: 396,621). These two newspapers are among the "quality press" newspapers the ones with the highest circulation numbers and represent a different political orientation with The Times being right-centred and the Guardian left and social liberal oriented. In this way I attempted to control for any possible influence of the authors opinion on the type and content of the frames that are quoted or paraphrased. For collecting the data, I have made use of the Factiva electronic database of international newspapers, journals and magazines.

First, a search has been conducted using only the very general term "renewable\*" which results in 19,199 articles in the two newspapers. These 19,199 articles include articles in which renewable energy is only mentioned in a side note and in which the main topic is not renewable related. In such articles it is less likely that quotes or paraphrases relate to a renewable energy topic. To increase the likelihood of extracting relevant data, articles need to have at least five mentions of "renewable" to be included in the research. Word frequency has been identified as a good indicator of importance and cognitive centrality in previous content analysis research (Duriau, Reger, & Pfarrer, 2007). To make sure that the data would relate to the UK, "UK" was added as a geographical constrain to the search term. Moreover, only printed newspaper articles were taken into account, all online articles were excluded from the search results. Adding these constrains and removing all the duplicates from the search results left a total of 767 articles, including 482 articles published in the Guardian and 285 articles published in the Times. This is the dataset that is used for the analysis.

The articles were uploaded to the online server of the Amsterdam Content Analysis Toolkit (AmCAT). The open source infrastructure of AmCAT aims to facilitate large-scale automatic and manual content analysis. R-package "amcatr" allows for data preparation and analysis within R via the application programming interface (API) of AmCAT.

### 3.2.1 Archival data

To determine the structural change influenced the renewable energy field in the UK archival data from two main sources are used complemented by other grey literature and newspaper articles. A complete overview is provided in Appendix A.

The first main source I used is the Digest of UK Energy Statistics (DUKES) which is published yearly by the Department of Energy & Climate Change. It contains all statistics regarding capacity of renewable energy as well as a discussion of other kinds of developments regarding specific technologies. For data energy policy in the UK I used the IEA/IRENA Joint Policies and Measurement database. This database contains policies relevant for renewable energy in the UK including information about their target technologies and their status.

## 3.3 Operationalisation

### 3.3.1 Actors

Actors within the renewable energy discourse are operationalised as being the source of the quote that is recognised by the source/quote detection. As it is likely that at least hundreds of different actors will be quoted, the identified actors will be divided into a categories. This categorization will be based on a coding scheme that will be adapted to fit the dataset, which is in line with the exploratory approach of this research.

The presence of an actor in the discourse is based on the number of times the actor is quoted in the assessed news articles. This could have led to some bias towards certain actors since some actor types might be more likely to be cited by newspapers than others. However, the news articles are considered to be a good representation of the overall discourse and I assume this effect is part of the influence of a certain actor within a field.

### 3.3.2 Discourse and framing

I assumed that statements of actors within newspaper articles on renewable energy are one way for actors to engage in framing practices and expressing their interpretation of the issue. The discourse can therefore be found in all the statement identified in these news articles. Newspaper articles have been used often to obtain data for framing and discourse analysis (Fiss and Hirsch, 2005; Stephens et al, 2009; Staufacher et al, 2015).

To extract all statements about renewable energy from the dataset I used an automated content analysis method called source/quote detection (Van Atteveldt et al, 2008; Van Atteveldt and Sheafem, 2015). Both quotes and paraphrases were identified by the method. From now onwards these identified quotes and paraphrases will be addressed as "quotes". A quote can exist out of one or multiple sentences which are linked to a certain source in the text. Only the content of these quotes has been used for the analysis.

Discourse and framing practices, and the meaning they provide to a certain issue can only be captured by looking at the text which represent the discourse or framing (Philips and Lawrence, 2004). I Such texts are in principle nothing more than a collection of words which get meaning when used in certain patterns. By analysing these systems of words and their meaning, referred to as vocabularies by Loewestein et al. (2012), the categories, ideas and concepts within a discourse or framing activity can be shown. These vocabularies are used by groups, organizations or a field to communicate, which allow for analysis on both the discourse as a whole as well as the framing practice of a specific actor.

Vocabularies have been assessed in different ways in management literature (Loewestein et al, 2012). Word frequency is a traditional way of addressing vocabularies as a way of looking at interpretation of actors (e.g. Hirsch and Fiss, 2005). However, such an approach is criticized since the connection between the words is ignored (Loewestein et al, 2012; Carley, 1994). Recently vocabularies are more assessed by analysing word-to-word relationship showing how certain words cluster together (Nigam and Ocasio, 2010; Jones & Livne-Tarandach, 2008). Carley & Palmquist (1992) argue that concepts are expressed in words that get meaning dependent on their use in relationship with other words. Meaning is in that sense a matter of word co-occurrences. Assessing vocabularies via patterns of word co-occurrence is a way to examine framing and discourse

To find patterns in word-occurrence and with that identify the meaning of texts, I use a method called topic modelling. Topic modelling, a recently developed method in the computational linguistics field, is more and more used in varying scientific fields to distinguish issues, themes and topics from certain text documents. For instance, Quinn et al. (2010) have used topic modelling to classify speeches in the US Senate into topics. Kaplan and Vakili (2014) apply topic modelling to identify breakthrough innovations within their patent dataset. I apply topic modelling since this method allows for analysis of large and complex text corpuses and has the ability to show connections between words.

Topic modelling algorithms automatically create topics based on patterns of occurrence of words in the text units that are analysed. The analysed text unit can be different types of documents as news articles or policy documents but also paragraphs or sentences (Blei, 2003). The document type used in this research are the individual quotes and this term is used from now onwards. Words get a probability to occur in a topic based on the words it co-occurs with. Words that co-occur often together within the quotes have a high probability to occur together and rank high in a certain topic. This means that topics all have an internal consistency, words put into a topic often occur together in the document or do not appear much outside that topic (Jacobi et al, 2015). Words are automatically ranked into topics but these topics still need to be labelled manually. A LDA topic model assigns a score for every topic to each quotes based on the occurrence and co-occurrence of words within the quote. Based on the score a quote can be linked to one or more topics.

The links between the quotes and the topics reflects the meaning given to an issue based on the co-occurrence of words. Hence, the framing activities of an actor are operationalised by all links between their quotes and the topics. As a consequence, all identified links between the quote and the topic are considered to represent the discourse.

### 3.3.3 Structural changes

Framing of actors are influenced by structural changes within the context of the discourse (Fiss and Hirsch, 2005). Structural changes are operationalised as developments within the energy sector that have the potential to influence the renewable energy sector. Developments could refer to a single event or a longer process and are categorised to be either policy or technology related. The policy developments are considered to be any introduction, adaptation or removal of a renewable energy policy. The technology developments are considered to be the increase of the energy generation in a certain periods as well as other major technological development regarding wind, solar, marine or a non-renewable energy source.

## 3.4 Data preparation

### 3.4.1 Syntactic dependency parser

For extraction of quotes, paraphrases and their sources from the dataset, the syntactic structure of sentences is used. Hence, the raw data needed to be converted. I processed the data via syntactic dependency parser Stanford CoreNLP. The first processing step is the tokenization of the data, which means splitting the data into a list of words. It includes a word boundaries that recognises things like acronyms, punctuations and contractions (Jacobi, 2015). The language analysis tool then marks up the structure of the sentence and shows the dependencies between the individual words within the sentences. Each sentence can be converted into a dependency graph in which each node represents a word, and the edges express grammatical dependency relations between the words. Moreover, it includes the lemmatization and POS (part of speech) tagging of the individual words (Stanford, 2015). Lemmatization involves the process of reducing all words to their respective headwords. In linguistic dictionaries every word corresponds with a specific lemma which includes a set of words with the same lexical root (Lazarinis, 2007). For example, the words “were” and “is” both have the lemma “be” and a word like “weaknesses” corresponds to lemma “weak”. With POS tagging a word is categorised into a certain type, e.g. noun, verb or preposition (Jacobi, 2015).

### 3.4.2 Quote//Source Detection

To extract the quotes and sources from the dataset I ran r module “rsyntax” which bases the source/quote detection on the identified syntactic structure. This technique has been developed recently and used before to identify differences in the way Chinese and American media are addressing the Gaza conflict (Van Atteveldt and Sheaferm, 2015). It recognises two main patterns in the dependency graph to extract quotes and paraphrases. The first type is defined by a “speech verb” (e.g. said, mention, tells, etc.) and the second by an “according to” relation identified by CoreNLP. The structure of the related sentences indicates the source and the quote using “a list of possible grammatical relations” (Van Atteveldt and Sheaferm, 2015). The source and the quote are linked together by an unique quote number. In addition, multiline quotes are identified by citation marks in the beginning and end of sentences that connected to a sentence with an identified quote.

Running this analysis on our dataset resulted in 6457 identified quotes including 92348 tokens. These 6457 quotes are connected to 5180 sources as multiline quotes from one sources had been assigned a different quote number. To simplify the analysis in a later stage, I gave multiline quotes the same quote number. Eventually, the dataset contained therefore 5180 quote numbers, reflecting all quote-source relations. Both the quote number and quote role were added to the existing Excel sheet.

The source of a quote can either be a person ( e.g. Prime minister Cameron; Director of Friends of the earth), an organisation (e.g. Greenpeace, Shell) or a personal pronoun. Note that the quote number does not reflect the number of active voices in the debate. Prime minister Cameron can be cited or paraphrased 3 times as “Cameron” and 4 times as “he” which results in 7 unique quote numbers.

### 3.4.2.1 Validation

To determine the quality of the source detection, all source-quote relations as identified by the software have been checked manually. Within the whole database I labelled 297 quote numbers as a wrongly detected source-quote relations which means that 94% of the relations were correct. Most of the false positives were due to the occurrence of a “speech verb” which had not the function of a “speech verb” in the context of the sentence. In example 1 *shows* was identified as speech verb and *Experience* therefore labelled as source while the rest of the sentence was considered as quote.

*"Experience shows that binding renewable targets do two things."*

Other examples of wrong detections were sources did not have a quote connected to it or quotes and sources which were identified the other way around.

I also coded 20 articles of the whole dataset manually to validate the source-quote detection as a method to extract quotes. Within these 20 articles I coded a total of 243 quotes-source relations. Of these 243 relations, 167 were also extracted by the software; giving a recall of 69%. However, the quotes identified by the software were significantly shorter than the manually coded quotes. This is mainly due to the fact that at most one sentence without a source can be included in a multi-line quote to avoid false positives due to incorrect punctuation handling by the software. Though valuable information got lost, the identified quotes are assumed to be a good representation of the debate and a strong basis for further analysis.

By parsing the sentences and running the source/quote detection, the dataset including 767 news articles has been converted into an excel sheet with 668043 rows, including both tokens and punctuation marks and 4883 correctly identified quotes. In the related columns information from the dependency parser is complemented with the quote role and quote number. This is the basis dataset for all analysis done in this thesis. For a snapshot of the data see Appendix B.

### 3.4.3 Document term matrix

The input for a LDA topic modelling is a document-term matrix. Again, document is in this case often a large body of text but could apply to any unit of text such as an abstract or quote (Grimmer and Steward, 2013). By creating a document-term matrix the order in which words occur within the document is discarded. It is assumed that the order of words is not necessary to capture the general meaning of a certain document (Grimmer and Steward, 2013). Within a document-term matrix every document ( $d$ ) has a vector that counts the occurrence of each unique word ( $x$ ). Each  $W_{dx}$  represents the number of times that word  $x$  occurs in document  $d$ . A matrix is likely to contain thousands of terms and most entries will be zero which means that a specific word does not occur in a document (Grimmer and Steward, 2013). For further analysis I created a document term matrix of the dataset and considered a quote as a ‘document’ since that is the unit of analysis in research. Hence, the entry of the matrix represents the number of time a term occurs in a quote with a unique quote number. All quotes combined contain 92348 tokens.

To get more meaningful results out of the analyses it is beneficial to analyse a limited amount of words in the corpus. Not all words have meaning for the content of a quote and words that do not occur often do not give much information about the co-occurrence. Stop-words “the” and “have” generally occur in many sentences regardless of the topic or unique terms used by an actor. Therefore, these irrelevant stop-words are often excluded from the database (Jacobi et al, 2015). In order to only include words that had meaning, I made use of the POS tags assigned by the Stanford Core NLP software to

only include verbs, nouns and adjectives in the document-term matrix (Jacobi et al, 2015). With these restrictions I filtered the most common stop words except for the common verbs: "have", "will", "be", "do", "can", "would". These were filtered out individually. Furthermore, I discarded terms with a frequency equal to or less than 10, with less than 3 characters and terms that contain numbers or non-word characters. This resulted in a document term matrix containing 35586 tokens. Though many words and relations are discarded, such document term matrixes have shown to be a sufficient basis for interesting analyses on different properties of text (Hopkins and King, 2010).

### 3.5 Data analysis

The result section consists of four main parts reflecting the four sub-questions. In the first part the occurrence of the different actor types within the discourse are discussed. In the second part the content of the frames of the different actors is assessed by the links between topics and quotes. Then, in the third part an overview of key developments regarding the renewable energy sector in the UK is provided. At the end, the outcome of the three parts have been compared qualitatively and it is discussed which kind of developments have influence on the framing of specific actors. The developments over time within these different parts are shown via 3 time periods: 2005-2008, 2009-2012, 2013-2015.

#### 3.5.1 Identifying actors

To be able to tell which actors are active in the debate, all identified sources need to be coded manually into actor categories. As a good overview of the actors in the renewable energy debate was not available, I used an exploratory approach for the creation of a coding scheme. The final coding scheme is data-driven, based on empirical information from the dataset. As such an approach might harm the internal validity of the research, part of the coding has been done by a second coder.

The coding process contained three rounds of coding. In the first round a coding scheme with just actor categories that were expected based on a quick scan through a sample of the data. The following actor labels were included: UK government, Scottish government, renewable energy companies, traditional energy companies, academics and NGO. Only sources that included a name of an organisation or a function of a person were coded in this first round. In the second round all names or personal pronouns were coded. In this round the sentences around the sources needed to be read to find the organisation or the function of the person which is referred to in the source. After this round all sources were checked but some had not been labelled yet since they did not fit with any of the original labels. These first two rounds were used to pre-test the initial coding instructions and identify problems. Since initial coding schemes often yield poor agreement, pre-testing and revising the schemes is important to secure the reliability of the coding process (Miles and Huberman, 1994; Gordon, 1992)

Actor
UK Government
Scottish government
International government
Academics
Research institutes
Think tanks
Environmental NGOs and charities
Renewable energy trade association (Energy) trade associations
Public
Renewable energy companies
Traditional energy companies
Non-energy businesses
Financial organisations
Opposition
Individuals/communities
Local politics
Advisory organisations
Media
Experts

Table 1: Final coding scheme

We evaluated the coding scheme and identified some limitations of the initial coding scheme. We redefined some existing categories and added some new labels to the coding scheme, resulting in 20 different labels. These labels are listed in table 1. An explanation of all the actor labels including some examples can be found in Appendix C. With this new coding scheme we were able to code almost all sources with a specific label. Only a few sources did not match one of the labels and were labelled as 'other'.

#### *3.5.1.1 Intercoder agreement*

The next step was to ensure that the initial coding scheme was interpreted in the same way by both coders. To estimate a final intercoder agreement each coder coded a random set of 50 quotes that were coded by the other coder in the first rounds. After this, we compared the actor category that each coder assigned to the quotes. It appeared that for 84 (84%) of the 100 quotes the same actor type was assigned which indicates a rather high level of replicability. Reasons for discrepancies included issues of wrong interpretations of personal pronouns or relatively unknown actor types. After looking into and discussing the disagreements we resolved most of the discrepancies, resulting in a final level of agreement of over 90%. This indicates a shared understanding of the actor labels and a high degree of mutual exclusivity between categories. The reliability of the coding process can therefore be considered as high.

#### *3.5.1.2 Grouping of actors*

As 21 actor labels (including the label "others") would hinder a meaningful analyses, actor types have been grouped together in the next phase. Organising and grouping already coded data into categories can be done when the different code labels share some characteristics (Saldana, 2009). The 21 coding labels were put into 7 actor categories based on basic classification criteria.

The first actor category is the UK government which includes only the actor label UK government. I chose to give the UK government a separate category as it is a strong voice in the discourse and it has a unique role. The second category is political actors which consists of all other political oriented actor labels including the Scottish government, the international government, the opposition and local politics. The next category is the renewable energy industry which includes both the renewable energy companies and the renewable energy trade associations. The category traditional energy companies refers to the labels (energy) trade association and the traditional energy companies. The external actors consist of the labels advisory organisations, financial organisations and non-energy businesses. This is a collection of all commercial players with no direct relation to the renewable energy sector. The social actors includes all actor labels which are non-governmental, not focused on research and have no business incentive: Environmental NGOs and charities, public, individuals/communities and media. The last category is research containing the actor labels academics, think tank and research institutes.

### 3.5.2 Topic modelling

As a next step I applied the LDA topic model to the document-term matrix I created. To optimize the outcome of the topic model some parameters needed to be set. First, the number of topics (K) should be specified. This indicates how many topics the LDA model will categorize the words in the quotes. There is no default value or rule of thumb you can easily use to determine the optimum for this parameter (Jacobi et al, 2015). It is a trade-off between description of the data with fewer topics than actually present and remaining enough topics so that little relevant information is lost. I ran the topic model for different parameters K (10, 20, 30, 50 and 100). All resulted in topics that were quite easy to interpret and contained more or less the same topics. I chose to use K=50 for my analysis since the

interpretability of the topics seemed to be the highest which is an important criteria for choosing this parameter (Jacobi et al, 2015)

The second parameter is the alpha hyperparameter. Alpha affects how many topics one document might contain. Choosing a lower alpha leads to a higher concentration of topics within documents. In our case this would mean that quotes score high on a few topics rather than low on many. I have chosen to use a common default approach to calculate alpha which is 50 divided by the number of topics. Since the number of topics is 50, the alpha used in this research equals 1.

Running the LDA model led to a 50 lists of words which the software considered to be a topic. The top 10 words within each topic can be found in Appendix D. I labelled the topics manually based on the top ten words within these topics. For 38 of the 50 topics identified by the LDA model a clear topic related to the renewable energy discourse could be distinguished.

Every individual quote got a score on each topic reflecting the extent to which a quote is about a certain topic. I assumed that a quote should at least exceed a value of 0.05 to be about a certain topic. This means, with the set parameters ( $K=50$  and  $\alpha=1$ ), at least 2 or more words should be assigned to a topic depending on the length of the quote. A quote can be linked to more than one topic but can also be linked to no quote at all. For validation, the results were compared with the results when using other threshold values. Of course, the number of times a topic was assigned to a quote differed but the relative distribution of the topics was comparable.

### 3.5.3 Developments

To answer the third research question the developments affecting the renewable energy sector have been mapped out. For every time period the major developments from a policy and on a technology perspective are discussed separately. This is done in a qualitative way in narrative form based on the review of the archival data.

### 3.5.4 Comparison discourse and developments

The differences in the discourse are then compared to the developments as described in the previous section. Interesting links between the actors are discussed in a qualitative way for both the technological developments as the policy developments. The Findings are supported by representative quotes from the discourse. Moreover, an absence of a response in framing practices to major developments by all actors or by a few actors are highlighted as well. This approach led to insights in which way and why the developments influence the framing activities of actors. These insights are introduced in the discussion section.



## 4 Results

### 4.1 Actors

In table 2 the division of the quotes among the 21 identified actor types is presented. It shows that the discourse indeed consists of a variety of actors. A lot of different types actors are each making up at least a few percent of the total discourse.

Actor type	Actor category	Quotes	%
UK Government	Government	888	18.2%
Scottish government	Political actor	243	5.0%
International government	Political actor	240	4.9%
Academics	Research	199	4.1%
Research institutes	Research	124	2.5%
Think tanks	Research	53	1.1%
Environmental NGOs and charities	Social actor	346	7.1%
Renewable energy trade association	Ren. Energy industry	352	7.2%
(Energy) trade associations	Trad. Energy industry	72	1.5%
Public	Social actor	88	1.8%
Renewable energy companies	Ren. Energy industry	382	7.8%
Traditional energy companies	Trad. Energy industry	517	10.6%
Non-energy businesses	External actor	162	3.3%
Financial organisations	External actor	186	3.8%
Opposition	Political actor	285	5.8%
Individuals/communities	Social actor	162	3.3%
Local politics	Political actor	68	1.4%
Advisory organisations	External actor	337	6.9%
Media	Social actor	42	0.9%
Others	Other	51	1.0%
Experts	Other	86	1.8%
<b>Total</b>		<b>4883</b>	<b>100%</b>

Table 2: Absolute and relative frequency of the 21 actor labels

The UK government is the largest actor type and is responsible for more than 18% of all quotes. Other political actors like, the Scottish government, the international government, the opposition and, to a more limited extent, local politics also have a share in the discourse. This indicates that the renewable energy discourse is quite policy oriented and renewable energy is rather high on the political agenda. The Scottish government is one of the more prominent actors in the discourse as it is responsible of 5% of all quotes.

Most of the actors with a large number of quotes, such as the energy incumbents and environmental NGO's and charities could be expected as important voices in the discourse as they have an particular interest regarding the integration of renewable energy. Renewable energy companies are responsible

for a significant share of the discourse themselves but seem to be represented by trade associations quite a lot too.

Organisations not directly involved into the renewable energy sector are also present in the discourse. The actor “advisory organisations”, which mostly consists of consultants is responsible for almost 7% of all quotes. Also, financial organisations, which mainly consist of investment companies contribute significantly to the discourse. This emphasizes the variety of actors in the discourse.

The decentralised aspect of the integration of renewables and the consequences for local actors such as communities, individuals and local politics cannot be clearly seen since these actors are responsible for a relatively small share of all quotes compared to the main actors.

Combining the 21 actor labels into 7 categories according to the division shown in table 2 resulted in an allocation of the quotes as shown in table 3. Most categories have a quite comparable amount of quotes, making up between 12 and 19% of all quotes. The share of the actor research is smaller with almost 7% and the “other” category contributes less than 3% to the overall debate.

Actor type	Quotes	%
UK government	888	18.61%
External actor	685	13.99%
Renewable energy industry	734	14.55%
Social actor	638	12.93%
Traditional energy industry	589	12.06%
political actor	836	18.38%
Other	137	2.88%
Research	376	6.61%
<b>Total</b>	<b>4883</b>	<b>100%</b>

Table 3: Absolute and relative frequency actor categories

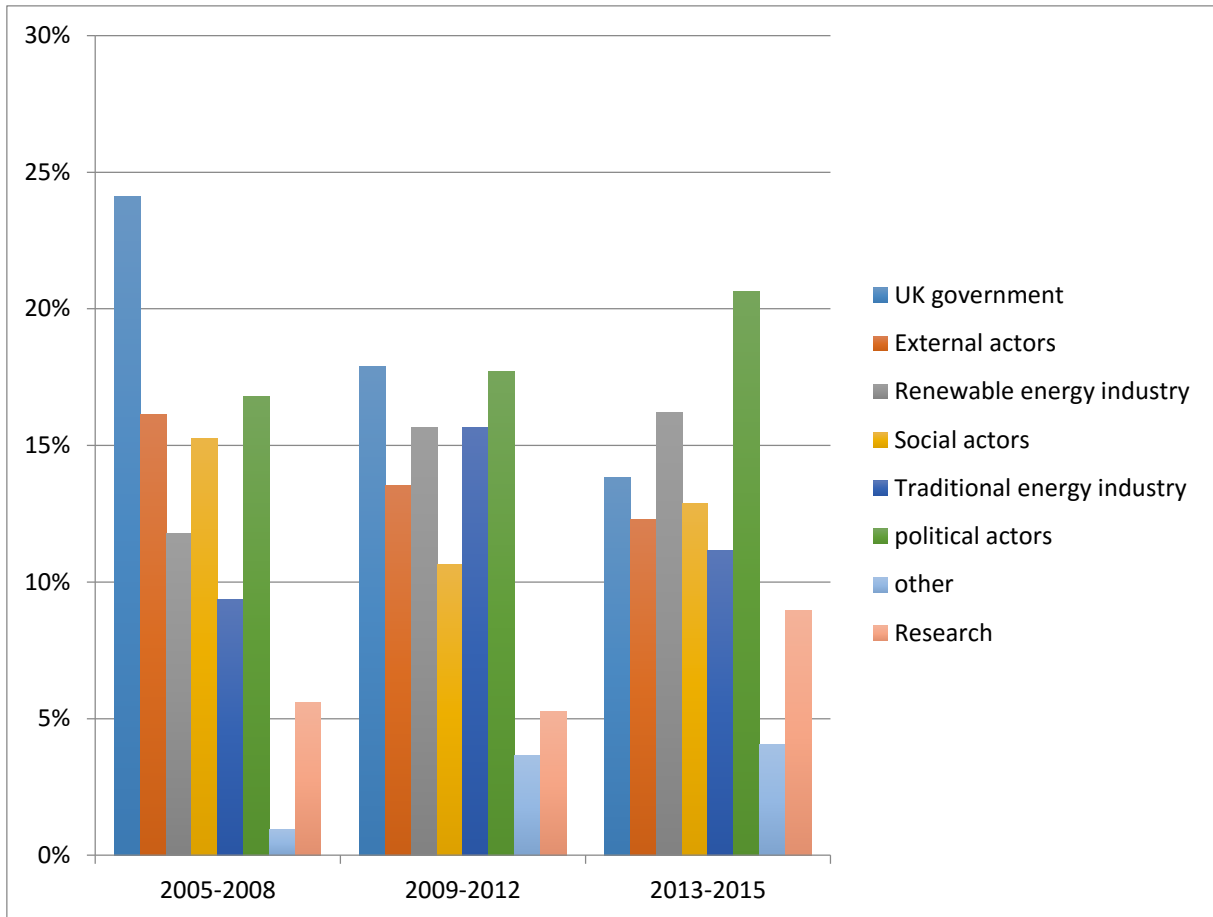


Figure 2: Relative frequency of actors in the three time periods

In figure 2 the division of quotes per actor types over the three periods is shown. Although, all actors are represented in each period, though some differences between the time periods can be noticed.

In the first period, UK government was responsible for almost a quarter of all quotes in the renewable energy discourse. Their share decreased to less than 15% of the quotes in the most recent period. However, the political debate remained strong over all periods as shown by the growing share of political actors other than the UK government in the discourse. The share of the renewable energy industry in the debate has increased slightly over the years which is in line with the growth in renewable energy generation. External actors became less present in the debate as their contribution decreased with 3.9 percentage point in the last period compared to the first. Social actors have a relatively small contribution in the second period with only 10.6% of the quotes. The traditional energy industry, on the other hand, was most active in the second period with more than 15% of all quotes compared to around 10% in the other periods.

## 4.2 Framing practices

### 4.2.1 Interpretation of the topics

To get a better feeling of the dynamics of the discourse and its content a topic model has been created from the document-term matrix. This resulted in a categorization of words which led to 50 topics. I was able to interpret and label 38 of the 50 identified topics. The 12 unlabelled topics consist of words that are too general or do not have a clear connection to each other in the renewable energy context. The topics that could be interpreted have been labelled with one or two elements which represent the most prominent words the best. A list of the ten words with the highest probability to occur are listed for each topic in Appendix D. To validate the label given to a topic, I looked at individual quotes that were linked to the topic. The labelling of some of the topics are explained below to give insights into how the interpretation and labelling process were executed.

One of the topics was mostly represented by “climate” and “change” but also by words like “tackle”, “fight” and “threat”. This topic was therefore labelled as *climate change; threat*. A check of some of the quotes linked to this topic, such as example 1, confirmed this label.

#### **Example 1 (Climate change; threat)**

*"Projects like this are urgently needed to help tackle the immense threat of climate change"*

Social actor, 2008

Since the topic with “offshore” and “wind” as most prominent words also included words as “development” and “opportunity” and largest I labelled it as *offshore wind; opportunity UK* to emphasize the positive direction of the framing. The quotes linked to this topic, such as example 2, confirm this interpretation.

#### **Example 2 (Onshore wind; opportunity UK)**

*"Offshore wind will become a multi-billion pound global industry over the next few years"*

Social actor, 2008

The topic *policy; criticism* includes, besides government and policy, “negative” words like “lack”, “wrong” and “less”. In this case it is very helpful to include two terms “policy” and “criticism” to capture the content of the topic. However, it was not always necessary or possible to use two terms to capture the content of a topic. A topic represented by words as solar, panel, biomass and boiler with some other “neutral” words like home, panel and product has been labelled as *small scale renewables*. No further term was needed to capture the content of the label. *Onshore wind* is a very broad topic with several aspects of onshore wind energy included in the most frequent words such as “cheapest” and “noise”. These words represent different aspects of onshore wind and I used only the term “onshore wind” as no further specification could be made. The topic *fossil fuel; reduction* differs from the topic *fossil fuels* since in this topic includes besides “fossil” and “fuel” words like “save”, “lower” and “tax” which indicate a desire to limit the use of fossil fuels. The topic *fossil fuels* is characterised by examples such as “oil”, “gas” and “coal”. The difference between these two topics is represented by the following two example quotes:

#### **Example 3 (Fossil fuels; reduction)**

*"for every \$ 1 that countries do not spend on cleaner fuel, they will have to spend \$ 4.3 within the next two decades to make up, for reliance on fossil fuels"*

Political actor, 2012

**Example 4 (Fossil fuels)***"Using gas to displace coal in power generation is a very important step"*

Traditional energy industry, 2015

After the interpretation and labelling process, the links between quote and topic were identified based on their score on a specific topic. In total, 3272 links between the 4883 quotes and the 50 topics were found. A quote could be linked to more than one topic or no topic at all, dependent on the score on a topic within the quote. The number of times a topic is linked to a quote for is referred to as the number of links for that topic. The 12 unlabelled topics occur relatively little, with 9 of them among the 15 least mentioned topics. This indicates that the unlabelled topics do not play a major role in the discourse. Therefore, these topics will be ignored which means there are 2714 links between quotes and topics for the analysis. The 38 labelled topics and the number of links within the quotes are listed in table 4.

#	Topic	links	#	Topic	Links
1	Onshore wind	152	20	Influence economy; positive	62
2	Climate change; threat	146	21	Leadership role; environment	62
3	CO2 emissions reductions	135	22	Reform subsidy, negative	61
4	Fossil fuels	117	23	Stimulation RE	61
5	Government target	105	24	Business strategy	61
6	Supply of electricity	98	25	Changes in energy generation	58
7	Nuclear energy	96	26	Funding; investment	57
8	Fossil fuels, reduction	90	27	Increase in costs	57
9	Offshore wind, opportunity UK	84	28	Small scale; heat	55
10	Costs, consumer	78	29	Policy, criticism	54
11	Value of industry	78	30	investment, new technologies	51
12	Security, energy mix	76	31	Sustainable, energy efficiency	50
13	Location projects, planning	75	32	Tackling uncertainties	50
14	local energy, consequences	74	33	Share RE, country	49
15	Small scale renewables	70	34	Security, supply	43
16	Grid connection	67	35	Increasing RE; Local	42
17	Subsidy	66	36	Market strategy	39
18	Public opinion	63	37	Government's attitude	39
19	Marine energy	62	38	Need for capital	31

Table 4: The 38 labelled topics and the number of links with topics

The identified topics show that the discourse on renewable energy is diverse and addresses a lot of different issues. Policy appears to be a core element in the discourse as several topics are in some way related to it such as *government target and subsidy*. Specific technologies are discussed with onshore wind occurring the most with a total of 152 links which confirms its status as most prominent renewable energy source in the UK. More business focused topics such as *market strategy* and *investment; new technologies* also appear. Moreover, non-renewable energy technologies have an

important role in the renewable energy discourse with *fossil fuels* (117 links, 4.3%<sup>2</sup>), *nuclear energy* and *fossil fuels; reduction*. (95 links, 3.5%) Some of these issues are quite broad such as *reduction CO<sub>2</sub> emissions* while others such as *location projects; planning* are more specific to a certain element of renewable energy.

The topics show that the diagnostic and prognostic framing tasks as often distinguished in the framing literature can be identified in the renewable energy discourse. Topics relate to some kind of problem related to renewable energy and/or a solution to such a problem. Not a clear distinction can be made between prognostic and diagnostic framing as most topics contain both elements, though there are some example of topics (e.g. *climate change; threat*) that focus more on the problem while others are more related to the solution (e.g. *stimulation RE*). The motivational element of framing appears in combination with a problem or a solution statement and tends to be more implicit in the topics. This is illustrated by example 5, in which the location of a wind energy project is considered to be a problem for the biodiversity in an area. At the same time, it can be considered as a call to authorities to block the plans for the development of the wind project.

#### **Example 5 (Location RE)**

"It [offshore wind project] would destroy huge areas of estuary marsh and mudflats used by 69,000 birds each winter and block the migration routes of countless fish"

Social actor, 2009

#### 4.2.2 Topics over time and per actor

Differences in topic use among the actors can be noticed. It appears that the framing of all actors relates as could be expected to their interests in renewable energy. Social actors use general topics such as *climate change; threat* (38 links) and *CO<sub>2</sub> reduction* (22 links) relatively often, especially compared to the renewable energy industry (4 and 8 links, respectively). Also research and political actors use these topics relatively often. The renewable energy industry is quite specific in their framing with specific technology topics such as *onshore wind* and *offshore wind; opportunity UK* among their most used topics. Those kinds of topics are little used by the traditional energy industry which mention non-renewable energy technology with *conventional energy sources* (21 links) and *nuclear energy* (18 links) as most prominent topics. The business-related topics, market creation and business strategy, are mostly used by the commercial actors: the renewable energy industry, the traditional energy industry and the external actors. The investment related topics, *Need for capital, investment; new technologies* and *funding; investment* are, as could be expected, mainly used by the external actors and the renewable energy industry. Although the government has a relatively large use of policy related topics, it covers a broad range of topics in their framing. This emphasizes their central role in the discourse, Political actors consist of actors with different incentives which is reflected in the topics occurring in their quotes though it seems that controversial issues as *climate change, threat; nuclear energy* and *fossil fuels* are prominent. Research actors mainly focus their framing on the general issues related to CO<sub>2</sub> emissions and climate change. The links of these topics change over time and the most interesting patterns are discussed below

##### 4.2.2.1 Policy

The more general topics such as *government target* and *subsidy* are especially discussed a lot in the first period with 37 links (5.2%) and 25 links (3.5%). These topics especially appeared in the framing of the government. The topics *reform subsidy; negative, policy; criticism* and *stimulation RE* all become

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<sup>2</sup> Percentage that the links mentioned makes up of all links. This relative occurrence in the discourse is especially insightful when comparing periods as more links are found in the first period than in the second. Just an absolute number could give a distorted picture.

more prominent, each making up around 3% of the discourse in the last period compared to only 1 % in the first. This is mainly due to the fact that the renewable energy industry uses these topics for their framing. In the last period they are responsible for half of the use of the topic *reform subsidy negative* (15 links).

#### 4.2.2.2 Climate

The overarching goal of climate change is represented by *Climate change; threat* and, as mentioned above, mainly used by social and political actors. It is prominent in the last period (55 links, 7.7%) and the last (66 links, 6.0%) but less in the second (25 links, 2.8%). The use of the topic *leadership role; environment* is the highest in the first period (24 links, 3.4%) and decreasing towards the end, making up only 1.5% (17 links) of the discourse. The social actor is using this topic the most, especially in the first period (8 links).

#### 4.2.2.3 Non-renewable energy

The non-renewable energy sources play a prominent role in the discourse around renewable energy. *Nuclear energy* occurs especially a lot in the first period (4.5%) while *fossil fuels* is prominent in the last period (5.7%). This trend can be seen very clearly in the framing of the traditional energy industry. *Nuclear energy* is their most frequently used topic in the first two periods (16 links in total), while in the last period they hardly mention it anymore (2 links). On the other hand, *fossil fuels* is used 13 times for their framing in the last period compared to 2 times in the first. Comparable patterns can be seen for the other actors except for the renewable energy industry, which use non-renewable energy sources very little in their framing.

#### 4.2.2.4 Decarbonisation

In relation to the increase of the *fossil fuels* topic, the topic *fossil fuels; reduction* also becomes more prominent (11 links vs 42 links). Political actors (19 links) and research (15 links) use this topic the most. A related but less specific topic, *CO<sub>2</sub> emission; reduction*, occurs more or less constantly over time and is mostly used by the government (35 links, 1.3%) and social actors (22 links, 0.8%). An alternative for decarbonisation is most frequently mentioned by the traditional energy industry by using the topic *sustainability; energy efficiency* (12 links).

#### 4.2.2.5 Economy

The topic *value of industry* is the most prominent in the first period (31 links, 4.4%) with the government making use of it the most (11 links). In the last period this topic accounts for only 1.9% of the discourse. The related topic *influence economy; positive* peaks in the second period as the part it makes up from the discourse is 1.5% percentage point higher. Also, here the government is using this topic the most (19 links) but also the renewable energy industry (15 links) and political actors (11 links) use it regularly.

#### 4.2.2.6 Technology

Specific renewable energy sources occur a lot in the framing around renewable energy. *Onshore wind* (152 links, 5.6%) is the most prominent topic and also *offshore wind; opportunity UK* (84 links, 3.1%) and *Marine energy* (62 links, 2.3%) are mentioned specifically. The renewable energy industry uses these topics a lot in their framing (62 links) while the traditional energy industry uses them less (21 links). *Onshore wind* is one of the most prominent topics in all three periods. In the last period this is mainly due to the framing of the government, the renewable energy industry and the social actors since they are responsible for almost all links of this topic in this period. The use of the topics *offshore wind; opportunity UK* and *marine energy* peaks in the second period with an increase in use compared to the other two periods of 1.5% and 2.0% percentage point, respectively. These topics became especially prominent for external (16 links) and political actors (19 links).

The topic *small scale renewables* occurs more in the first period (26 links, 3.7%) than in the last period (25 links, 2.3%) in relative terms. *Small scale; heat* is used relatively constantly as a topic over the three periods (65 links in total). In the beginning the government (12 links, 1.7%) and the external actors (11 links, 1.7%) use these two topics the most in their framing while in the later stages it occurred more often in the framing of the renewable energy industry (11 links, 1.0%). As well as with the more technology focused small scale topics, *local energy; consequences* occurs the same amount of times in the discourse in relative terms. The local and small-scale topics are a popular way of framing for the renewable energy industry (40 links) while used the least by the traditional energy industry (16 links).

#### 4.2.2.7 Energy system

There are a couple of topics which relate to the energy system and the supply of electricity. The topic *supply of electricity* occurs the most frequently of them (98 links, 3.6%) and is used most by the government (19 links) and the political actors (23 links). Government is also using related topics such as *energy mix; supply* (13 links) and *grid connection* (14 links) frequently compared to other actors in the first two periods. However, *grid connection* enters the framing of both the traditional (9 links) and the renewable energy industry (7 links) while the government uses this topic less (3 links). The topic *security of supply* does not play a large role in the discourse in the first period (6 links, 0.8%), its use is increasing towards the end (21 links, 1.9%), mainly due to the government framing. The political actors and the social actors address energy security mainly by using the topic *energy mix; security* (18 and 13 links respectively).

#### 4.2.2.8 Costs

Costs of renewables became more prominent in the discourse over time with a strong increase in use of both the topics *costs consumer* and *increase costs*. Most actors have a preference in their framing for the topic *costs consumer* with only the traditional energy industry with a preference for the topic *increase costs* (13 versus 6 links). The growth in the use of “costs topics” can be seen the most clearly for the government which mentioned these topics 20 (1.8%) times in the last period compared to 6 (0.8%) in the first period.

## 4.3 Events

### 4.3.1 Period 1 – 2005-2008

#### *Policy and government*

A Labour government was in charge over the whole period with Tony Blair as PM up to June 2007 when he resigned and was succeeded by Gordon Brown. In 2007 the EU renewable energy directive was established in which targets for greenhouse gas emission reduction, renewable energy shares and energy efficiency improvements were set by EU leaders. The energy act 2008 was introduced to make provision for different aspects of energy generation such as gas importation and carbon capture and storage and payments to small-scale electricity generators. Moreover, it allowed local authorities to set their own standards for renewable energy requirements in development plans. More small scale initiatives were launched such as a Low Carbon Building Programme in 2006, a Microgeneration Strategy Programme in 2006 and an Environmental Transformation Fund in 2007, all meant to increase the deployment of micro-generation. Another important policy measure introduced in 2008, the Renewable Transport Fuels Obligation, was focussed on the transport fuels which included a long term mechanism requiring transport fuel suppliers to ensure a set percentage of their sales are from a renewable source. In the end of this period the Climate Change Act 2008



became law. Major provisions of the Act include the setting of legally binding greenhouse gases reduction targets which ensures a 80% reduction in 2050 and the legally binding targets, the establishment of a carbon budgeting system and the establishment of the Climate Change Committee, an independent advisory body.

### *Technology*

This period is characterised by a small uptake of renewable energy sources. Onshore wind is besides hydro and bio energy by far the largest renewable energy source in the UK in 2005 with a total 2,5 GWh was generated by small scale and large scale onshore wind farms. In 2008 this figure was more than doubled to 5,8 TWh. In 2005 only 4 offshore wind parks were in operation but especially in the last year of this period offshore wind grew strongly and was responsible for 1,3 TWh in 2008. However, wind still had only a small share in the total energy generation with less than 0.5% of the total electricity generation. Photovoltaics (PV) hardly played a role in this period in the UK. In 2005 10.9 MW PV capacity was installed which only grew to 22.5 MW in 2008. Also, marine energy played a marginal role with only a couple of test devices installed although some grants and funds were established to support research.

In 2007 the public interest on the topic of shale gas was triggered when Cuadrilla was granted a licence for shale gas exploration along the coast of Lancashire. A major development regarding nuclear energy was a high court ruling won by Greenpeace that led to the decision that the government's plan to build new nuclear plants to meet carbon targets was unlawful. In 2007 NGO's including Greenpeace and FOE pulled out of a consultation on the future of nuclear power. In early 2008, government gave approval to proceed with planning of the construction of new nuclear power stations.

#### 4.3.2 Period 2 – 2009-2012

### *Policy and government*

A change in government took place in this period. Up to 2010 (general election in May 2010) the labour government with Gordon Brown was still in place. After the elections of 2010 a coalition government was formed between Conservatives and Liberal Democrats with David Cameron (Conservative Party) as PM. One of the main developments in this period is the Copenhagen Climate Change Conference in 2009. The goal of the conference was to reach agreement on how to approach issues on climate change. It resulted in the Copenhagen Accord, which expressed a political intent to constrain carbon and react to climate change. This accord was signed by the UK and 113 other countries involved in the conference. Further, the targets set in the Renewable Energy Directive of 2007 were enacted in legislation in 2009 including allocation of country shares which are binding targets (15% for the UK). As a response a national Renewable Action Plan was introduced which outlines how the UK will meet the targets as set by the Directive. In 2009, the Low Carbon Industrial Strategy was launched with the aim to ensure that British businesses were able to maximise the opportunities and limit the costs of transitioning to a low-carbon economy. This included investments to accelerate offshore wind and tidal energy development and nuclear energy investments. The renewable heat incentive came into place in 2011, initially just for the non-domestic sector. It aimed to stimulate the use of renewable heat by a financial incentive. For small-scale renewables the introduction of a Feed-in-Tariff (FiT) had a large impact. The Feed-in Tariff guaranteed a fixed payment rate per kWh generated to the owner of the system for the duration of 20 years. This scheme was revised in 2012. Especially the FiT for solar was reduced significantly. For

all other technologies the generation tariffs were slightly changed or not changed at all. Deployment rates were taken into account to control the cost of the scheme.

### *Technology*

This period is characterized by a slow increase in the renewable energy generation in the first two years and a large increase in the last two years. Bioenergy is still responsible for most of the renewable energy production but wind energy became a considerable energy source between 2009 and 2012. Generation from onshore wind increased therefore from 5.8 TWh in 2008 to 12.1 TWh in 2012 accounting for 3,3% of UK's electricity generation. The number of offshore wind farms increased with 20 fully operational windfarms and 4 windfarms under construction. This led to a strong increase in generation from 1.3 TWh in 2008 to 7.5 in 2012. Also PV emerged as a significant energy source in the UK in this period. Supported by the Feed-in tariff scheme, the capacity of PV installations in the UK grew exponentially after 2010. Generation in 2012 was nearly four times higher with 1,188 GWh compared to 2011 (up by 944 GWh). Marine energy received a lot of attention in this period and the UK became a world leader in wave and tidal stream energy. Different funds and grants were launched and investments were made by, for example, the UK Technology Strategy Board (TSB) and the Engineering and Physical Sciences Research Council (EPSRC), which invested £7m in 9 wave and tidal projects. In 2010 the Crown Estate announced their decision on the first commercial leasing round, leasing six wave and four tidal sites in the waters off the north of Scotland. Several test facilities were successfully deployed.

From 2009 to 2011 ten sites were identified for new nuclear power plants. In March 2011, an earthquake and tsunami caused a nuclear disaster at Fukushima caused which resulted in large releases of radioactive materials. In 2012 two of the big six energy suppliers decided not to proceed to develop new nuclear power projects in the UK. Fracking activities were suspended in 2011 after two seismic tremors related to Cuadrilla fracking activities (the only ones in the country) in Lancashire. This suspension was lifted after new controls were implemented to mitigate the risks of seismic activity. In December 2012, the Government confirmed gas would continue to play an important role in the energy supply mix. The Gas Generation Strategy sets out a number of steps that would be taken to stimulate investment in gas generation.

#### 4.3.3 Period 3 – 2013-2015

##### *Policy and government*

Another change of government took place in this period. The coalition between the Liberals and the conservatives was replaced after the elections in 2015 by a Conservative government with David Cameron as PM. In the end of the 2015 United Nations Climate Change Conference, COP 21 took place. The Paris Agreement was negotiated and agreed on by all the representatives of the 196 countries participating. The energy act of 2013 focussed on decarbonisation of the electricity supply, security of supply and control of the costs of energy. This led to a couple of policy incentives such as the replacement of the Renewable Obligations with the Contracts for Difference as main support mechanism for renewable electricity projects in the UK. The Contracts for Difference include support for nuclear energy and CCS. A framework called The Green Deal was introduced as well, which allowed building owners to pay for some of the costs of renewable energy or energy efficiency improvements using a loan that is paid back with the savings they could expect to make on their fuel bills. The Renewable Heat Incentive is expanded to include domestic heat in 2014. In mid-2015 the

Green Deal was ended since it had a low take-up and unclear industry standards according to the Department for Energy and Climate (DECC). Around the same time DECC opened the FIT scheme to the review consultation process. DECC proposes to severely cut Feed-in Tariff levels for PV and non-PV installations starting as soon as possible.

### *Technology*

Although data on the last year is lacking, it can be concluded that the renewable energy generated in this period increased rapidly. This has led to problems with grid connection for renewable energy projects throughout the UK. For example, Western Power Distribution, one of the DNOs, has closed the grid to new large renewable projects in several places for up to six years.

The electricity generated from renewable energy sources increased from 11.3% in 2012 to 19.8% in 2014. Onshore and offshore wind are still the main contributors in the renewable energy generation and grew between 2012 and 2014 with an increase of 48% and 87% respectively. In absolute terms the increase in generation due to biomass was the largest, going from around 5 TWh in 2012 to more than 13 TWh in 2014 due to the conversion of some large coal plants as well as some new installations. Solar energy had a large uptake increasing from 1.1 TWh to 4.1 TWh, an increase of almost 300% in only two years. Marine energy is still in the development phase and in 2014 its energy generation fell by 62% as test devices were not constantly in operation. Some problems arose as part of the financial support was stopped and concerns about the environmental impact have been addressed.

The office of Unconventional Gas and Oil was established to promote the development of shale gas and oil. Around 18 new wells have been drilled in this period with no commercial production yet. In 2013, a cross party house of commons report on future of nuclear was published which stated that without new build nuclear power “it will be extremely difficult to meet our low-carbon obligations, and potentially more expensive too.” Nuclear power is supported by the government as an attractive low carbon solution.

## 4.4 Comparing developments and discourse

When the patterns in the discourse and the policy and technology developments in the field are compared some interesting relations are noticeable. Patterns are discussed between a development and the use of a related topic by an actor or a couple of actors at a certain time period. I also address the actors that are not impacted by a certain development. Moreover, I analyse which major development do not seem to have an impact at all. Emphasizing these differences allow for interpretation on why certain developments impact the discourse.

### 4.4.1 Technological developments

When looking at the changes in the use of the topics related to specific RE sources, it appears that the peak in the use of the topics *offshore wind*; *opportunity UK* and *marine energy* relates to the developments around offshore wind and marine energy. Offshore wind capacity increased rapidly since a lot of farms were operationalised and offshore generation became a significant share in the energy mix. In this period offshore wind was framed as an opportunity for the UK in terms of energy generation by the political actors, mainly the Scottish government, and the investors within the external actors.

**Example 6 (Offshore wind; opportunity UK)**

"Scotland has an opportunity with offshore wind which can only be delivered through a modern, purpose-built infrastructure. This will act as a catalyst to open up finance from other sources and give Scotland the capability to realise its offshore development "

*External actor, 2010*

In the last period offshore wind capacity continued to rise but the use of the topic reduced, except for the renewable energy industry which increased their use of this topic.

For the *marine energy* topic a similar story can be told, although the technology is in a much earlier stage of development. In the second period a lot of test projects were planned and development funds were established. This led to an increase of links in marine energy and speculation about its potential within the framing activities especially from the Scottish government and the renewable energy industry.

**Example 7 (Marine energy)**

"Scotland has 25 per cent of the EU 's offshore wind and tidal power potential , and 10 per cent of its wave potential"

*Renewable energy industry, 2010*

Marine energy lost momentum and commercialisation was not achieved right away and the topic *marine energy* became less popular.

There is not always a strong relation between the occurrence of topics and the uptake of the technology. The topic *small scale renewable* with solar as most representative word is not influenced by the strong growth in PV capacity or the rapid decline in costs of solar energy but rather constant over time for all actors. Also the use of the topic *small scale heat* seems not to be influenced by any technological developments.

The grid connection problems at the end of the last period let to an increased use of the topic *grid connection* by the traditional energy industry and the renewable energy industry.

**Example 8 (Grid connection)**

"the Government had decided to allow wind farms to be built and connected to the grid despite knowing that its "extensive programme of network reinforcement" would not be completed for several years"

*Traditional energy industry, 2015*

It does not seem to have had an impact on the framing of the government as their use of this topic decreases over time. However, the increase of renewable energy capacity seems to have had an impact on the use of the related topic *supply security* for both the government and the political actors.

**Example 9 (Supply security)**

"Offshore wind is going to be required to keep the lights on in England"

*Government, 2015*

Developments related to non-renewable energy sources have had impacts on the framing around renewable energy. The plans of building new nuclear power plants made the topic *nuclear energy* occur a lot in the renewable energy discourse in the first period as an alternative for decarbonisation and in some cases to oppose subsidies:

**Example 10 (Nuclear energy)**

"British backing for renewables, would undermine nuclear power"

*Traditional energy industry, 2008*

However, a strong decline in the use of the topic can be observed over the periods which seems to relate to the nuclear disaster in Fukushima. Especially the framing of the traditional energy industry is affected significantly by this event.

The increase in the use of the *fossil fuels* topic can be explained by several developments. Firstly, it is related to the developments around shale gas. The first granted license for fracking and the start of the public interest did not have an immediate impact on the renewable energy discourse. Though commercial drilling had not started yet, shale gas entered the renewable energy discourse in the last period when the number of licenses increased and the government established the office of Unconventional Gas and Oil (OUGO) to stimulate the shale gas industry. Shale gas is mostly presented as a low-carbon fossil fuel which either should or should not become part of the energy mix.

**Example 11 (fossil fuels)**

"The issue of shale gas exploration, or fracking, will be another key decision during the planning of the fifth carbon budget "

External actor, 2014

This is related to the second development that boosted the use of *fossil fuels* in framing around renewable energy: the replacement of coal by gas in the energy mix as a way of reducing CO<sub>2</sub> emissions. Both government and the traditional energy industry seem to be addressing this opportunity to decarbonisation.

**Example 12 (Fossil fuels)**

" Using gas to displace coal in power generation is a very important step"

Traditional energy industry, 2015

Another reason for the increase of *fossil fuels* is related to the development discussed above: the increase of renewable energy and the concerns this raises towards energy security. The traditional energy industry frames gas as a solution to the problem via the topic *supply security*.

**Example 12 (Fossil fuels)**

"An accelerating move to natural gas is critical to keeping the lights on"

Traditional energy industry, 2015

#### 4.4.2 Policy developments

The EU directive setting renewable energy targets seems to trigger the government to become active in the discourse since *government target* is the most prominent topic in their framing in the first period, example quote 13 refers specifically to the EU target.

**Example 13 (Government target)**

"the government would review its strategy to meet the UK share of the EU renewables target"

Government, 2008

The framing of a possible solution seems to be influenced as topics such as *subsidy* are used relatively a lot in the first period compared to other periods as well as compared to other actors. At the same time framing of potential problems related to supply occurs in government framing such as *grid connection* which can be seen in example quote 14.

**Example 14 (Grid connection)**

"It [the government] would remove without delay the barriers that currently prevent renewable generators connecting to the national grid "

*Government, 2008*

For all other actors effects of the EU directive are not directly noticeable. Though the relatively large use of the topic *leadership role, environment* might be explained by the influence of this directive as example quote 15 indicates.

**Example 15 (leadership role; environment)**

"We are an island that has fantastic potential for renewable power and could be leading the world"

*Social actor, 2008*

The fluctuations in the occurrence of the topic *climate change; threat* in the discourse correspond with the climate conferences that were organized in 2009 and 2015 as well as the climate change act in 2008. In the run up to these events especially the political actors, research and the social actors emphasized the problem of climate change:

**Example 16 (Climate change; threat)**

" Projects like this are urgently needed to help tackle the immense threat of climate change"

*Social actor, 2008*

The framing of the renewable energy industry and the traditional energy industry do not seem to be affected by these climate change events.

The introduction of the FiT does not have a big impact on the discourse and no changes in the use of topics that could be associated with it. The introduction of small scale generation funding and grant programmes and the establishment of a microgeneration strategy in the first period also have minor impacts. Only the government uses the *small scale renewables* topic relatively more in the first period but it does not appear yet in the framing of the renewable energy industry.

In summary, the introduction of policies do not seem to have a large impact on any individual actor group in the discourse. However, the cuts in the FiT in 2012 and especially the proposed cuts in 2015 had a large impact on the presence of the renewable industry in the discourse and their framing. It blamed the government, directly or indirectly, for harming the renewable energy industry and especially the solar industry as can be seen in example 17.

**Example 17 (Reform subsidy; negative)**

"Next year we are sadly expecting solar installations to decline due to the government taking away key support for the industry"

*Renewable energy industry, 2015*

The renewable energy industry uses the topic *reform subsidy, negative* as a very specific way of framing. The government also slightly increases their use of this topic as a response. A larger effect can be seen in their use of the topics *increase of costs* and *costs; consumer* which seem to be an alternative response to the framing of the renewable energy industry. This idea is supported by example 18.

**Example 18 (costs consumer)**

"We're taking urgent action to address the projected overspend on subsidies for renewables and protect bill payers"

*Renewable energy industry, 2015*

The changes of government have had a large impact on the discourse around renewable energy. Directly, since the more conservative government addressed problems related to renewable energy such as costs and started to use the topic *fossil fuels* in their framing. But also indirectly, by actively reducing support for renewable energy. This led to the use of the topic *reform subsidy, negative* but also a direct *policy criticism* mainly used in the last period by the renewable energy industry and *research*.

**Example 19 (Policy; criticism)**

*"Lack of clarity in policy is damaging investment in renewable energy"*

*Research, 2015*

# 5 Discussion

## 5.1 Discussion of results

Based on the topics identified it can be concluded that the framing practices of the actors are revolving around problems related to renewable energy and their solutions. This is in line with the framing literature, which acknowledges that problem identification, diagnostic framing, and solution identification, prognostic framing, are core elements of the discourse. These different types of framing cannot be distinguished according to the topics since most topics seems to include elements of both prognostic and diagnostic framing. This is in line with previous research that emphasized the overlap between the different types of framing.

However, what clearly can be distinguished from the topics is that the way these framing practices relate to renewable energy differs. Renewable energy can have different roles within the discourse either related to the problem or the solution. The frequently used topic *climate change; threat* deals with renewable energy as a way of reaching the solution of reducing CO<sub>2</sub> emissions to the problem of climate change. This is a very general aspect of the discourse, referring to the overarching goal of integrating renewables. Somewhat more specific framing practices refer to renewable energy as the solution to reduce CO<sub>2</sub> emissions, for example by using the topic *government target* or *CO<sub>2</sub> emissions; reduction*. Increasing the share of renewable energy can however also be seen as a problem, with either a specific technology or ways to stimulate deployment such as the investment topics and the subsidy topics as possible solutions. The last level which can be identified within the discourse includes framing practices referring to problems or challenges caused by the deployment of renewable energy and possible solutions. The problems can related to the increasing costs for energy due to the integration of renewables such as the *costs; consumer* topic or to problems with grid stability such as the topic *grid connection*. So, four levels of framing, going from general towards more specific issues related to renewable energy, can be identified. The solutions from one layer result in problems for the next layer. A framework is represented in figure 3.

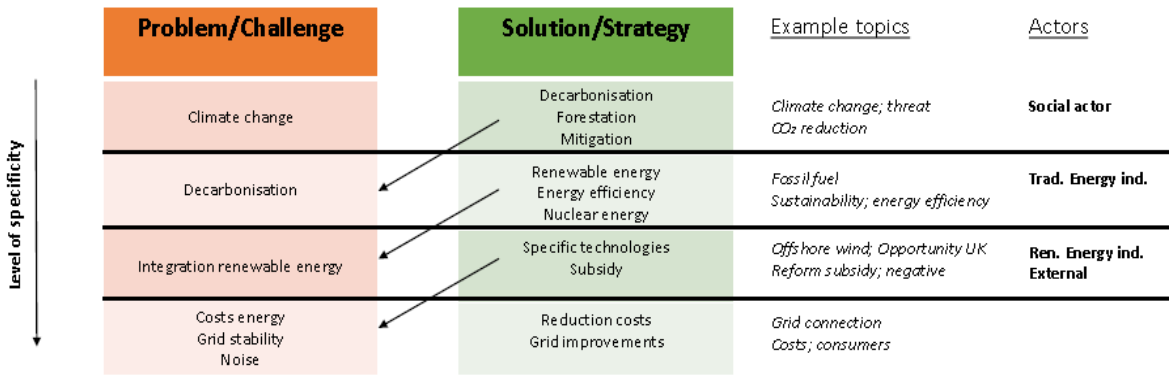


Figure 3; "level of framing" framework including links with example topics and actors

Topics relate to one of the levels of framing based on the problems and the solutions they deals with. Several topics are added to framework to clarify the differences between the levels. Some of the actors are also linked to a certain level based on their most frequently used topics. This provides some insights into how actors approach the renewable energy discourse. The social actors, including the



environmental NGOs, use the topic *climate change; threat* the most and also the topics *CO<sub>2</sub> emission; reduction* and *leadership role; environment*. Their framing in the renewable energy discourse is general and they see climate change as the main problem and the reduction of CO<sub>2</sub> emissions as the way of solving this. Prominent topics in the framing of the traditional energy industry, relate to the second layer of framing with CO<sub>2</sub> emissions reduction as the problem. The topics *fossil fuels, nuclear energy* and *sustainability; energy efficiency* are all alternatives to solve the problem of CO<sub>2</sub> emissions reduction. The renewable energy industry frames integrating renewables as the problem as they use topics like *onshore wind, offshore wind; opportunity UK* and *reform subsidy; negative* quite often. The government has a kind of mediator role in the discourse and their main framing practices include topics from all four levels with *climate change; threat, fossil fuels, onshore wind and costs; consumers* among their most prominent topics.

The renewable energy discourse includes different levels which have their own problems and associated solutions. Actors vary in the layer they focus their framing on based on their own interest. Since actors engage in framing practices to influence the opinion of others this misalignment might reduce the effectiveness of their framing. The framing of renewables by the social actors relates to a very general level, in which renewables is a way of reaching the solution of CO<sub>2</sub> emissions reduction. Framing the problem as CO<sub>2</sub> emissions reduction rather than integrating renewable energy leaves the opportunity for the traditional energy industry to come up with alternatives for renewables within the renewable energy discourse such as nuclear energy or shale gas instead of coal. These alternatives are probably less favoured by the social actors. The problem of a mismatch between levels of framing can also occur in one specific example. The renewable energy actors responded to the subsidy cuts by arguing that they harm the industry, identifying challenges associated with the integration of renewables as the problem. However, the government diagnoses the costs associated with the subsidies as the main problem. The renewable energy industry might have been more effective with their framing if they were active on the same framing level.

A clear connection between the changes in the discourse and some of the policy and technological developments can be seen. No clear differences in impact between technological and policy developments can be noticed. For both some developments seem to have much impact on the discourse while the effects of other developments can hardly be noticed. A development can impact the interpretation of the problem as well as the interpretation of the possible solution of a certain actor. A development can have a big impact on the framing of one actor while hardly affecting another actor's framing. This might be due to the solutions and problems that are affected by the development. The nuclear disaster in Fukushima impacted the framing around the reduction of CO<sub>2</sub> emissions but did not directly affect the more specific levels of framing. The developments in marine energy offered a solution to the problem of integrating renewables but did not directly influence more general levels of framing. It appears that developments are more likely to affect one level of framing than affecting all of them.

However, the change in the diagnoses of the problem and the identification of a related solution are not the core reasons for an actor to become active. The upcoming climate change conference did not change the view of the political actors or the social actors on the issue but had a big impact on the framing activities of some of the actors as a kind of field-configuring event. On the other hand, the introduction of subsidies is likely to change an actors view on solutions or strategies for renewable energy integration. However, this does not seem to have an effect on the discourse.

The goal of framing is to express interpretation and influence the framing of other actors according to your own interest. It seems that developments trigger actors to engage in framing practices, actively influencing the interpretations of other actors, when these other actors have the power to change

something in their interest. The framing related to a development includes a “call to arms”, a direct or indirect appeal to undertake a particular course of actions. This aspect of framing, referred to as the motivational task of framing in the literature (Benford and Snow, 2000), is an essential element in the framing practices in response to events. The proposition to cut the feed-in-tariff led to framing of the renewable energy industry to influence the government not to go forward with these plans. The developments around offshore wind energy increased the use of the topic *Offshore wind; opportunity UK* to motivate others to get consent for offshore wind projects or to fund offshore wind projects. The problems with the grid resulted in a call for action from the industry towards the government via the topic *grid* connection. The increase in installations and the sharp cost reductions of PV are likely to affect the idea about PV as a solution to increase the renewable energy share. However, since there is no urge for any actor to motivate others to act, the impact on the framing practices is limited.

## 5.2 Implications

### 5.2.1 Practical

The results show that different actors are concerned about different things in relation to renewable energy. They do not diagnose the same problems and do not propose the same solutions. This is not necessarily a bad thing as a variety of opinions can lead to a fruitful debate. However, the type of problems which are identified and the relation of renewable energy to these problems differs as well. The presence of different levels of framing, as introduced in this research, might lead to misunderstanding in the field and a reduced effect of framing practices of actors. Realising the existence of these level of framings is important for actors that want to stimulate the uptake of renewable energy. When an actor engages in framing practices they should be aware of the actor they want to address and which level of problems and solutions they identify.

For instance, environmental NGOs frame renewable energy in a very general way using mostly the topics *climate change; threat* and *CO<sub>2</sub> reduction*. However, to increase the impact of their framing practices, they could use more specific ways of framing problems and solutions in the discourse to align with the actors whose interpretations they try to influence. Framing renewable energy as the solution might prevent the traditional energy industry from focusing on fossil fuels as an alternative solution to renewable energy (or at least reduce the impact of these types of framing activities). The renewable energy industry, on the other hand, has focussed its framing mainly on the integration of renewable energy as the problem. For them it could be more helpful to use also general levels of framing the issue to better align with other actors, in particular the government, and to emphasize the importance of renewable energy to solve the overarching problems.

The analysis over time indicates that developments which have a big influence on the renewable energy sector do not have to be the ones that have a big impact on the discourse. The ability and need of a specific actor or group of actors to change the actions of another actor is an important factor. This insight might help to predict which developments are likely to open up the discourse and which ones are not.

### 5.2.2 Methodological implications

Language has had a central role in organisational sciences for a long time, though content analysis has been a complex and time consuming process (Lowenstein, 2012; Grimmer and Stewart, 2013). Lately, automated content analysis methods have been developed or imported from social sciences to

perform systematic analysis, especially on large sized corpora. These methods offer new ways of conducting content analysis for analysing language to study culture, practices and institutions.

This research adds to the latest developments in the field by combining two relatively new methods of automated content analysis. It shows the potential automated content analysis can have for capturing the content of large-scale text. The results show that using quote/source detection with topic modelling are suited to examining framing practices and discourse in a more systematic way via the concept of vocabularies. The methodological approach used in this research, automated content analysis methods supported by manual interpretation, can also be used for the assessment of other large, complicated debates.

The quote/source detection could accelerate the coding process in any analysis on discourse. However, the method is still under development and needs further improvement and several validation steps to increase its value for scientific purposes. This research contributes to this process by validating the quote and source extraction for a part of the dataset. Moreover, suggestions could be made to improve the method as syntactic structures that led to unidentified quotes or incorrectly identified quotes were identified

Topic modelling is a method that is already more established in several literature streams (Jacobi et al, 2015). However, using topic modelling for the analysis of framing practices departs from the traditional use of topic modelling in which articles are used as objects of analysis. The interesting insights this approach has offered show the value of topic modelling for the framing literature. Topic modelling has offered a large added value in comparison with an analysis on word frequencies. Word frequencies and simple word co-occurrences found in the quotes were hard to interpret and hardly any relevant patterns could be identified. Topic modelling gave a better overview of the content of the framing practices of the different actors and allowed for bottom-up development and exploration of the topics themselves.

### 5.2.3 Theory

The findings in this study have some implications for the existing framing literature. Diagnostic, prognostic and motivational framing, the core framing tasks as identified in the social movement literature, can be clearly seen in the framing on renewable energy. These tasks cannot be distinguished separately but are heavily intertwined as the framing of a problem includes often some kind of solution.

This research offers new insights into how this framing process around a complex issue such as renewable energy is shaped. I argue that the framing practices around such an issue can be categorized into different levels of framing dependent on what is considered as the problem (diagnostic framing) and what possible solutions are (prognostic framing). The prognostic framing for one level is related to the diagnostic framing of the next. In other words, the solutions identified for one problem might be the cause of the problems at the more specific level of framing. The resulting framework can be very helpful for analysis of framing practices of complex issues.

The results emphasize the impact structural changes can have on discourse and I argue that structural factors should be taken into account when analysing a discourse over time. The concept of levels of framing can also be of use when analysing the effect of structural changes as these changes are likely to affect only one level of framing and therefore mainly influence one or a few actors in the discourse. The motivational task of framing is very important to the framing of actors after an event. Actors become only active if other actors have the possibility to act. Until now, framing studies often ignore

the motivational task of framing and assess prognostic and diagnostic framing (Kaplan, 2008; Le Ber and Branzei, 2010). However, my study indicates that attention should be paid to the motivational aspect, especially when structural changes are taken into account.

### 5.3 Limitations

The main limitations related to data collection are due to the choice and the amount of data. I chose the statements of newspaper articles about renewable energy to be representative for the discourse within the renewable energy field. This decision has some implications that may influence the results. The first limitation relates to the fact that a news article is written by an author which might have adapted the statement of the actor, especially in the case of paraphrasing. The statements might represent the view of the author rather than the view of the cited actor. Moreover, media do not necessarily write about the issues that are of the highest interest for the industry, but rather discuss those issues that are interesting for the public. To reduce the effect of these limitations I took newspaper articles from the Guardian and the Times which represent different sides of the political spectrum. Although, I had the option to use more direct data sources (e.g. interviews, press releases), I chose to use news articles as it fitted the exploratory character of the research. I wanted to find out which stakeholders were present in the discourse and not choose specific stakeholders beforehand. Moreover, via newspaper articles actors can influence others' opinions and those statements are therefore likely to include framing practices. The second issue concerning the dataset relates to the number of statements that are included. The 4883 statements contain a lot of information however when divided into years and by actor the data gets thin. This leads to the problem that one single article including a lot of statements from one actor can have a major influence on the results and decreases the validity of the research. To limit this impact I clustered the actors into 7 categories and the differences over time are interpreted per period instead of per year.

The use of relatively new automated content analysis methods comes with some limitations as well. The quote-source detection as used in this research is still in a development phase and has not been widely applied yet in any literature stream. To secure the correctness of the detection all wrongly identified quotes have been removed manually and the percentage of missed quotes and sources has been checked. A substantial part of the quotes were not extracted but this is not considered to be a big issue since the quotes are not specifically related to a topic or an actor and are therefore not likely to cause a bias in the dataset. Topic modelling is a method that is already more established. However, using quotes as the input of the model departs from the standard method of using articles. This might harm the reliability of the outcome of the topic model. Several example quotes are therefore checked to see if the name of the topic assigned to the quote matches the content of the quote. These manual checks are an important step in the assessment of any topic model and a good indication that the outcome of the topic model provides a good representation of the quotes (Jacobi et al, 2015).

The extent of causality when assessing the influence of developments on the discourse is hard to determine based on the results of this research. On the one hand, this is caused by the choice of only three time periods which offers little opportunity to observe patterns. On the other hand, the complexity has to do with the fact that discourse influences the developments in the field by its impact on the actions of actors. The causal relationship might be the other way around or operates in both directions. Correlation between developments and framing practices of a certain actor can be noticed based on the increase or decrease in the occurrence of topics related to the developments. Moreover, assessing some example quotes support this correlation. For some developments, such as the nuclear

disaster and the grid problems, it is safe to say that the development influenced the discourse and not the other way around. The causality can also be assessed by looking at the words characterizing a topic and the example quotes. For example, the increase in use of the topic *reform subsidy; negative* can be seen as a consequence of the proposed cuts since the specific development is part of the framing. However, some developments, such as the climate conferences, seem to show asymmetry in time as the peak in the topic use is before the development. I still argue though that this peak is caused by the development in the sense that the actors knew that the climate conference was going to happen. In that way the climate conference caused the change in the discourse rather than the other way around. This is in line with the idea of field-configuring events which offer opportunity for a change in discourse in the build-up to an event (Hardy and Maguire, 2010). So, the interpretation of the results indicate some causality but the research choices made and the results obtained do not allow for hard conclusions to be drawn. The developments should be seen as possible explanations of variations in framing rather than the absolute cause of the variations.

The last two limitations relate to the constructs of framing and discourse and the way these are used. I acknowledge that one of the main purposes of framing is to try to influence the interpretations of others. This goal of framing can also be recognized in the results of this research and is used to formulate practical implications. However, how this mechanism of influencing the interpretation of others works and how this influences others' framing practices has not been taken into account. The concept of discourse is used to be able to say something about the direction of the framing practices of all actors combined. Based on this approach, I could say something about the content of the renewable energy discourse. However, one should be aware that this research does not assess the way framing practices aggregate into a renewable energy discourse.

## 5.4 Future research

The explorative character of this research as well as the innovative methodology offers plenty of further research possibilities. Regarding the analysis of the renewable energy discourse, it would help to add more data to the database to be able to observe clear patterns. Causality could be shown more easily when analysis can be based on developments per year. Once the database is expanded, quantitative models could be developed to assess framing, for instance, before and after a certain event. In this way causality could be established. Furthermore, the interaction between actors and the way they influence each other's framing, which was not the direct focus of this research, could be further assessed. The interaction between the government and the renewable energy industry around the subsidy cuts indicates that some interesting mechanisms can be analysed. This research focuses on the influence of structural changes in the environment on the framing practices of actors. However, framing practices are besides being subjects of a changing environment also contributors to such an environment (Ocasio & Joseph, 2005). Investigating how the changing framing practices in the renewable energy discourse influence actions taken in the field is an interesting future research aim.

A comparison of framing practices between countries could provide further insights in understanding of framing practices and their consequences for actions in the field. The topic modelling can be done for any language, however, the search/quote detection is language specific. The results of this research indicate some interesting patterns in the discourse. For example, the large impact that both climate conferences had on the framing of certain actors and the interesting role gas plays in the renewable energy discourse, especially in the last period. These aspects could be further analysed by using more in-depth research methods.

Additional research is needed to support the claim that the different levels of framing are influencing the effectiveness of framing practices and harming the cooperation in the industry. Also, the role of motivational framing in relation to the impact of developments is an insight that can be further assessed. Moreover, future studies could test if the framework including the several levels of framing is also useful for the analysis of framing on other complex issues.

Lastly, I want to stress the need for further research into both quote/source detection and topic modelling for the use of analysis on framing practices and/or discourse. The recognition of linguistic patterns needs to be further improved and should be tested and validated for different types of texts. The consequences of using topic modelling on relatively small bodies of texts such as quotes should be further assessed. The influence of the length of a quote on the chances to be assigned to a topic is one important aspect which require further analysis. Moreover, the impact the choice of quotes has on the use of the parameters should be assessed to optimize the interpretability of the topics in later research on framing practices.

## 6 Conclusion

An analysis has been conducted on 4883 statements of actors in the “field” around the issue of renewable energy. To identify these statements and link them to the right source a new automated content analysis method, quote/source detection, has been applied on 767 newspapers articles. The content of the statements has been analysed by using topic modelling, another automated content analysis method. Fifty topics were distinguished within the dataset and these topics were linked to the individual quotes. A manual interpretation of the quotes and the topics allowed me to answer the following research question:

*How did the framing practices of actors differ within the discourse on renewable energy in the UK between 2005 and 2015?*

As expected, a lot of different actors were engaged in the discourse on renewable energy. After bundling related actors, 7 main actor types were identified. These actor types all represented a substantial share of the discourse. The government and political actors were the main contributors which shows that the discourse is policy-oriented to a certain extent.

The actors differ in the issues they address in their framing practices. The renewable energy industry focuses a lot on specific renewable energy sources in their framing while the traditional energy industry addresses non-renewable technologies instead. The social actors are concerned with limiting the CO<sub>2</sub> emissions and climate change while the external actors are business oriented. The government’s framing is policy focussed although it covers a broad range of topics regularly. All actors seem to address topics related to their own interests. Every actor framed problems and solutions which were related to their own interest and for which they tried to influence the interpretations of others. This mechanism leads to a variety of issues which were included in the discourse.

Some of the developments can be linked to the increase of the usage of a topic by a specific actor. The climate conferences influenced the framing of the political actors and the social actors via the topic *climate change; threat* and the proposed subsidy cuts led to an increase in the use of the topic *reform subsidy; negative*. Also the developments in the second period around offshore wind and marine energy impacted the framing of several actors. Not all major developments, however, caused a change in the framing activities of at least one of the actors. A change in the interpretation of the problem or solution is not necessarily a reason to adapt framing practices. I argue that the impact of a development relates to the motivational task of framing. If an actor senses that a development creates an opportunity or a need for another actor to act, it will adapt its framing practices to motivate others.

By assessing all framing activities of the actors and the developments influencing them, it can be concluded that the discourse on renewable energy has not been focussed on one type of problem-solution combination but has included several types of problems and associated solutions. Renewable energy had a different role in the different levels of framing, either related to the solution or to the problem. Based on the idea of “levels of framing”, I develop a framework depicting a problem that is diagnosed on each level and a related solution(s). The solution is then translated into a problem on the next level. Actors differ in the level of framing they use when engaging in framing on renewable energy. The framework can be valuable for practice as it can help actors to conceptualise how to optimize the effects. The framework also provides insights for theory as it can be useful to understand the framing practices in other types of discourses too.

## 7 References

- Alanne, K., & Saari, A. (2006). Distributed energy generation and sustainable development. *Renewable and Sustainable Energy Reviews*, 10(6), 539–558.
- Adams, S & Berry, S (2008). *Low Carbon Communities A study of community energy projects in the UK, Ruralnet UK.* , Stoneleigh Park, Warwickshire.
- Barry, J., Ellis, G., and Robinson, C. (2008). Cool Rationalities and Hot Air: A Rhetorical Approach to Understanding Debates on Renewable Energy. *Global Environmental Politics*.
- Benford, R. D. and D. A. Snow (2000). 'Framing Processes and Social Movements: An Overview and Assessment', *Annual Review of Sociology* 26, 611–639.
- Blei, David, Ng A., and Jordan, M.. 2003. Latent dirichlet allocation. *Journal of Machine Learning and Research* 3:993–1022.
- Carley, K. (1994). Extracting culture through textual analysis. *Poetics*, 22, 291–312.
- Carley, K.M., & Palmquist, M. (1992). Extracting, representing and analyzing mental models. *Social Forces*, 70, 601–636.
- Carvalho, A. (2005) Representing the politics of the greenhouse effect:, *Critical Discourse Studies*, 2:1, 1-29,
- Chmutina, K., & Goodier, C. I. (2013). Case Study Analysis of Urban Decentralised Energy Systems. In W. Leal Filho, F. Mannke, R. Mohee, V. Schulte, & D. Surroop (Eds.), *Climate-Smart Technologies* (pp. 307–323). Springer Berlin Heidelberg.
- Cooke, H., Keppo, I., & Wolf, S. (2013). Diversity in theory and practice: A review with application to the evolution of renewable energy generation in the UK. *Energy Policy*, 61, 88–95.
- Cornelissen, J. P., & Werner, M. D. (2014). Putting Framing in Perspective: A Review of Framing and Frame Analysis Across the Management and Organizational Literature. *The Academy of Management Annals*, 8(1),
- Devine-wright, P., & Wiersma, B. (2013). Opening up the “local” to analysis: exploring the spatiality of UK urban decentralised energy initiatives. *A Report on Community Renewable Energy in Scotland - SCENE Connect Report*, 9839(March), 37–41.
- Duriau, V. J., Reger, R. K., & Pfarrer, M. D. (2007). A Content Analysis of the Content Analysis Literature in Organization Studies: Research Themes, Data Sources, and Methodological Refinements. *Organizational Research Methods*, 10(1), 5–34.
- Eurostat (2015), Share of renewables in energy consumption up to 15% in the EU in 2013, retrieved from: <http://ec.europa.eu/eurostat/documents/2995521/6734513/8-10032015-AP-EN.pdf/3a8c018d-3d9f-4f1d-95ad-832ed3a20a6b>



- Farrell, S. (2015), UK electricity grid holds back renewable energy, solar trade body warns, *The Guardian*, retrieved from: <http://www.theguardian.com/business/2015/may/10/uk-electricity-grid-renewable-energy-solar-trade-association>
- Ferree, M. M., Gamson W. A., Gerhards J., & Rucht, D., (2002). *Shaping Abortion Discourse: Democracy and the Public Sphere in Germany and the United States*. Cambridge, England: *Cambridge University Press*.
- Fiss, P., & Hirsch P. (2005) The Discourse of Globalization: Framing and Sensemaking of an Emerging Concept. *American Sociological Review*, 70(1), 29–52.
- Fox-Penner, P., (2010). *Smart Power, Climate change, the smart grid, and the Future of Electric Utilities*. *Island Press*. Washington DC
- Gamson, W. a., & Modigliani, A. (1989). Media discourse and public opinion on nuclear power: A constructionist approach. *American Journal of Sociology*, 95(1), 1–37.
- Gerring, J. (2007). *Case Study Research: Principles and Practices* , New York: Cambridge Univ. Press
- Goffman, E., (1974), *Frame Analysis: An Essay on the Organization of Experience*, *Harvard University Press*, Cambridge, MA).
- Grimmer, J., & Stewart, B. M. (2013). Text as Data: The Promise and Pitfalls of Automatic Content Analysis Methods for Political Texts. *Political Analysis*, 21(3), 267-297.
- Hajer, M., & Versteeg, W. (2005). A Decade of Discourse Analysis of Environmental Politics: Achievements, Challenges, Perspectives. *Journal of Environmental Policy and Planning*, 7(3), 175–184.
- Hardy, C., Lawrence, T. B., & Grant, D. (2005). Discourse and Collaboration: The Role of Conversations and Collective Identity. *Academy of Management Review*, 30(1), 58–77.
- Hardy, C., & Maguire, S. (2010). Discourse, field-configuring events, and change in organizations and institutional fields: Narratives of DDT and the Stockholm convention. *Academy of Management Journal*, 53(6), 1365–1392.
- Hoffman, A. J. (1999). Institutional Evolution and Change: Environmentalism and the U.s. Chemical Industry. *Academy of Management Journal*, 42(4), 351–371.
- Jacobi, C., van Atteveldt, W., & Welbers, K. (2015). Quantitative analysis of large amounts of journalistic texts using topic modelling. *Digital Journalism*, 0811(November), 1–18.
- Jacobsson, S., & Bergek, A. (2004). Transforming the energy sector: The evolution of technological systems in renewable energy technology. *Industrial and Corporate Change*, 13(5), 815–849.
- Jones, C., & Livne-Tarandach, R. (2008). Designing a frame: Rhetorical strategies of architects. *Journal of Organizational Behavior*, 29, 1075–1099.
- Kaplan, S. (2008). Framing Contests: Strategy Making Under Uncertainty. *Organization Science*, 19(5), 729–752.

- Kaplan, S., & Vakili, K. (2014). The double-edged sword of recombination in breakthrough innovation. *Strategic Management Journal*
- Lampel, J., & Meyer, A. D. (2008). Field-configuring events as structuring mechanisms: How conferences, ceremonies, and trade shows constitute new technologies, industries, and markets. *Journal of Management Studies*, 45: 1025–1035
- Lazarinis, F. (2007). Engineering and utilizing a stopword list in Greek Web retrieval. *Journal of the American Society for Information Science and Technology*, 58(11), 1645-1652.
- Le Ber, M. J., & Branzei, O. (2010). Value Frame Fusion in Cross Sector Interactions. *Journal of Business Ethics*, 94(2010), 163–195.
- Loewenstein, J., Ocasio, W., & Jones, C. 2012. Vocabularies and Vocabulary Structure: A New Approach Linking Categories, Practices, and Institutions. *The Academy of Management Annals*, 6(1): 41–86.
- Müller, M. O., Stämpfli, A., Dold, U., & Hammer, T. (2011). Energy autarky: A conceptual framework for sustainable regional development. *Energy Policy*, 39(10), 5800–5810.
- Nigam, A., & Ocasio, W. (2010). Event attention, environmental sensemaking, and change in institutional logics: An inductive analysis of the effects of public attention to Clinton's health care reform initiative. *Organization Science*, 21(4), 823–841.
- Ocasio, W., & Joseph, J. (2005). Cultural adaptation and institutional change: The evolution of vocabularies of corporate governance, 1972–2003. *Poetics*, 33, 163–178.
- Quinn, Kevin M., Burt L. Monroe, Michael Colaresi, Michael H. Crespin, and Dragomir R. Radev. 2010. "How to Analyze Political Attention with Minimal Assumptions and Costs." *American Journal of Political Science* 54 (1): 209–228.
- Saldaña, J. (2009). *The coding manual for qualitative researchers*. London: Sage.
- Seidel, G. (1985). Political discourse analysis. *Handbook of discourse analysis*, 4, 43-60.
- Snow, D. A., E. B. Rochford Jr., S. K. Worden and R. D. Benford: 1986, 'Frame Alignment Processes, Micromobilization, and Movement Participation', *American Sociological Review* 51, 464–481
- Stauffacher, M., Muggli, N., Scolobig, A., & Moser, C. (2015). Framing deep geothermal energy in mass media : the case of Switzerland Framing deep geothermal energy in mass media : the case of Switzerland. *Technological Forecasting and Social Change*, 98
- Stephens, J. C., Rand, G. M., & Melnick, L. L. (2009). Wind Energy in US Media: A Comparative State-Level Analysis of a Critical Climate Change Mitigation Technology. *Environmental Communication*, 3(2), 168–190.
- Steinberg, Marc W. 1999. "The Talk and Back Talk of Collective Action: A Dialogic Analysis of Repertoires of Discourse among Nineteenth-Century English Cotton Spinners." *American Journal of Sociology* 105:736-80.
- Strachan, P. A., Cowell, R., Ellis, G., Sherry-Brennan, F., & Toke, D. (2015). Promoting Community Renewable Energy in a Corporate Energy World. *Sustainable Development*

- Unruh, G. C., & Einstein, A. (2000). Understanding carbon lock-in. *Energy Policy*, 28(March).
- Van Alphen, K., van Voorst, Q., Hekkert, M. P., & Smits, R. E. H. M. (2007). Societal acceptance of carbon capture and storage technologies. *Energy Policy*, 35, 4368–4380.
- Van Attevelde, W., Kleinnijenhuis, J., & Ruigrok, N. (2008). Parsing, semantic networks, and political authority using syntactic analysis to extract semantic relations from dutch newspaper articles. *Political Analysis*, 16(4 SPEC. ISS.), 428–446
- Van Attevelde, W., Sheferm, T. (2015) Clause analysis: using syntactic information to enrich frequency-based automatic content analysis, retrieved from: [http://vanattevelde.com/uploads/attevelde\\_clauses\\_zurich.pdf](http://vanattevelde.com/uploads/attevelde_clauses_zurich.pdf)
- Walker, G., & Devine-Wright, P. (2008). Community renewable energy: What should it mean? *Energy Policy*, 36(2)
- Walker, G., Devine-Wright, P., Hunter, S., High, H., & Evans, B. (2010). Trust and community: Exploring the meanings, contexts and dynamics of community renewable energy. *Energy Policy*, 38(6)
- Weick, K. E. (1995) Sensemaking in Organizations. Thousand Oaks, CA: Sage
- Wiersma, B., & Devine-Wright, P. (2014). Decentralising energy: comparing the drivers and influencers of projects led by public, private, community and third sector actors. *Contemporary Social Science*, 9(4), 456–470.
- Woodman, B., & Baker, P. (2008). Regulatory frameworks for decentralised energy. *Energy Policy*, 36(12), 4527–4531.

# Appendix A

Archival data

## **Main sources:**

*Digest of United Kingdom Energy Statistics (DUKES) 2006 - 2015*

Available at:

<http://webarchive.nationalarchives.gov.uk/20130109092117/http://www.decc.gov.uk/en/content/cms/statistics/publications/dukes/dukes.aspx>

<https://www.gov.uk/government/collections/digest-of-uk-energy-statistics-dukes>

*IEA/IRENA Joint Policies and Measures database UK*

Available at:

<http://www.iea.org/policiesandmeasures/renewableenergy/?country=United%20Kingdom>

## **Additional sources:**

United nations framework convention on climate change (2016), retrieved at: 14 February 2016, available at: [http://unfccc.int/meetings/copenhagen\\_dec\\_2009/meeting/6295.php](http://unfccc.int/meetings/copenhagen_dec_2009/meeting/6295.php)

United nations framework convention on climate change (2016), retrieved at: 16 February 2016, available at: [http://unfccc.int/meetings/paris\\_nov\\_2015/meeting/8926/php/view/reports.php](http://unfccc.int/meetings/paris_nov_2015/meeting/8926/php/view/reports.php)

Farrell, S. (2015), UK electricity grid holds back renewable energy, solar trade body warns, *The Guardian*, retrieved from: <http://www.theguardian.com/business/2015/may/10/uk-electricity-grid-renewable-energy-solar-trade-association>

Office of Unconventional Gas and Oil (OUGO) retrieved at: 13 February 2016, available at: <https://www.gov.uk/government/groups/office-of-unconventional-gas-and-oil-ougo>

## Appendix B

Snapshot of the dataset which is the basis of the analysis.

word	parent	Doc. Nr	id	pos1	entity	Quotes_id	Quote_role	Year	Medium
provide	95	1.57E+08	115	V		1	quote	2008	Guardian
affordable	117	1.57E+08	116	A		1	quote	2008	Guardian
heat	115	1.57E+08	117	N		1	quote	2008	Guardian
and	NA	1.57E+08	118	C		NA	NA	2008	Guardian
power	115	1.57E+08	119	N		1	quote	2008	Guardian
to	NA	1.57E+08	120	?		NA	NA	2008	Guardian
people	115	1.57E+08	121	N		1	quote	2008	Guardian
in	NA	1.57E+08	122	P		NA	NA	2008	Guardian
social	124	1.57E+08	123	A		1	quote	2008	Guardian
housing	121	1.57E+08	124	N		1	quote	2008	Guardian
,	NA	1.57E+08	125	.		NA	NA	2008	Guardian
and	NA	1.57E+08	126	C		NA	NA	2008	Guardian
we	129	1.57E+08	127	O		1	quote	2008	Guardian
've	129	1.57E+08	128	V		1	quote	2008	Guardian
extended	136	1.57E+08	129	V		1	quote	2008	Guardian
that	129	1.57E+08	130	P		1	quote	2008	Guardian
to	NA	1.57E+08	131	?		NA	NA	2008	Guardian
public	133	1.57E+08	132	A		1	quote	2008	Guardian
buildings	130	1.57E+08	133	N		1	quote	2008	Guardian
,	NA	1.57E+08	134	.		NA	NA	2008	Guardian
"	NA	1.57E+08	135	.		NA	NA	2008	Guardian
says	NA	1.57E+08	136	V		NA	NA	2008	Guardian
Belinda	138	1.57E+08	137	M	PERSON	1	source	2008	Guardian
Miller	136	1.57E+08	138	M	PERSON	1	source	2008	Guardian
,	NA	1.57E+08	139	.		NA	NA	2008	Guardian
the	141	1.57E+08	140	D		1	source	2008	Guardian
council	143	1.57E+08	141	N		1	source	2008	Guardian
's	NA	1.57E+08	142	O		NA	NA	2008	Guardian
head	138	1.57E+08	143	N		1	source	2008	Guardian
of	NA	1.57E+08	144	P		NA	NA	2008	Guardian
economic	148	1.57E+08	145	A		1	source	2008	Guardian
and	NA	1.57E+08	146	C		NA	NA	2008	Guardian
environmental	148	1.57E+08	147	A		1	source	2008	Guardian
sustainability	143	1.57E+08	148	N		1	source	2008	Guardian

## Appendix C

Overview and description of all the actor labels including example sources that were assigned to a certain label.

Label number	Label name	Description	Examples of sources
1	UK government and regulators	All references to "the government", a government department or a regulator general statements that reference "the government", clear reference to government department or to a member of the sitting government; clear reference to a government initiative or government agency. Includes references to Welsh government or Welsh Assembly.	<i>"Ofgem"</i> <i>"Department Energy Climate Change"</i> <i>"Ed Miliband, the energy and climate change minister"</i>
2	Scottish government and regulators	All references to "the government", a government department or a regulator general statements that reference "the government", clear reference to government department or to a member of the Scottish government; clear reference to a Scottish government initiative.	<i>"Fergus Ewing"</i> <i>"Highland Islands Enterprise"</i> <i>"A Scottish government spokesman"</i>
3	Intern. Government	All references to international government bodies, and references to countries in general and governments and individual politicians and parties from a specific country.	<i>"The EU climate chief"</i> <i>"IEA"</i> <i>"The France president"</i>
4	Academics	All references to universities or university departments or any individual which is introduced as an academic connected to a university.	<i>"Professor Hughes"</i> <i>"Climate scientists"</i>
5	Research Institute	All references to research institutes or research centres including individuals associated with such an organisation	<i>"The office of national statistics"</i> <i>"The director of the UK Energy research centre"</i>
6	Think tank	All references to think tanks performing research and advocacy concerning controversial topics or all individuals connected to such a think tank.	<i>"New Economic Foundation"</i> <i>"The NEF report"</i>
7	Environmental NGO and charities	All references to an environmental NGO or a charity in some way concerned with renewable energy or any member connected to such organisations.	<i>"Greenpeace"</i> <i>"The RSPB"</i> <i>"Renewable energy foundation"</i>
8	Renewable industry and trade associations	All references to renewable trade associations or individuals with a function at such association; all reference to the renewable energy sector as a whole.	<i>"A spokeswoman of the British wind energy association"</i> <i>"The German Renewable Energy Association BEE"</i>

9	Energy and general industry trade associations	All references to non-renewable related energy trade association and general industry associations concerned regarding actors in the energy sector or individuals with a function at such association.	<i>"Oftec, the oil heating industry's trade body"</i>
10	Public	All references to groups of people without referring to any kind of organisation or function; results of polls among the public	<i>"People"</i> <i>"Respondents to the survey"</i>
11	Renewable energy companies	All references to independent energy companies having a renewable energy focus since their foundation. Includes only companies founded after 1990.	<i>"Energy4All"</i> <i>"Thea Botha, co-founder of Blade Dynamics"</i>
12	Traditional energy companies	All references to traditional energy companies including its subsidiaries which might operate in the renewable energy sector. Main activities related to conventional energy sources, nuclear or energy utilities.	<i>"SSE renewables"</i> <i>"BP"</i>
13	Non-energy companies	All references to companies without main activities in the energy sector is not related to energy	<i>"Google"</i> <i>"Owen Yeatman, a dairy farmer from Dorset"</i>
14	Financial organisations	All organisations which core activities include investing and financing of different projects or companies; Private investors.	<i>"The head of a leading investment bank"</i> <i>"Trillion fund"</i>
15	UK political debate	Political parties or individual politicians which are not a member of the sitting government.	<i>"some Tories"</i> <i>"A Whitehall source"</i>
16	campaigners	All individuals or communities that campaign for a specific cause or giving their opinion on a specific topic related to renewable energy.	<i>"Environmental Campaigners"</i> <i>"European platform against windmills"</i>
17	local government	All references to local politicians, local political parties or local councils or local government related organisations.	<i>"A local councillor"</i> <i>"A spokesman of Orkney Islands Council"</i>
18	advisory organisations	All references to organisations providing advisory services like consultants, architects and lawyers or any other organisation which main activities includes advisory services	<i>"Law firm DLA"</i> <i>"Cathy Debenham who runs a renewable advice website"</i>
19	Media	All references to media statements, individual journalist or statements of the author himself.	<i>"Local media reports"</i> <i>"An analysis of The Times"</i>
20	Experts	All references to individuals or a group which are referred to as experts without a clear description of their function; Participants of a round table.	<i>"Industry experts"</i> <i>"The participants"</i>
21	Others	All references to sources which could not be included into one of the previous categories because the source was too vague or unusual.	<i>"The Serious Hazards transfusion group"</i> <i>"The Church of England"</i>

## Appendix D

Overview of the 10 most prominent words and the label of all the topics.

	<b>Topic 1</b>	<b>Topic 2</b>	<b>Topic 3</b>	<b>Topic 4</b>	<b>Topic 5</b>	<b>Topic 6</b>	<b>Topic 7</b>
	<i>Ref. subsidy, negative</i>	<i>Unclear</i>	<i>local energy, consequences</i>	<i>Location RE</i>	<i>Unclear</i>	<i>Nuclear energy</i>	<i>Fossil fuels</i>
1	industry	energy	local	many	move	power	gas
2	subsidy	renewable	economic	area	become	nuclear	oil
3	challenge	source	benefit	find	clear	build	price
4	uncertainty	landscape	community	exist	way	plant	coal
5	face	growth	environmental	come	offer	new	shale
6	protect	cheaper	planning	case	recent	station	greenhouse
7	reform	insulation	potential	city	serious	reactor	production
8	regime	decision	allow	open	sign	harness	import
9	delay	pay	view	opportunity	point	vital	rise
10	act	difference	windfarm	solution	supplier	food	burn
	<b>Topic 8</b>	<b>Topic 9</b>	<b>Topic 10</b>	<b>Topic 11</b>	<b>Topic 12</b>	<b>Topic 13</b>	<b>Topic 14</b>
	<i>Stimulation RE</i>	<i>Small scale renewables</i>	<i>Unclear</i>	<i>Unclear</i>	<i>Sustainable; energy eff.</i>	<i>Onshore wind; imp.</i>	<i>Costs; consumer</i>
1	support	solar	renewable	could	energy	Wind	Bill
2	renewable	home	energy	use	renewable	farm	scottish
3	system	biomass	help	such	efficiency	onshore	consumer
4	provide	install	scale	waste	problem	turbine	Pay
5	continue	small	difficult	tell	hope	cheapest	Add
6	state	panel	value	programme	sustainable	affect	Thing
7	financial	risk	budget	buy	limit	remove	Rise
8	strong	fit	step	savings	competition	noise	household
9	enable	boiler	trade	leave	conventional	build	Least
10	energy	product	turbine	report	offer	track	average
	<b>Topic 15</b>	<b>Topic 16</b>	<b>Topic 17</b>	<b>Topic 18</b>	<b>Topic 19</b>	<b>Topic 20</b>	<b>Topic 21</b>
	<i>Offsh. wind, opp.UK</i>	<i>Security, supply</i>	<i>Grid connection</i>	<i>Public opinion</i>	<i>Market strategy</i>	<i>CO2 emissions reductions</i>	<i>investment, new technologies</i>
1	wind	need	project	people	company	carbon	New
2	offshore	deliver	grid	want	market	emission	technology
3	opportunity	keep	major	see	demand	reduce	Need
4	development	secure	bring	think	raise	cut	Invest
5	grant	ensure	national	say	focus	low	Work
6	manufacturing	light	reach	able	customer	reduction	Hit
7	available	turn	network	great	political	storage	confirm
8	infrastructure	rest	line	like	service	tonne	Key
9	become	effort	decide	understand	conference	capture	example
10	largest	supplies	step	crucial	design	urgent	carry



	<b>Topic 22</b>	<b>Topic 23</b>	<b>Topic 24</b>	<b>Topic 25</b>	<b>Topic 26</b>	<b>Topic 27</b>	<b>Topic 28</b>
	<i>Supply of electricity</i>	<i>Government's attitude</i>	<i>Tackling uncertainties</i>	<i>Unclear</i>	<i>Increasing RE</i>	<i>Marine energy</i>	<i>Fossil fuels, reduction</i>
1	electricity	government	take	plan	more	power	fuel
2	generate	commit	should	form	big	generation	fossil
3	supply	remain	put	say	lot	capacity	increase
4	produce	developer	action	alternative	decade	tidal	tax
5	enough	claim	development	group	site	resource	price
6	equivalent	order	concern	week	happen	term	lower
7	use	recognise	risk	firm	people	wave	save
8	gigawatt	process	question	model	come	megawatt	help
9	chain	course	long	fail	competitive	replace	consumption
10	third	improve	involve	believe	home	consent	contribute
	<b>Topic 29</b>	<b>Topic 30</b>	<b>Topic 31</b>	<b>Topic 32</b>	<b>Topic 33</b>	<b>Topic 34</b>	<b>Topic 35</b>
	<i>Policy, criticism</i>	<i>Unclear</i>	<i>Business strategy</i>	<i>Value of industry</i>	<i>Infl. eco.; positive</i>	<i>unclear</i>	<i>Security, en. mix</i>
1	government	decision	make	year	green	company	future
2	policy	place	business	pound	job	know	energy
3	lack	may	possible	next	create	work	part
4	should	try	strategy	few	investment	look	security
5	wrong	amount	sense	worth	economy	project	role
6	ambition	run	right	start	growth	see	play
7	head	large	progress	spend	thousand	rate	important
8	kind	natural	full	day	bank	represent	key
9	less	rule	attractive	extra	revolution	sure	lose
10	administrat.	whole	start	billion	massive	meeting	mix
	<b>Topic 36</b>	<b>Topic 37</b>	<b>Topic 38</b>	<b>Topic 39</b>	<b>Topic 40</b>	<b>Topic 41</b>	<b>Topic 42</b>
	<i>unclear</i>	<i>Government target</i>	<i>Leadership role, env.</i>	<i>Finance, investment</i>	<i>Unclear</i>	<i>Increase in costs</i>	<i>Unclear</i>
1	renewable	target	world	sector	other	cost	get
2	investment	meet	global	give	level	higher	way
3	energy	set	lead	investor	achieve	high	issue
4	grow	ambitious	huge	green	british	drive	best
5	private	government	country	end	water	expensive	deal
6	moment	miss	potential	fund	something	charge	work
7	activity	goal	environment	aim	european	damage	better
8	agenda	contribution	leader	confidence	member	basis	little
9	biggest	binding	leadership	certainty	priority	independent	life
10	say	decarbonisation	programme	operate	effect	become	only

	<b>Topic 43</b>	<b>Topic 44</b>	<b>Topic 45</b>	<b>Topic 46</b>
	<i>Unclear</i>	<i>Share RE, country</i>	<i>Need for capital</i>	<i>Climate change, threat</i>
1	money	renewable	clean	change
2	show	energy	need	climate
3	public	country	require	tackle
4	good	develop	different	fight
5	minister	come	announcement	threat
6	impact	must	capital	positive
7	today	share	look	objective
8	consider	source	encourage	heart
9	news	nation	greater	decc
10	prime	store	deliver	relate

	<b>Topic 47</b>	<b>Topic 48</b>	<b>Topic 49</b>	<b>Topic 50</b>
	<i>Small scale, heat</i>	<i>Unclear</i>	<i>Affordability energy</i>	<i>Subsidy, schemes and tariffs</i>
1	much	time	cent	scheme
2	expect	first	last	tariff
3	heat	current	renewable	build
4	mean	significant	result	include
5	own	same	increase	feedin
6	might	number	fall	review
7	building	base	total	figure
8	real	period	month	proposal
9	heating	budget	talk	funding
10	domestic	point	Record	obligation