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Determining the fate of Carbon Capture and Storage

A Repertory Grid Analysis

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28 June 2013

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Zep Zero emissions platform
European Technology Platform for Zero Emission Fossil Fuel Power Plants

Photo credit: Bellona (2013)

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Abstract

Despite nearly all of the global emission reduction scenarios in the European Union and on a global level confirm CCS as a critical component in meeting EU and global climate targets, the short and long-term future of CCS in Europe is uncertain. The uncertainty for the future of CCS calls for research of the dynamic landscape of CCS-related European decision-making and how European-level actors put into practice their decision-making capabilities positively or negatively. This research provides expert insight to a set of fifteen actors from industry, government, NGOs, and advisory bodies. The results call for a business case for CCS because all actors are looking for soundness in an investment for CCS. There is a need for more coordination between government and industry. Both must take up significant risk and overcome various barriers. So there should be an outlet for clear communication pathways for government and industry. ZEP can only facilitate the decision making process of CCS.

Keywords: CCS, decision-making, repertory grid analysis, European Union, ZEP

Approximate word count: 14,000

Photo Credit Shell 2013

Forward

I would like to extend my sincere gratitude to Dr. Matthijs Hisschemöller for his guidance throughout my research project. Also, I would like to thank the ZEP Secretariat at Triarii, B.V. for providing the opportunity to work with ZEP. My research would have not been possible without the support of the ZEP secretariat and so I am very thankful. A special thanks to Gert-Jan van der Panne at the ZEP Secretariat for providing direction and support. I would also like to thank Emma van der Zanden and Jennifer Poussin at the Institute for Environmental Studies for their statistical expertise. A final thanks to my family and friends for their words of encouragement throughout my entire academic career.

Abbreviations

CCS	Carbon Capture and Storage
CCSA	Carbon Capture and Storage Association
CO_2	Carbon Dioxide
DG	Directorate-General
ETS	Emission Trading Scheme
EGR	Enhanced Gas Recovery
EOR	Enhanced Oil Recovery
EERA	European Energy Research Alliance
EEPR	European Energy Programme for Recovery
EPS	Emissions Performance Standards
EU	European Union
EUA	Emission Unit Allowance
FID	Final Investment Decision
GCCSI	Global Carbon Capture and Storage Institute
GHG	Greenhouse Gas
ITRE	Industry, Research and Energy Committee
MEP	Member of Parliament
NER300	New Entry Reserve 300
PCT	Personal Construct Theory
RES	Renewably-sourced Energy
RGT	Repertory Grid Technique
TIS	Technological Innovation Systems
ULCOS	Ultra-low Carbon Dioxide Steelmaking
ZEP	Zero Emissions Platform

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1. Introduction

1.1 The Zero Emissions Platform

In 2005, European Commission launched the European Technology Platform for Zero Emission Fossil Fuel Power Plant (ZEP), where the stakeholders, led by industry, defined research priorities and created action plans and targets. ZEP serves as the advisor to the European Commission on the research, demonstration and deployment of carbon capture and storage (CCS). This initiative is seen as an important networking and knowledge sharing activities in the EU (Varnäs, 2012). The membership of ZEP includes utilities, petroleum companies, equipment suppliers, scientists, academics and environmental NGOs. They are motivated in obtaining three main goals:

1. Enable CCS as a key technology for combating climate change.
2. Make CCS technology commercially viable by 2020 via an EU-backed demonstration program.
3. Accelerate R&D into next-generation CCS technology and its wide deployment post-2020.

(ZEP, 2013)

ZEP (2012) acknowledges that "a successful demonstration of CCS is a precondition for commercial deployment; but without a secure environment for long term investment, demonstration projects will not happen." A secure environment for demonstration projects and long term investments are highly reliant on funding from a combination of government at the European and national level, in addition to industry. The knowledge-based network of recognized experts on CCS are proactive and prominent in sharing technology ideas (Stephen et al., 2011), but there is doubt whether commercial viability can be achieved by 2020 (Varnäs et al., 2012). The uncertainty for the future of CCS calls for further research of the dynamic landscape of CCS-related European decision-making and how European-level actors put into practice their capabilities to positively or negatively reinforce CCS decisions. Extensive research was conducted in policy making developments (Stigson et al., 2012; von Stechow et al., 2011; Vrijmoed et al., 2009) and recommendations for accelerating the deployment of CCS in Europe (Groenenberg & de Coninck, 2008; Markusson et al., 2011; van Alphen et al., 2010). Research was also conducted in areas of public perception of CCS (Brunsting et al., 2011; de Best-Waldhober et al., 2012; Upham & Roberts, 2011; Shackley et al., 2009). Due to the complexity and time-sensitivity of the issue, there is a need to further survey the landscape of CCS in terms of the actors who positively or negatively reinforce CCS-

related decision making. The drivers that cause the uncertainty of CCS will be outlined in section 1.2 followed by section 1.3 which will address the aims of the research.

1.2 The landscape of CCS in the European Union

CCS is a low-carbon technology which averts the CO_2 produced in the burning of fossil fuels from entering the atmosphere. It is recognized by industrialized countries as a crucial technology to reduce carbon dioxide emissions in the long term (Bakker et al., 2010, Markusson et al., 2011). CCS interests in the European Union (EU) and around the world derive from three factors (Rubin et al., 2012). First, it is recognized that large reductions in global CO_2 emissions are needed to avoid serious climate change impacts. Second, despite significant and real advances in renewable technologies, the world energy mix is reliant on fossil fuels for over 85% of its energy use. CCS is a transition technology which can reduce large amounts of CO_2 emissions from power plants and industrial sources with the intention to allow further development and large scale introduction of more sustainable solutions (Kjärstad et al., 2011, Seebregts and Groenenberg, 2009). Finally, CCS is recognized as a cost-effective addition to the emission reduction strategy portfolio (Rubin et al., 2012).

European roadmaps projecting towards the end of the 21st century acknowledge that CCS is an important aspect of the greenhouse gas (GHG) mitigation portfolio (EU Commission, 2011; IEA, 2010; DECC, 2012; Notenboom et al., 2012). Without sufficient policies, CO_2 emissions will increase by about 130% above 2005 levels by 2050. CCS is acknowledged to contribute one-fifth of the necessary emission reductions to achieve stabilization of GHG concentrations at the lowest-cost option in order to meet the ETP 2008 BLUE Map scenario (IEA, 2010). Figure 1 shows the extent to which CCS is said to contribute to emission reductions.

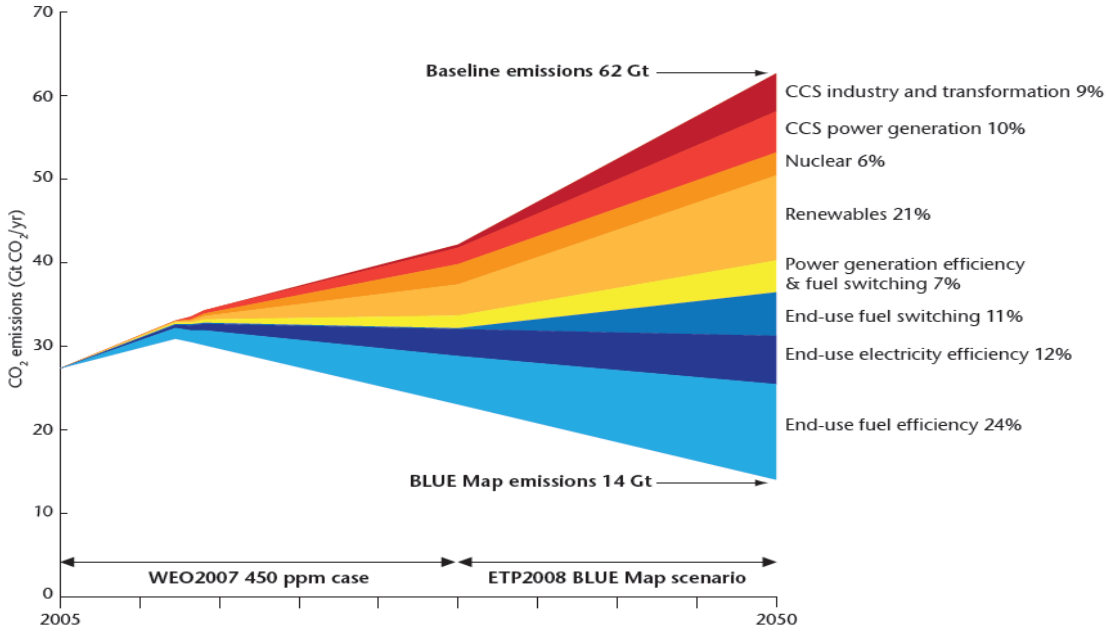


Figure 1. **CCS delivers one fifth of the global lowest cost GHG reduction solution in 2050 (IEA, 2010).**

However, there is inherent uncertainty in the future role of CCS in the EU because there has been no large demonstration project in the EU to date (Varnäs et al., 2012). Four major challenges that CCS needs to overcome are identified below.

First, despite CCS technology maturity at all three stages, CCS faces technological challenges. High energy requirements of current CO_2 capture processes are major barriers to their use (Rubin et al., 2012). There are also challenges which come about with the uncertainty extended to the technology's perceived maturity, viability, and potential impacts by CCS skeptics (Markusson et al., 2011).

Second, CCS faces financial challenges. CCS technology teeters on the cliff towards the "technology valley of death" because of investment uncertainty, in combination with high investment needs for full-chain CCS investment. Economic market failures that exacerbate uncertainties include externalities, information asymmetry and uncertain additional costs like investment costs and fuel prices (von Stechow et al., 2011). Although CCS faces only limited technological challenges, there are significant political challenges including the securing of investment costs, the price on CO_2 emissions, and regulatory uncertainty (Nykvist, 2013; Torvanger et al., 2013, van Alphen et al., 2010). CCS market conditions hinder the advancement of CCS, which may come about only too late for the upcoming investment cycles in, for example, electricity infrastructure (Varnäs et al., 2012). However, the

incentives brought forward by the European Commission, such as the Emission Trading Scheme (ETS), New Entry Reserves – 300 (NER300) and the European Energy Programme for Recovery (EEPR) are not sufficient and there is a need for additional funding programs and initiatives from the Commission and other actors (European Commission, 2013a).

Third, CCS faces legal uncertainty and challenges. The optimism expressed in policy documents such as the legal framework for CCS (European Commission, 2009) and research reports from the IEA (2009) and IPCC (2007) does not equate with the willingness to transform optimism into the reality of a large demonstration or commercial-level project in the European Union (van Alphen et al., 2010). Hansson and Bryngelsson (2009) describe this as an inherent paradox to developing new complex energy technologies. The CCS Directive (European Commission, 2009) provides the legal basis for geological storage of CO_2 in the EU with the option for Enhanced Oil Recovery (EOR) or Enhanced Gas Recovery (EGR). EU-level governmental actors have the option of making CCS application mandatory by law, but such a decision at present remains improbable because CCS will most likely remains to be perceived as a new and risky technology in the future (Schenk, 2013). The ETS Directive is another policy challenge because of the lackluster price of CO_2. The EU ETS was introduced as the cornerstone of EU climate change policy and also the most effective long-term incentive for operators to invest in CCS (GCCSI, 2013). However, CCS is directly dependent on the ETS CO_2 price and does not have other support schemes to depend on like feed-in tariffs or portfolio requirements (Pearson and Whiriskey, 2013). The low Emissions Unit Allowance (EUA), trading at around €4.30/tCO_2, has failed to provide a long-term price signal for CO_2 emitters to pursue the development of CCS technology, and thus has severely eroded the business case for CCS (Pearson and Whiriskey, 2013; European Energy Exchange, 2013).

Further, international law has contributed to the advancement of CCS through the London Protocol. Article 6 of the London Protocol, one of the first international conventions controlling marine pollution and dumping of wastes into the sea, was amended in light of removing barriers for contracting parties to cooperate on offshore storage (IEA, 2011). The protocol was amended by contracting parties in 2009 to allow for cross-border transportation of CO_2 for sub-seabed storage, but the amendment has not been ratified by two-thirds of contracting parties to enter into force. Further, it is unlikely that ratification will occur in the near term since Norway is the only party of the 40 contracting parties to have ratified the amendment (IEA, 2011).

Fourth, CCS technology is at a crossroads largely due to political and social uncertainties. Political uncertainties include legal and regulatory issues, as well as public acceptance issues. The

uncertainties associated with the development of CCS uncertainties lie in the costs of CCS in the present and the future, perceived risks associated with storage and transport of CO_2, and complexity issues at the technical, organizational and environmental levels (Hansson and Bryngelsson, 2009). To ensure success, strong commitments from both industry and government are imperative. In order to progress towards a large-scale demonstration project, industry must be willing to financially invest in projects and share knowledge and lessons learned and governments must share with industries the first-mover risks associated with CCS and all innovative technologies (Lipponen et al., 2011). However, as the interviews conducted in this study confirm, the commitment from industry and government is not always definitive.

The complexity of uncertainties that CCS faces call for the following research objectives followed by an outline of the research questions.

1.3 Research questions and objectives

In the transition towards cleaner energy, decision making in both the public and private domains will advance or hinder technologies. This research anticipates a modest contribution to the area of decision-making practice in the context of the European-level actors, while focusing on a complex, significant and timely issue. The objectives of the study are to identify how different actors put into practice their capabilities to positively or negatively reinforce CCS-related decision making using CCS expert interviews. A series of research questions will address the objectives of the research. In addition to addressing the series of research questions, the study will also provide a landscape overview of CCS in the European Union, both technologically and politically.

1. Main Question
    a. How do different European-level actors put into practice their capabilities to positively or negatively reinforce CCS-related decision making?
2. Sub-questions
    a. What is the position of the set of European-level actors on CCS and to what extent do the actors believe CCS as a priority?
    b. What characterizes the relationships between the set of fifteen actors in this study on CCS decision making?
    c. What are the implications of the analysis for ZEP-led stakeholder dialogue?

1.4 Limitations

This study contains four main limitations. The first limitation is the pre-defined set of actors used in the research. This limits the scope of the analysis. However, interviewees were able to recommend additional decision makers in order to make the interview more complete. The second limitation is related to the participating experts. Experts who are personally in favor or are affiliated with an organization which is either publically in favor or against CCS were invited to participate in the study. However, there were few experts affiliated with an organization that is against CCS and willing or able to participate. The third limitation is the overlap of the selected actors and the organization of which experts are affiliated. In addition, many interviewed experts are affiliated with more than one of the selected actors as well as other actors in the CCS network. The final limitation is the interpretation of the interviews. Not all statements and diction could be clarified within the one hour interview, thus the interpretation of the interviews and the analysis are those of the author.

1.5 Outline

The next chapter will address the state of affairs of CCS, both technically and politically. Also, Chapter 2 will briefly outline the actors used in this study with regards to any projects, policy making and other initiatives in which the actors is involved. Chapter 3 reviews the theoretical framework. Chapter 4 introduces the methodology used for the analysis. Chapter 5 presents the qualitative analysis of the research. Chapter 6 presents the quantitative analysis of the research. Chapter 7 is an opportunity to discuss the research and provide recommendation for future research. Chapter 8 presents conclusions and answers to research questions.

2. Background

2.1 Carbon capture and storage (CCS)

CCS is technologically mature at each of its three components. First, capture technologies include pre-combustion, post-combustion and oxyfuel. Transport, mainly by pipeline or by truck, is the second component. Finally, storage options include deep saline aquifers and depleted oil and gas fields (ZEP, 2012). There are additional technical options for each of the three components, including CO_2 transport by tanker and CO_2 storage in the deep ocean, but they are not yet available or deployable at a commercial scale (Rubin et al., 2012). Refer to figure 2 for a schematic overview of a CCS system.

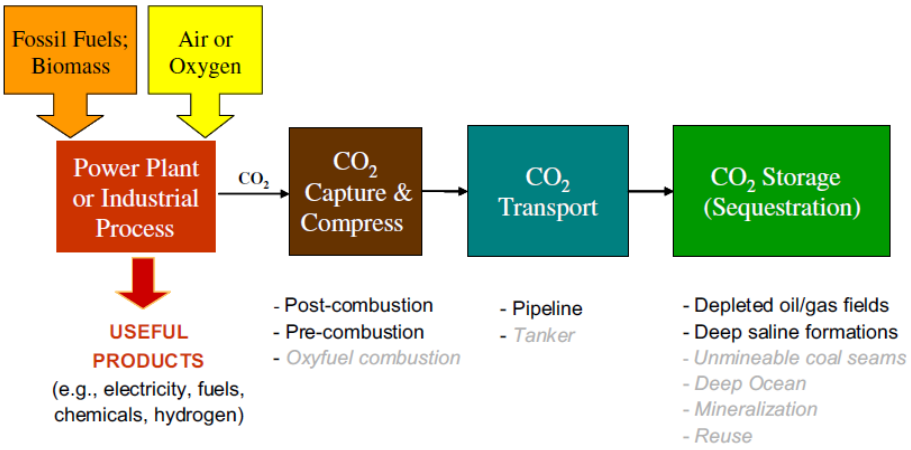


Figure 2. **Schematic overview of a CCS system (Rubin, 2012).**

CCS technology has been fitted to a number of demonstration plants around the world. The Global Carbon Capture and Storage Institute (GCCSI) (2011) reports there are eight large-scale projects in operation around the world. However, the only two operational projects in Europe are the Sleipner and Snøhvit projects, both of Norway. There are no operational large-scale projects within the European Union. There are several small-scale initiatives, but the overall integration of all three components in a full scale project remains severely underdeveloped in Europe (IEA, 2012). As is depicted in figure 3, there are a number of defined projects which are waiting for the final investment decision (FID). Over the past few years, no projects have made the transition from the define stages to the execute stage. There is an apparent barrier between the final planning stages and the first steps in executing a project. The number of evaluated projects has also decreased, while identified projects have slightly increased.

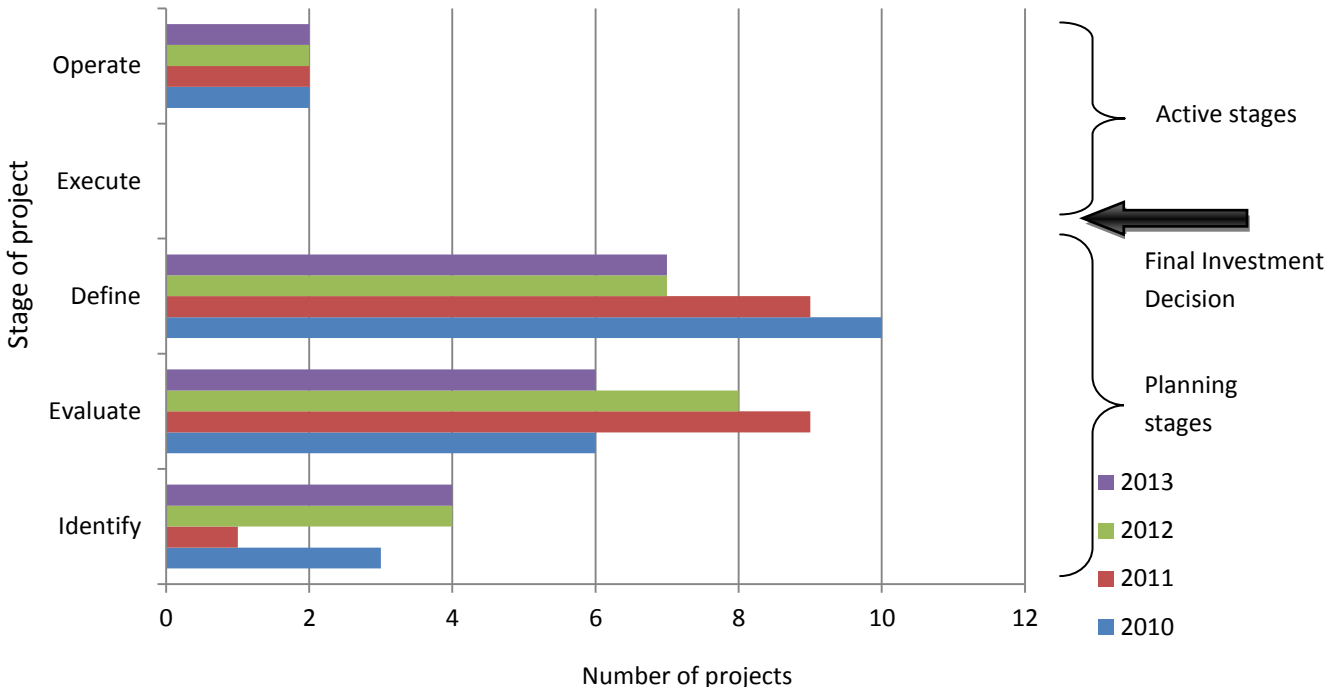


Figure 3. **European large-scale integrated projects by project stage (Kneppers, 2013).**

2.2 Background information of actors used in this study

Each group of stakeholders plays a role in the large scale deployment of CCS. Industry and utilities drive the timely demonstration of CCS in addition to the commercialization of the technology. At the commercialization stage, CCS technology is applied through private investment only (Schenk, 2013). According to Varnäs et al. (2012), the development of CCS is dependent on projects developed by the utilities since they are the most directly exposed to the price of carbon emission set by the EU ETS. In addition, they own and operate the assets into which CCS technology will be integrated. Equipment manufacturers are also seen as important players in the development of CCS technology. Similarly, research and development has provided significant contribution to CCS technology development, as well as attempts to standardize the cost of CCS and the capacity for CO_2 storage in Europe (Varnäs et al., 2012). Finally, European environmental NGOs play a significant role in advocating for or against CCS. Overall, the positions of NGOs on CCS vary, where many are skeptical or vocally negative towards CCS (Meadowcroft and Langhelle, 2009; Stephens et al., 2011), but there are a few notable NGOs who actively promote CCS including Bellona. The most frequent arguments against CCS relate to the risks to

human health and the environment, the possibility that CCS will divert resources from renewables, and the concern that CCS will prolong the use of coal (Varnäs et al., 2012). Actors from all of the aforementioned groups of stakeholders, except equipment manufacturers, involved in the large-scale deployment of CCS were included in this study. See section 4.3 for an overview of the selection process of the actors. The following will briefly outline the fifteen elements selected for this study and their involvement in CCS.

2.2.1 Industries

Shell

Shell is involved in several demonstration projects around the world and two of its projects are located in Europe. Shell is a partner in the TCM Mongstad project in Norway where it will develop and test CO_2 capture technology with the capability of capturing up to 100,000 tons of CO_2 a year (Shell, 2013). Their Peterhead project in the UK looks to develop the first full-scale CCS project at a gas-fired power plant with the potential to capture up to 10 million tons of CO_2. The CO_2 would be transported for offshore long-term storage in the North Sea (Shell, 2013). They were the project owner and developer of the CCS capture and storage demonstration project located in Barendrecht, The Netherlands. The storage facility was two depleted gas fields under the town of Barendrecht (Brunsting et al., 2011). The project has been cancelled by the government due to delays and public opposition (MIT, 2013).

Statoil

Statoil is considered to be one of the pioneers of CCS (van Alphen et al., 2009). They are currently involved in four large-scale commercial projects. Three projects are located in Norway including Sleipner in the North Sea, Snøhvit in northern Norway, and Mongstad (Statoil, 2010). Statoil first began investigating for cost-effective options in order to take control of the CO_2 emissions for their Sleipner gas field because of the introduction of a carbon tax (van Alphen et al., 2009). Despite significant progress in CCS, Statoil has faced setbacks including a delayed final investment decision for the Mongstad project, which is now scheduled for 2016 (ZeroCO2, 2013).

2.2.2 Utilities

Vattenfall

Although Vattenfall was one of the early movers on CCS, they faced a substantial setbacks with the termination of several of their projects, including the EEPR funded Jänschwalde project in Germany and a capture and storage facility called Vested near Jutland, Denmark. Vattenfall was forced to delay its Danish project in 2009 due to public opposition and cancel the German project in December 2011 largely due to German legal constraints as well as public opposition (Stigson et al., 2012, Vattenfall, 2013). However, according to their corporate website, "Vattenfall still holds firmly to CCS" and continues several other CCS-related endeavors like the pilot plant at Schwarze Pumpe in Brandenburg (Vattenfall, 2013).

E. ON

Utility companies like E. ON strive to develop CCS technology which would allow for the generation of technology from coal at nearly zero emissions. Low-emission generating technologies are not expected to be able handle energy demand world-wide for decades to come and fossil fuels like coal will remain the provider for electricity generation (E. ON, 2013a). Their most notable project is the ROAD Demonstration Project in the Netherlands, which is an initiative of E. ON Benelux and GDF SUEZ Energie Nederland. The ROAD project is co-financed by the EEPR, the Government of the Netherlands and the Global CCS Institute (http://www.road2020.nl/en/). E. ON is a partner of several power pilot power plants (E. ON, 2013b). They also planned to build the UK's first CCS coal-fired power plant project at Kingsnorth in Kent but postponed the project in 2010 (BBC, 2010).

National Grid

National Grid is exploring opportunities to apply its expertise in gas pipelines to CCS. It is looking in developing networks where clusters of power stations or other heavy industry adopting CCS use the same pipeline infrastructure (National Grid, 2011). They are partners in five of the seven currently proposed CCS projects in the UK (National Grid, 2012).

2.2.3 Governmental bodies

National Government of Germany

The low-carbon future envisioned by Germany prior to the Fukushima disaster consisted of a triad of technologies – nuclear power plants, CCS plants and renewably-sourced energy (RES), where the first two technologies were seen as transitional technologies (Lechtenbömer and Luhmann, 2013). Post-Fukushima Germany saw only RES as a viable option in its *Energiewende* (Energy Transition). The ambitious targets in the Transition call for a decrease of 80-90% in GHG and a primary energy supply made from 60% RES by 2050. In addition to passing several laws that led to the shutdown of nearly the entire fleet of nuclear power plants, the Transition has led to legal setbacks for CCS.

National Government of the Netherlands

The Netherlands is home to one of the EEPR-funded projects, the Rotterdam ROAD project. The infamous CCS project in Barendrecht sits a few kilometers east of Rotterdam. The project, an initiative of Shell, aimed to store CO_2 from a nearby oil refinery. The plans received immense opposition from the community which delayed and eventually cancelled the project (Brunsting et al, 2011; Feenstra et al., 2010). In September 2011, the amendments of the Mining Law entered into force in order to implement the EU CO_2 Storage Directive, as well as the OSPAR Decision 2007/2 on the storage of carbon dioxide streams in geological formations (IEA, 2012). The cabinet decided to not support onshore CO_2 storage project deeming offshore storage as sufficient for mitigating climate change (IEA, 2012).

National Government of the United Kingdom (UK)

The UK Department of Energy and Climate Change's CCS Roadmap (2012) presents the government's commitment to CCS. The UK has significant interest in storage capabilities in the North Sea and building infrastructure networks for existing power and industrial plants. Policy initiatives in the UK require that all new coal-fired power stations must be built with CCS on at least a proportion of their capacity. In addition, new thermal generating plants (coal, gas, biomass and oil) over 300MW must be carbon capture ready. Further, the EU CCS Directive has been transposed into UK law. The UK has the intention to introduce an Emission Performance Standard (EPS), which would regulate the amount of carbon dioxide that can be emitted per unit of production (CCSA, 2013). Finally, the UK Government has selected two projects, Peterhead and White Rose, to receive funding from the UK's £1bn Carbon

Capture and Storage Commercialisation Programme Competition (Department of Energy & Climate Change, 2013). The UK has shown significant support but is aware of the risks associated with "picking winners" and becoming too involved in supporting one low-carbon technology (Scrase & Watson, 2009).

National Government of Norway

Norway is the only non-EU government in this study, but is nonetheless important in the European context and considered to be the world pioneers in CCS development and deployment (Tjernshaugen, 2011). Their share of global emissions is small, but they aim to develop and promote technologies that would significantly reduce emissions in other countries (Buhr & Hansson, 2011). Norway coordinates their CCS activities with climate policies and CCS initiatives of the European Union in order to further advance towards the dual challenge of reducing GHG emissions and meeting a growing energy demand (Buhr & Hansson, 2011, van Alphen, 2009). They are the sole country to have a targeted CCS deployment policy in place with policy support in the form of a tax on offshore CO_2 emissions (IEA, 2012). Although the public shows support for CCS, the significant amount of funding committed to the Norwegian government to Statoil projects has faced criticism in the media (Buhr & Hansson, 2011).

European Commission

The EU-level governmental bodies face a triad of challenges: meeting greenhouse gas emission targets, ensuring the security of energy supply, and maintaining competitiveness. The EU Energy Roadmap 2050 confirms the critical role of CCS in the emission reduction targets set by the European Union. CCS policy and funding schemes in the EU have developed substantially since the 2007 Climate and Energy package, where CCS was envisioned as a key solution in combating climate change in the EU. In addition, an EU-wide legal framework has been established with the 2009 CCS Directive (European Commission, 2009), where member states were requested to implement regulation of carbon storage (ZEP, 2012).

Table 1. ***Overview of recent CCS policy developments in the European Commission.***

Date of publication	Document number	Document title
27-Mar-13	2013/180/EC	Communication on the Future of Carbon Capture and Storage in Europe
27-Mar-13	2013/169/EC	Green Paper: A 2030 framework for climate and energy policies
08-Mar-11	2011/112/EC	Energy Roadmap 2050
23-Apr-09	2009/31/EC	CCS Directive – geological storage of carbon dioxide

The two main funding initiatives have come out of the European Commission including the EEPR and the NER300. The EEPR, a funding scheme that was a result of the 2008 Economic Crisis, was approved by the European Council and the Parliament to fund energy-related projects. Six CCS projects were selected to receive €1 billion worth of funding with the aim of advancing the technical and economic viability of CCS on large-scale power plants. However, two of the projects, Jänschwalde in Germany and Bełchatów in Poland have been cancelled. It is unclear whether a third project in Porto-Tolle, Italy, will proceed due to permit issues (MIT, 2013). See Appendix A for an overview of the EEPR projects.

The 2009 launching of the CCS directive in the European Commission contains a provision (Article 10(a)8) to set aside €300 million EUA allowances for the New Entrants' Reserve 300 (NER300) of the EU ETS (Nykvist, 2013, http://www.ner300.com/). The preliminary list of innovative projects qualifying for funding under the NER300, published in December 2012, included only one CCS project, the French Ultra-low carbon dioxide steelmaking (ULCOS) project sponsored by ArcelorMittal. However, the project withdrew from the competition in late 2012 (ZeroCO2, 2013). A second call for proposals opened in April 2013 with a deadline of 3 July 2013. The funded projects from the second call will receive the remaining €100mn in reserves. The second list of funded NER300 projects is scheduled to be published at the end of 2013.

European Parliament

The European Parliament (Parliament) is active in climate policy making, including the EU ETS Directive, the Renewable Energy Directive and the CCS Directive (Harmsen et al., 2013). Two recent developments in the Parliament are relevant to the development of CCS in the EU. First, the Parliament voted against the backloading decision thus prohibiting the EU to intervene in the carbon market and artificially boost prices. Second, in response to the Commission's Roadmap 2050, the Parliament's Industry, Research and Energy Committee (ITRE) adopted its own-initiative report entitled, Developing and Applying Carbon Capture & Storage Technology in Europe, which intends to propose innovative instruments to promote and fund the development of CCS.

2.2.4 Advocacies, Associations, and NGOs

International Energy Agency (IEA)

The IEA is the only autonomous organization of the set of actors in this study. The aim of the IEA is to ensure reliable, affordable and clean energy for its 28 member countries and beyond (IEA, 2013a). The IEA has been actively working on CCS-related issues for over ten years and have produced numerous analyses, which address many facets of CCS technology, strategy and policy. Analyses of the IEA point to CCS playing a vital role in global, lowest-cost efforts towards meeting emissions reduction goals for 2050. However, for CCS to reach this potential around 100 CCS projects need to be implemented by 2020 and over 3000 by 2050 (IEA, 2013b).

Bellona

Bellona is one of the most prominent NGOs in the CCS community. They recognize CCS as a main solution to combat global warming, in addition to enhanced energy efficiency and more renewable energy production. They are involved in numerous projects and initiatives that aim to progressively develop and deploy CCS (Bellona, 2013a). They emphasize the consequences of not developing CCS and believe that there "should [be engagement] in a dialogue to provide information and awareness and promote enthusiasm for this very important technology [CCS] without which we will not reach our goal to stay below two degrees temperature change" (Stephens et al., 2011).

European Energy Research Alliance (EERA)

The EU has recognized that the advancement of more efficient technology is imperative in order to successfully defeat climate change while securing the European energy supply. The EERA was founded on the grounds of achieving this goal and aims to accelerate the development of key new energy technologies. Since its founding, the EERA has launched 15 joint programs including a program for carbon capture and storage (http://www.eera-set.eu/). Forty-four European research centers and universities work together in the carbon capture and storage program, including SINTEF and TNO. In the aims of meeting the goals of the European and international community for CCS, they strive to be a catalyst for large scale deployment of CCS by creating cost competitive and energy efficient capture methods and storage technologies (EERA, 2013).

Carbon Capture and Storage Association (CCSA)

The CCSA focuses on promoting the business of CCS and works to show the role of CCS in moving the UK and beyond towards a low-carbon economy and as a viable option for climate change mitigation (CCSA, 2013b). Their membership includes a diverse range of industries ranging from manufacturing and power generation to oil & gas. The membership also includes others affiliated with the energy sector from banking, consultancy and law (CCSA, 2013c).

3. Theoretical Framework

3.1 Technological innovations systems

In understanding the role of CCS in the European energy transition, it is useful to reference technological innovation systems (TIS). Energy options are frequently assessed in only technical and financial dimensions. However, public policy decisions and the influence of social institutions play a critical role in influencing the outcome of a technology. TISs provide a framework for understanding the evolution of large technical systems within social, cultural and political institutions. Transitions occur when a niche technology gains enough traction to compete with, and eventually supplant, the current socio-technical regime (Geels, 2002; Stephens & Jiusto, 2010). See figure 3 for a schematic overview of a technological innovation system.

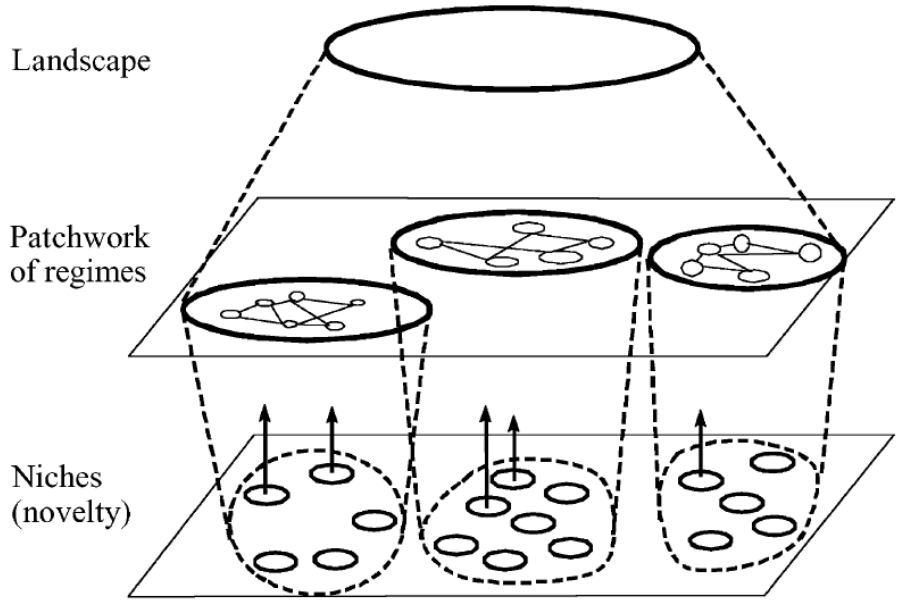


Figure 3. **Schematic view of a technological innovation system (Geels, 2002).**

Successful development of technology is dependent on a sufficiently structured and functioning system of a network including government, NGOs, private companies, knowledge institutions (research centers and universities) and other actors. However, many systems feature poorly aligned network and policy processes which can hinder the advancement of the niche technology (Wieczorek et al., 2012). An

exponential growth rate of a TIS with a structured a functioning system increases the chances of a successful technology (Hekkert and Negro, 2008). TISs have been used to effectively explain the success or failure of technological trajectories of technologies in various regions and countries (van Alphen et al., 2009).

3.2 Network Structures and Decision Making

The thesis studies the ability of European-level actors to reinforce CCS-related decision making within a network of decision makers (Stokman et al., 2000; Thomson et al., 2004; Schalk et al., 2007) in the context of European public actors (Bueno de Mesquita & Stokman, 1994; Stokman & Thomson, 2004), as well as multi-level decision making including both public and private actors (Richardson, 2000). In collective decision making, actors will try to build a coalition as large as possible behind a position that is as close as possible to their own (Stokman & Zeggelink, 1996; van Assen et al., 2003). Collective decision making becomes difficult when a large group of actors take different positions and express different preferences with respect to the outcome (Stokman et al., 2000). Actors hope to realize their position in the final decision as much as possible. The dynamics of decision making is based on a process through which a few dominating actors influence others to change their position, either through persuasion, coercion or exchange (Stokman & Thomson, 2004, Stokman, 2004). In order to understand the characteristics of the actors in relation to the issue at hand, interviews with experts allow for the elicitation of the position of the actor, the salience of the issue for the actor and the capabilities of the actor to determine the outcome (Stokman et al., 2000; Stokman & Zeggelink, 1996; Bueno de Mesquita & Stokman, 1994; Stokman, 2004).

CCS experts were asked to consider a set of actors' favorability of CCS, as well as the elements' ability to exert the most influence on decision making. Bueno de Mesquita & Stockman (1994) allow for the elicitation of the network structure of CCS through expert interviews. Evidence shows (Wright, 2002) that expert judgments can be expected to be of more value than the judgment of novices when the subject of judgment is from an expert in the field of study, also referred to as ecological validity (Wright, 2002; Green, 2002). In simpler terms, a person with practical experience of, or directly affected by, the set of issues in the study is considered to have an expert opinion (Eden & Ackermann, 2004). In this case, an expert is defined as being well-informed about CCS, as well as well-informed about European-level decision making in both the public and private domains.

4. Methodology

4.1 Personal Construct Theory

The core method implemented in this research is the Personal Construct Theory (PCT), developed by Gerald A. Kelly (1955), which says that all humans develop 'rules' by which we use to categorize situations, people, relationships and objects with almost all events we experience. The rules help people make sense of a situation by noting similarities and difference in a specific event. (Fransella et al., 2004; Vasileiadou et al., 2013). An element is a relevant subject or object that people face in an event. According to Jankowicz (2004), the key component of the theory says that all individuals develop and test constructs as a way of explaining and anticipating events. Interviewees typically differ in how they construe events. However, using one set of elements consistently throughout a study will give rise to the same constructs stated multiple times within a group of interviewees. This allows for the elicitation of patterns in a series of constructs on a specific issue.

4.2 Repertory Grid Technique

The Repertory Grid Technique (RGT) attempts to capture a personal construct system. RGT was selected for this study as it strives to elicit how a set of European-level actors (the elements) are perceived by CCS experts (the interviewees). The technique notes that people constantly try to make sense of the world in order to act within and upon that world through construct systems (Eden & Ackermann, 2004). People observe, make inferences, and act based upon these conclusions. The RGT aims to reveal patterns of a series of individual construct systems on a specific issue (van de Kerkhof et al., 2009). RGT has been applied mainly in the area of psychology, but recently, the technique has been applied in areas of policy analysis and environmental issues (Vasileiadou et al., 2013; van de Kerkhof et al, 2009; Eden & Ackermann, 2004).

There are two main components of RGT, including **elements** and **constructs** (Tan & Hunter, 2002). **Elements** are the 'objects of attention' within the study (Tan & Hunter, 2002). Interviewees are asked to comparatively explore the similarities and differences between triads of elements (Tan & Hunter, 2002). The elements in this study are fifteen organizations that have been determined as having key influence in the CCS decision-making arena. A detailed explanation regarding the selection of the elements can be found in chapter 4.3. From here forward, elements will be referred to as "actors." **Constructs** are the second component of RGT and represent the experts' interpretation of the elements.

Constructs are a reflection of the distinction people make to distinguish elements and relate them to their own world (van de Kerkhof et al., 2009). The CCS expert constructs a link between the triad in the way that two of the actors are similar to each other and the third is different from the first two actors. It is important that constructs are bipolar so that one side of the construct is opposite from the other. The technique is efficient in the sense that RGT can elicit the true range of relevant constructs in a particular context with only a limited number of interviews, or approximately 15 to 25 interviews (van de Kerkhof et al., 2009; Vasileiadou et al., 2013). Further details on the interview design for this study can be found in chapter 4.5. The following section will outline the selection of the elements for this study.

4.3 Selection of Actors

The actors must fit within the aims of the study. This study aims to identify how different actors put into practice their capabilities to positively or negatively reinforce CCS-related decision making. The actors should reflect the various sectors of European actors involved in CCS-related decision making. It was determined to include sectors of government, industry, agencies, associations and NGOs who are involved in CCS-related decision-making. It is important that the actor is recognizable to the extent that the interviewee would be able to produce a statement or opinion about the actor (Jankowicz, 2004). In order to identify the most important elements to use in the interviews, a consultation meeting was set up with the ZEP Secretariat, where a long list of relevant actors was produced.

The next step was to narrow down the list of elements to 15 elements, which is a manageable number for the interview process according to Jankowicz (2004). In order to narrow down the list, the ZEP Advisory Council and Task Force Members were consulted through an electronic survey. Members were asked to rate, on a scale of one to five, the relevance of the 26 European-level actors on CCS-related decision making. The survey was sent to 342 members, of which 65 responded to the survey for a 19% response rate. Elements which received a weighted score of 3.5 or greater were included in the final list. Twelve of the 26 actors listed in the survey were included in the final list. Members were also able to suggest additional actors. Three actors that were frequently suggested including the National Government of Norway, the European Energy Research Association (EERA) and National Grid were added to the final list. They were added to the list because they had a weighted score of 3.5 or greater. See table 2 for the final list of elements selected and consistently used in the interviews for the repertory grid. The following section sets out the following process for which the interviewees were selected.

Table 2. ***Elements selected for study***

Number	Organization	Sector
1	Shell	Industry, Oil and Gas
2	Statoil	Industry, Oil and Gas
3	Vattenfall	Industry, Utilities
4	E. On	Industry, Utilities
5	National Grid	Industry, Utilities
6	National Government of Germany	Government
7	National Government of The Netherlands	Government
8	National Government of UK	Government
9	National Government of Norway	Government
10	European Commission	Government
11	European Parliament	Government
12	IEA (International Energy Agency)	Intergovernmental organization
13	Bellona	NGO
14	EERA (European Energy Research Alliance)	Research
15	CCSA (Carbon Capture and Storage Association)	Sector Association

4.4 Selection of Interviewees

With the guidance of the ZEP Secretariat, 72 CCS experts with interview potential were defined. It was not expected that all candidates could commit to a one-hour interview because of generally eventful schedules, but it was expected that approximately 15 to 20 candidates would be willing to participate. The criteria selection for an interviewee included two components. First, an expert is well-informed about CCS, as a technology and as a political issue. Second, the interviewee is well-informed about decision-making in the context of public and private European organizations.

After contacting the potential expert interviewees, 22 candidates accepted the invitation. Twenty-one candidates were able to meet face-to-face and two were able to schedule a one-hour phone interview. The final interviewee was able to schedule a 20 minute phone interview, which contributed to the qualitative analysis, but was excluded from the quantitative analysis because the repertory grid analysis could not be sufficiently conducted within the timeframe of the conversation. All 20 interviews were scheduled with one person, with the exception of one interview where three experts sat in on the interview together. All experts were promised that their names and affiliated organizations would be presented collectively and anonymously as possible. Statements stated by experts are cited by

the experts' number randomly assigned at the time of the interview. Each interviewee was asked for permission to list their name and organization in an alphabetical listing of the interviewees. See Appendix B for the list of the participating experts. Twenty-three potential expert interviewees declined the invitation, mostly due to scheduling difficulties, and no response was received from 25 potential expert interviewees. Unfortunately, potential interviewees that declined or did not respond included experts from organizations that are publically not in favor of CCS.

4.5 Repertory Grid Interview Design

Before commencing the interview process, a step-by-step design of the repertory grid interview was determined. There are three main steps: presentation of the elements, construct elicitation, and the rating of the elements against the construct. At the beginning of the interview, the expert was asked to rate all 15 actors on a scale of one to five, where one means the element is completely against CCS in the EU and five means the element is completely in favor of CCS. The data obtained from this ranking exercise was analyzed in the quantitative analysis. See appendix C for the protocol used during interviews.

Presentation of the elements

During face-to-face interviews, the actors were written on index cards and randomly presented to the expert in triads. Many of the experts were affiliated with one or more of the actors. Out of the 22 interviewees, 18 were affiliated with one or more of the actors. However, the actors with whom the experts are affiliated were not removed with the intent to elicit the experts' own perception of the entire set of actors. Experts were allowed to construct more than one link between the actors in one triad. Experts who were available for a phone interview were sent an interactive, real-time online document prior to the interview. This document not only assisted in visually explaining the RGT, but it was designed to easily conduct the analysis.

Eliciting constructs

The constructs reveal how the expert perceived the topic. After the triad of elements was given to the interviewee, the following question was asked: "In what ways are two of these elements alike and at the same time different from the third?" Also, to avoid too many simplistic constructs, the qualifying

phrase “in terms of elements’ influence on decision-making related to CCS” was stated after the aforementioned question, as necessary. In a 30 minute interview, an expert was presented with five to seven triads.

Rating the actors

The ratings reveal what the expert thinks about individual actors. After the constructs were elicited, the expert was asked to select the two most important constructs that (s)he constructed. These constructs were then rated using a five-point scale. The side of the construct with a more negative connotation was assigned a one and the side of the construct with a more positive connotation was assigned a five. For example, “not politically influential” was assigned a one and “politically influential” was assigned a five. During the repertory grid exercise the original construct was not always produced from negative to positive connotation. It was occasionally necessary to reverse the construct produced in the RGT exercise for the rating exercise in order to maintain the format of negative to positive connotation. Also, some ratings were not constructed during the RGT exercise and instead produced during the rating exercise. In this case the additional construct was usually a combination of two constructs produced during the RGT exercise. All 15 actors were assigned a rating on a scale of one to five, unless the expert was unsure of the actor and asked the card to be removed from the deck. Figure 4 shows examples of a construct rating.

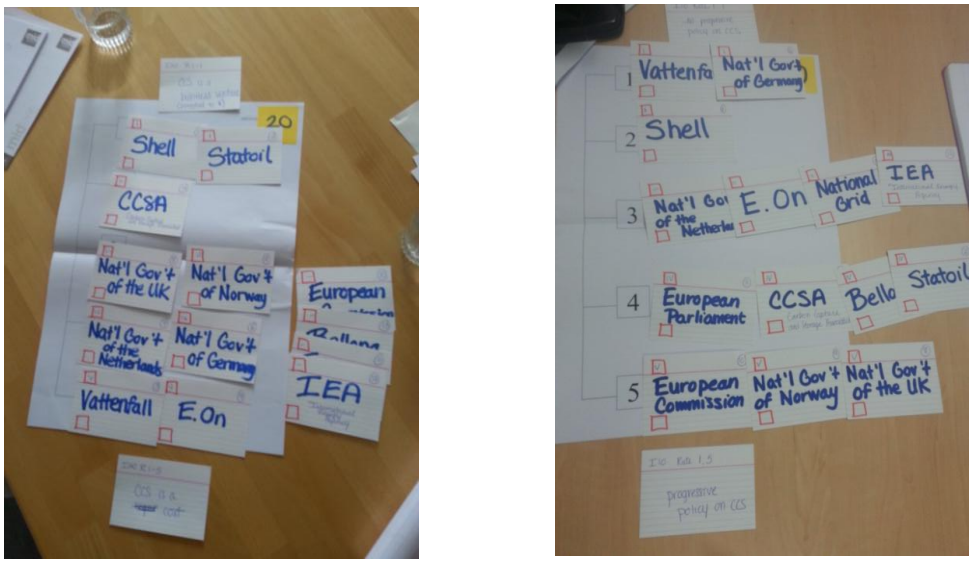


Figure 4. **Examples of a construct rating.**

5. Qualitative analysis of CCS expert perception of European-level actors

This section will present an analysis of the interviews. The interviews consisted of three components; the rating of the actors, the repertory grid interview, and the rating of the most important constructs. The analysis of the rating of the most important constructs will be addressed in chapter 6. Chapter 5.1 will present the average rating of the actors. The experts were asked to rate each element as for or against CCS in the context of the EU on a scale of 1 to 5. Second, significant elicited constructs will be presented in the qualitative analysis in chapter 5.2.

5.1 Overview of expert perception of element's favorability of CCS

Before the beginning the repertory grid, each expert was asked to rate each actor as for or against CCS within the EU on a scale of 1 to 5 where one means the element is completely against CCS in the EU and five means the element is completely in favor of CCS in the EU. This exercise was included in the interview protocol in order to familiarize experts with the set of actors. In addition, the collected data provides insight into expert perception of the actors. Some experts gave insight into their ratings of actors, which is noted in this section. The average rating of each element is presented in figure 5. Outliers, represented by an open circle or star, are labeled with the interview number. For example, expert 6 rated Shell with a rating of two, yet most rated this actor as a four or a five. Shell, Statoil, the UK, Norway, Bellona and CCSA consistently received high ratings. However, expert 4 noted that Shell and Statoil are not "throwing their weight behind CCS," otherwise they would be investing and planning for the utilization of CCS in the long term. Expert 9 mentioned that Statoil cannot be considered completely in favor of CCS otherwise they would be willing to commit to all initiatives in the EU that would push forward CCS. Expert 9 also noted that, in the end, Shell and Statoil are "strictly [involved in] business." E. ON, National Grid and the Commission received average ratings. E. ON and National Grid were many times given a neutral rating of three because they are perceived to be favor of CCS to the extent that the government of the country in which they operate is in favor of CCS. At this point in time, actors like E. ON and National Grid are waiting to see what kind of direction Germany and the UK, respectfully, take before making any further commitments. Germany and the Parliament were perceived as negative towards CCS. Germany received the lowest rating overall. Several experts equated the CCS

legislation in Germany as a justification for a low rating.[1] Vattenfall was usually given a rating of three, but some experts rated the element with a low or high rating. This shows that experts are divided over the position of the actor. Several experts rated the actors based on their paper commitments and plans, but as expert 13 noted, there is a clear distinction between theoretical plans and the actual implementation of plans. Expert 7 believed that actors are for or against CCS in the EU depending on who is going to pay for CCS. In sum, figure 5 shows most experts have similar perceptions on this set of actors. Also, most actors in the study are perceived by experts to be positive towards CCS, but some governmental bodies have a less than positive outlook on CCS

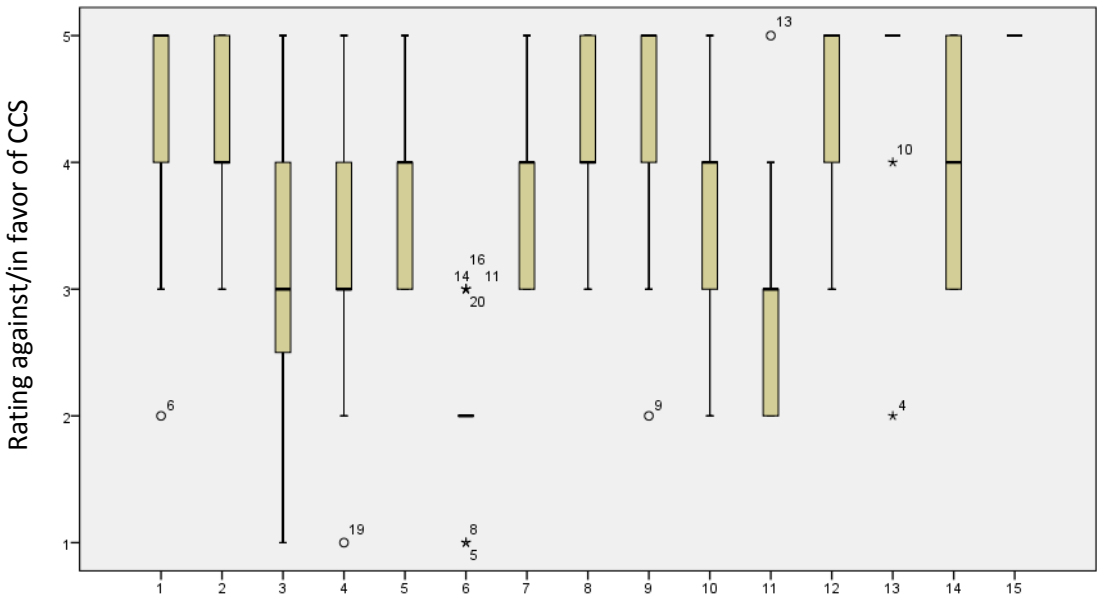


***Figure 4*. Average rating of actors.**

[1] Act on the Demonstration and Use of the Technology for the Capture, Transport and Permanent Storage of CO_2. http://www.bmwi.de/BMWi/Redaktion/PDF/Gesetz/gesetzesentwurf-ccs-08-2012,property=pdf,bereich=bmwi2012,sprache=de,rwb=true.pdf

5.2 Qualitative Analysis of European-level actors on CCS decision-making

Of the 20 interviews, 19 were able to conducts the Repertory Grid segment of the interview. The interviews elicited 161 constructs. As expected, many of the same constructs were repeated in numerous interviews. The constructs that were repeated several times were grouped together into an identified construct. The repeated constructs were grouped into 39 identified constructs. In figure 6 each of the first seven interviews made several new constructs. No new constructs were made until interview 11, where three additional constructs were formulated. The last two constructs were made during interviews 14 and 15 where each interview produced one additional construct. As the technique predicts, the number of new constructs elicited in an interview diminishes to zero by the final interview. This signals that the set of constructs is complete.

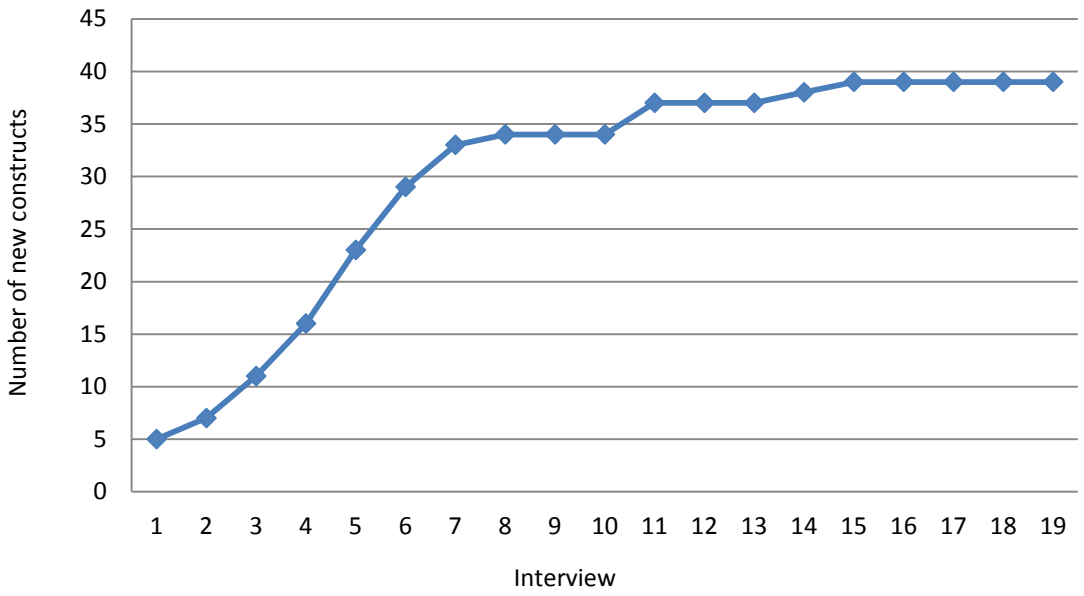


Figure 5. **Saturation of constructs.**

Table 3 presents the complete set of identified constructs and the frequency of which the construct was stated. The following sub-sections will provide an analysis of emergent trends of the constructs. The lowest level of commitment is considered to be an *Interest in CCS* followed by *support*

for CCS, authority of actors on CCS-related decision making, and *salience of CCS on the actor's agenda*. All but three of the constructs fit into the trends.

Table 3. ***Complete set of identified constructs and frequency***

Number	Side 1 of construct	Side 2 of construct	Frequency
1	Varying positive support for CCS	Continuously positive support for CCS	17
2	No current strong support for CCS	Very strong support for CCS	11
3	No financial capabilities for CCS	Financial capabilities for CCS	10
4	Focused on CCS in the EU	Focused on CCS at non- EU/global level	10
5	Interested in CCS because of business opportunities	Interested in CCS because of other interests in or besides CCS	9
6	Silent in the media on CCS	Present in the media on CCS	7
7	Politically influenced	Politically independent	7
8	No power to implement CCS	Power to implement CCS	7
9	No active participation in politics and business for advancing CCS	Active participation in politics and business for advancing CCS	6
10	Has faced more problems with project	Has faced less problems with project	6
11	No power in CCS decision making	Power in CCS decision making	6
12	Focuses only on CCS issues in its portfolio	Portfolio deals with many issues besides CCS issues	6
13	Reports to shareholders	Reports to citizens	5
14	Believes decarbonization cannot take place without CCS	Believes decarbonization can take place w/o CCS	4
15	No investment in CCS	Investment in CCS	4
16	Unclear communication on CCS	Clear communication on CCS	4
17	Skeptical about storage	Pro-storage	4
18	No public opposition	Stronger public opposition	4
19	Climate/decarbonization is not on the agenda	Climate/decarbonization is on the agenda	4
20	Research is an end to itself	Research is a tool to move CCS forward	3
21	CCS decisions do not have financial/technological risks	CCS decisions have financial/technological risks	3
22	Not working on a CCS project	Working on a CCS project	3
23	Committed to words	Committed to deeds	3

24	Focused on short-term delivery of CCS	Focused on long-term delivery	2
25	Future is dependent on CCS	Future not dependent on CCS	2
26	CCS needed for future energy security	CCS needed for future legal requirements/costs	2
27	Not very active in CCS decision making	Active in CCS decision making	2
28	Future of CCS policy questionable	future for CCS policy favorable	2
29	Not lobbying effectively in Brussels	Lobbying effectively in Brussels	2
30	Element has no interest in hydrocarbons	Element has interest in hydrocarbons	2
31	Bottom up network	Top down network	1
32	Late to the forefront on EU level regarding CCS	On forefront of EU since beginning of CCS	1
33	Most likely not supportive of CCS in the future	Supportive of CCS in the future	1
34	Published support for CCS	Published against CCS	1
35	CCS is not a clear part of strategy	CCS is clearly in strategy	1
36	Not a member of CCSA	Member of CCSA	1
37	CCS decisions are not only financially based	CCS decisions are financially based	1
38	No expertise on CCS	Expertise on CCS	1
39	Focus on pilot deployment of 1st generation tech	Focus on 2nd/3rd generation technology	1

Interest in CCS (Constructs 4, 5, 14, 24, 30, 39)

An interest in CCS requires the lowest level of commitment, as it requires only the attention of an actor and limited financial commitment. An interest in CCS comes about if the technology is perceived as a solution to a problem. In the case of CCS, actors view the technology as a solution towards economic, financial, and political interest. Disinterest comes about in the event that perceived complexities of the technology make implementation difficult for reasons including technological, financial, political or legal complexities. For example, industries are perceived as interested in CCS for its current business ventures, as well as expanding their business ventures, but the lack of a business case and political and legal complexities of CCS quickly leads to disinterest.

There is a divide between in interest in CCS for business opportunities available for the actor versus interests in combating climate change. Actors dependent on or interested in hydrocarbon-related industry were perceived as being more interested in CCS for the benefit of the company. Actors from the oil & gas and utility sectors are perceived as losing interest in CCS due to a lack of incentives as CCS is expensive in the short term. Many experts noted that both utilities and industries benefits from or will require CCS in the long term for their own interests. On the contrary, actors with interests in achieving their long-term emission reductions goals are interested for the benefits of society. These actors include the European Commission, the European Parliament and member states like the Netherlands who are losing interest and divided over the extent to which CCS is a necessity. Some experts believe that interest in CCS for societal benefits is sensitive to the public perception of the technology. Ambitious decarbonization goals might need to be met with a less politically agitated and controversial technology.

Support for CCS (constructs 1, 2, 6, 9, 16, 17, 23, 27, 29, 32, 33, 34)

Supporting CCS requires a higher commitment to CCS, although supporting CCS does not necessarily imply a financial commitment. “Support” was described by experts as promoting, advancing, lobbying, and actively participating in the CCS discussion. Support requires the actor to dedicate at least communication resources to publically broadcast its position through various media outlets.

Nearly all elements were perceived as currently supportive of CCS, but to varying degrees. Support usually varies within large institutions, as noted by experts 2 and 3. For example, some Directorate-Generals (DG) are more in favor of CCS, where DG Energy demonstrates more consistent support and is “alive with CCS” as described by expert 2 in comparison with DG Climate Action. Future support of CCS has to do with the political climate which surrounds the actor and previous experience with CCS projects. For example, several experts believed that E. ON and Vattenfall have lost faith and interest in CCS due to the failure of their projects. The current support of some elements, notably Germany, has diminished significantly since early to mid 2000s. In 2006, Germany was *the* CCS country in the world because of the pursuance of their environmental goals, however today they are noted by expert 18 as “lukewarm at best.” This statement implies that the political climate in which the actor must operate is one of the most determining factors of support.

The following section will address the authority of actors. There is a distinct difference between elements who support CCS and those who have the authority to influence CCS related decision making. The former are those who do not have or have little authority to influence CCS.

Authority on decision making related to CCS (constructs 3, 8, 11, 22, 28, 38)

Experts consistently saw an actor with authority as an actor with financial and legislative power or influence. Actors with the most financial authority were those from the oil & gas industry. Expert 1 noted that Shell and Statoil, as major players in the oil and gas industry, have a big responsibility in bringing forward a sustainable business model and financial case for CCS because they are perceived as having influence on decision making. Expert 12 also noted that oil companies are in the best position to move CCS forward. They have the understanding and know-how needed to deploy CCS, but it is a matter of CCS becoming a salient point on the agenda. Salience is the final trend and will be discussed in the following section. Further, oil companies would eventually be hurt by not incorporating CCS, especially if there is strict enforcement of emission standards.

Second, actors with the legislative authority are governmental actors. Member states have more influence and/or power than EU level actors because they make the final decision to implement a policy or not. As previously noted, the EU cannot mandate a member state to build a project (E9). Although the European Parliament was not considered to be the most powerful decision maker, their decision towards no backloading has had a negative impact on CCS and the carbon price.[2] According to expert 17, the European Parliament policy makers "hold the key" to the possible deployment of CCS through the upcoming backloading decision, noting that many individuals within the Parliament view CCS as an expensive and unverified technology. The Commission has funding capabilities and relative immunity from public perception and direct elections, but the salience of the issue remains undecided.

The elements most in favor of CCS like Bellona and CCSA have the capability to promote CCS through means of advising and lobbying. They can only assist in moving CCS forward because of the lack of financial capabilities or decision making authority. However, the interest, support for, and influence of an actor are extraneous if there is no potential for CCS to achieve and maintain a prominent position on an actor's agenda.

Salience of CCS on the agenda of the actor (constructs 7, 10, 12, 13, 15, 18, 19, 21, 25, 26, 35, 37)

The salience of CCS on an actor's agenda signals the willingness of the actor to commit to a level of investment financially and through other types of commitment until the realization of a CCS

[2] The backloading proposal aims to postpone the auctioning of 900 million carbon allowances for 2013-2015 (The Parliament, 2013).

demonstration project and beyond. Regardless of an actor's financial capabilities, opportunities to implement or fund a CCS project are insignificant if the actor is unwilling to invest in CCS (E6; E18). According to experts, the lack of willingness sources from five issues. First, an actor with diminishing support for CCS was usually due to political reasons. German politicians will not commit to CCS with upcoming elections because public perception of CCS. Expert 11 noted that once the public has an opinion on a certain issue, it is difficult to reverse the perception. The second issue is the failure of an investment gives CCS less salience on the agenda. Expert 1 characterized Vattenfall as dependent on CCS for its future endeavors, yet political pressure from stakeholders and failure in previous CCS-related investments outweighs dependence. Third, many of the most influential actors divide their focus amongst a portfolio issues leaving low-carbon technologies as only one component of the portfolio. Further, CCS is one tool in a portfolio of low-carbon technologies. Fourth, the lack of binding legislation equates to the lack of concrete actions of actors. Member states can choose to implement the directive. Finally, even if an element finds CCS as a necessity, there may be a lack of willingness to commit to CCS because it is a challenge to implement. Expert 15 noted that actors like E. ON would be hesitant to be too positive towards CCS because it might trigger governments like the UK to mandate CCS, which would be a financial challenge to private companies like E. ON.

After the presentation of the quantitative analysis in chapter 6, a discussion regarding the results of this analysis will be presented in chapter 7.

6. Quantitative analysis of CCS expert perception of European-level actors

This section will present the results of the final segment of the interviews where experts were asked to rate two of the most important constructs that they constructed during the RGT interview. In total, 38 constructs were identified as most important. Some constructs were identified as the most important multiple times, thus 20 of the identified constructs were selected in total. The most frequently constructed link was also the most frequently rated construct. Four constructs were selected thrice for ranking, while another four constructs were selected twice. The remaining eleven constructs were each rated once. The results are presented in figure 6.

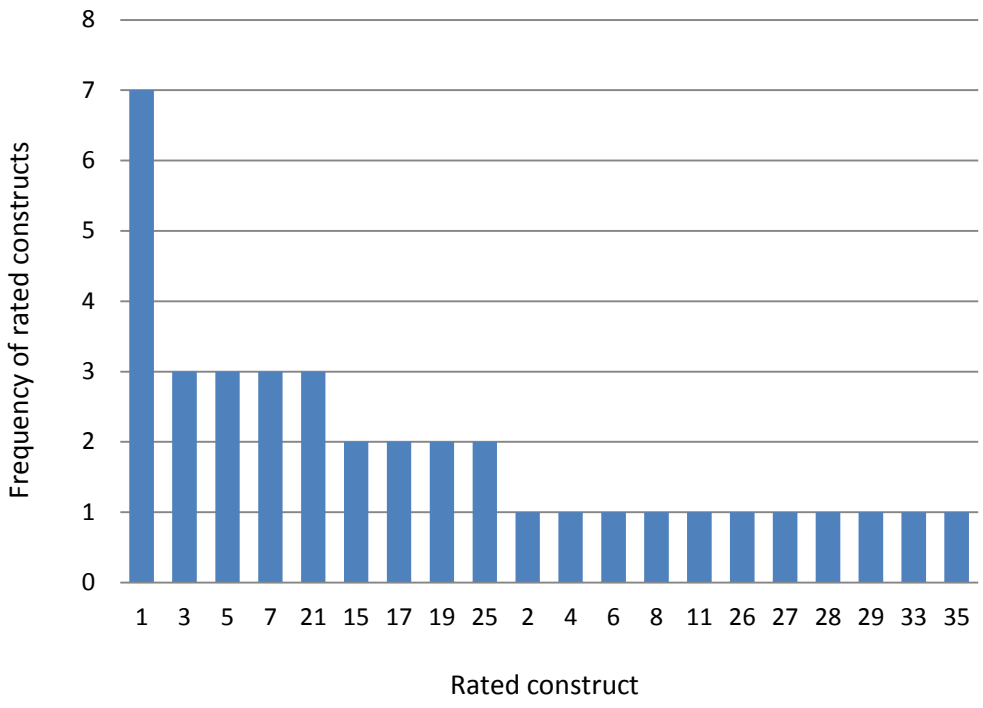
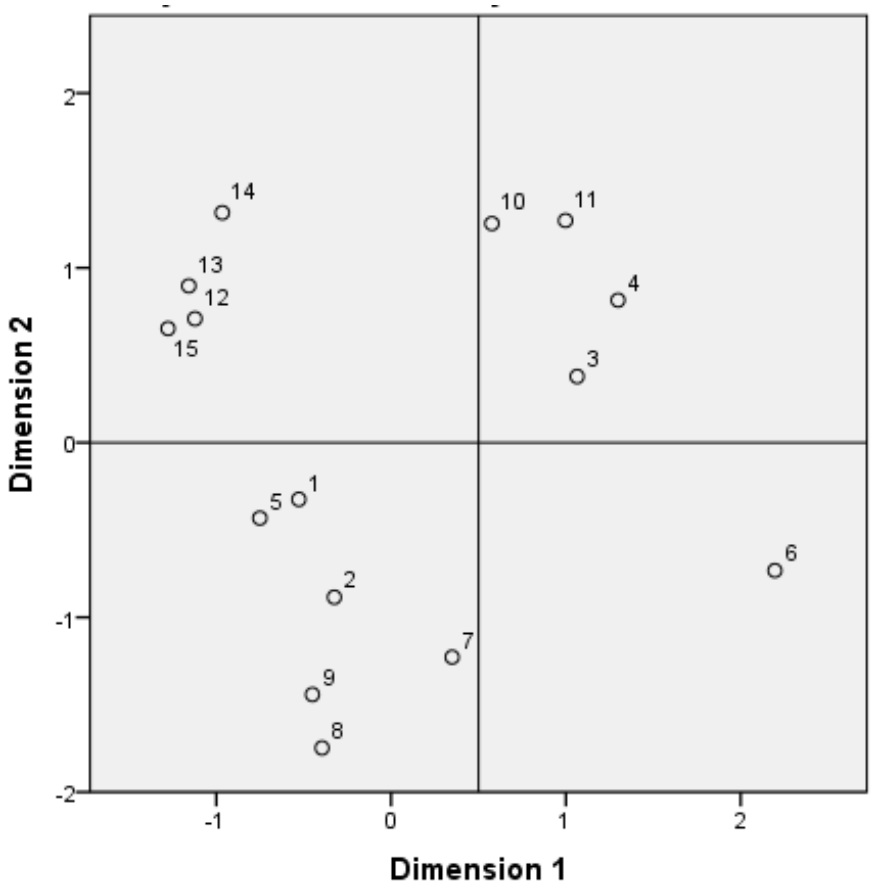


Figure 6. **Most frequently rated constructs.**

The quantitative analysis was conducted using the Multiple Correspondence Analysis in SPSS, which generates a two-dimensional plot of the 15 actors (see Figure 7). The quantitative analysis intends to statistically reveal similarities and differences between actors and their decision-making influence at the European-level. The actors were used as the input for cases. The variables were a combination of the expert and the construct. For example, I1C1 stands for Interview 1 + Construct 1 and I18C5 stands for Interview 18 + Construct 5. The analysis included 38 variables and 15 cases.

The plot is presented in two steps. First, the top five most salient discrimination measures for dimensions 1 and 2 will be analyzed. Second, actors with extreme positioning on the plot will be analyzed in order to bring forth a greater understanding of the positioning of the actors on the plot. The two-step analysis intends to bring forth a clear characterization for each dimension. Tables 4 and 5 list the variables with the salient discrimination measures from most salient to less salient. The discrimination values between dimensions 1 and 2 of certain variables were significant and considerably influenced the formation of the plot. The dimension with the larger discrimination value signaled that the corresponding variable greatly influenced that dimension. For example, variable I3C27 had a discrimination measure of .876 for dimension 1 and a discrimination measure of .266 for dimension 2. See appendix D for the complete set of discrimination measures. Since the discrimination measure of dimension 1 was greater than dimension 2, I3C27 influenced dimension 1. The following variables were salient in determining dimension 1 starting with the most salient: I15C5, I3C27, I5C15, I11C17, and I16C4. Dimension 2 was influenced by I16C21, I18C3, I7C21, I17C3, and I12C5. Constructs 3 and 21 were doubly influential to dimension 2 and thus greatly influenced the outcome of the plot.



1 – Shell	8 – Nat'l Gov't of the UK
2 – Statoil	9 – Nat'l Gov't of Norway
3 – Vattenfall	10 – European Commission
4 – E. ON	11 – European Parliament
5 – National Grid	12 - IEA
6 – Nat'l Gov't of Germany	13 – Bellona
7 – Nat'l Gov't of the Neth'lands	14 – EERA
	15 - CCSA

***Figure 7*. Two-dimensional plot.**

6.1 Analysis of Dimension 1

This section will present an analysis of dimension 1. Actors which received a high rating, like the UK and the EERA, were clustered on the left side of dimension 1, while actors which received a low rating, like Germany, E. ON, the Parliament, and the Commission were clustered on the right side (E5). See table 4 for the most salient discrimination measures of dimension 1. Those clustered on the left side of dimension 1 were perceived as completely in favor of CCS. However, being "completely in favor" usually signaled that the actor had little to lose financially if they supported CCS. The private actors like Shell

and E. ON were rated in the low to mid-range because a sound business case is necessary before pursuing a project, despite the realization that the climate is an important and serious issue and private companies should contribute to climate mitigation (E6). Vattenfall was noted as supportive of CCS in the past, but the failure of their Jänschwalde and Bełchatów projects has decreased their level of support (E6). The European Commission, located almost in the middle of dimension 1 was acknowledged as supportive of CCS and has provided vehicles for CCS like the NER300 and EERA, but the deployment of CCS has not progressed fast enough (E3). As mentioned in the qualitative analysis, investment in CCS is seen as indicator whether the actor has a positive or negative outlook on CCS. Investing in CCS can be considered to be both a financial or time commitment. Thus actors like the IEA and Bellona were given a high rating despite limitations with respect to financially funding projects. Again, actors with a low rating for this construct appeared on the right side of the plot. Finally, one of the most controversial aspects of CCS is the storage of CO_2. Actors on the right side of the plot clearly view storage as a problem which is in part due to public opposition.

Table 4. ***Salient discrimination measures in Dimension 1***

Variable	Expert	Construct	Side 1 of construct	Side 2 of construct
I15C5	15	5	Interested in CCS because of business opportunities	Interested in CCS because of other interests in or besides CCS
I3C27	3	27	Not very active in CCS decision making	Active in CCS decision making
I5C15	5	15	No investment in CCS	Investment in CCS
I11C17	11	17	Skeptical about storage	Pro-storage
I16C4	16	4	Focused on CCS in the EU	Focused on CCS at non-EU/global level

The most salient construct of dimension 1 can be read on the plot from left to right where actors on the left side of the plot were rated as interested in CCS because of business opportunities, while actors on the right side of the plot are interested in CCS because of other interests in or besides CCS. Most of the actors on the right side of the plot, especially Germany, Vattenfall and E. ON, have interests besides CCS. The Parliament and the Commission have a limited interest in CCS. Both the Parliament and the Commission deal with a very large range of issues and energy-related issues are only one component of their portfolio. The Parliament and Commission in their entirety are very large institutions with many different individuals, parties, and directorates, thus it is very unlikely that the entire institution will share the same level of interest in CCS.

The remaining salient constructs of dimension 1 can be read from right to left, where actors with a rating closer to 1 are on the right side and actors with a rating closer to 5 are on the left. Those on the right side are perceived to be not very active in CCS decision making. Active in decision making refers to activities ranging from promoting and lobbying for CCS to working on a demonstration project. Actors on the right are also less like to have invested in CCS, where investment relates to both a financial and time commitment. Those on the right side also are more skeptical to the storage of CCS. Germany has taken legal measures in order to prohibit onshore storage. Finally, actors on the right side are focused on CCS in the EU, while actors on the left are focused on CCS at a global level. The globally-oriented actors see possibilities in developing CCS at the EU level with a global impact (E20).

6.2 Analysis of Dimension 2

Actors which received a high rating, like the Commission and the IEA, were located on the top of the plot, while actors which received a low rating, like the Netherlands and Germany, were clustered on the bottom.

Table 5. ***Salient discrimination measures in dimension 2***

Variable	Expert	Construct	Side 1 of construct	Side 2 of construct
I1621	16	21	CCS decisions have financial/technological risks	CCS decisions do not have financial/technological risks
I18C3	18	3	No financial capabilities	Financial capabilities
I7C21	7	21	CCS decisions have financial/technological risks	CCS decisions do not have financial/technological risks
I17C3	17	3	No financial capabilities	Financial capabilities
I12C5	12	5	Interested in CCS because of business opportunities	Interested in CCS because of other interests in or besides CCS

Construct 21 was influential in determining the position of the actors on the plot. Actors with the most financial and technological and implementation risks were private companies. Private companies face shareholder pressure in achieving successful investments. Still national governments face public pressure (E7). In the plot, Germany is the most positively situated national government. This positioning is most likely not the case due to the fact that CCS-related decisions are risk- laden, but instead related to CCS being virtually removed from the agenda. The risk is not as upfront as

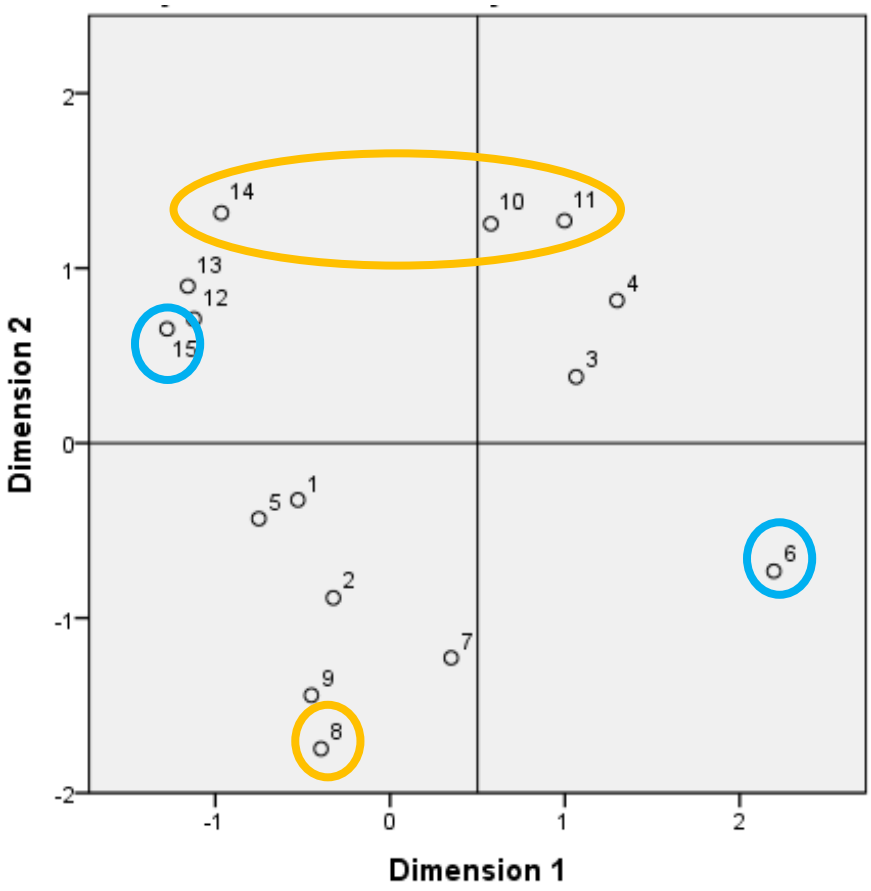
governments and private companies, who are still involved in CCS projects, or need to make or further extend their commitments.

The actors in the lower quadrants are the most financially influential, as well as influential in policy making. All member states received high ratings with respect to financial abilities and power in CCS decision making, especially with regards to CCS decision making. Member states have more influence and power in CCS decision making than EU-level actors. This is due to the member states' ability to choose to implement an EU-level policy directive. As previously mentioned, the EU-level governmental bodies cannot force a member state to, for example, build a project or enforce a directive (E9).

Overall, an actor with capabilities to provide a sound environment for moving forward a CCS project does not always position CCS on a trajectory which would lead to a salient position. This was described as the difference between the *ability* to fund projects and the *willingness* to fund projects (E18). In order to be willing to fund a project, there must be interest, whether for business opportunities or otherwise. Actors like Shell who were given a lower rating see CCS as an opportunity to capitalize on climate legislation since there is significant potential to sell carbon capture and storage services. Several of the highly rated actors, like Germany, were those who have other interests besides CCS or take a defensive, wait-and-see approach to CCS like the Netherlands and Vattenfall. Others however have interest in CCS for reasons other than business. Norway and Statoil are interested in the business opportunities for their hydrocarbon industry that would come along with investing in CCS, but their "invest for the future" mentality calls for investment in CCS in order to contribute its social responsibility to the environment and climate (E5, E18).

6.3 Extreme actors on the plot

An analysis of extreme actors is the second dimension of analysis. The plot reveals actors in both dimensions which are significantly positioned away from the center of the axis. See figure 9 for an overview of the extreme actors of each dimension.



1 – Shell	8 – Nat'l Gov't of the UK
2 – Statoil	9 – Nat'l Gov't of Norway
3 – Vattenfall	10 – European Commission
4 – E. ON	11 – European Parliament
5 – National Grid	12 - IEA
6 – Nat'l Gov't of Germany	13 – Bellona
7 – Nat'l Gov't of the Neth'lands	14 – EERA
	15 - CCSA

***Figure 8*. Extreme actors on the plot.**

Dimension 1 shows Germany positioned to the far right and CCSA positioned to the far left. According to the salient discrimination measures, Germany should be positioned against CCS and not

interested in CCS as a business opportunity. The lack of interest in CCS can also imply that the actor is less dependent on CCS for their future energy needs. In contrast, CCSA should be positioned in favor of CCS and very interested in CCS for future business opportunities. The experts were in accordance with this notion as Germany mostly received a very low rating (frequently 1 out of 5), and CCSA consistently received a very high rating (frequently 5 out of 5). Germany is mostly against CCS because public perception is negative. It has become a toxic issue that no politician will positively commit to with upcoming elections. Germany is clearly against CCS, as nearly every expert made this connection with this actor. One expert noted that the anti-CCS position in Germany is essentially anti-coal (E5). However, experts 5 and 14 noted that Germany should have some dependency on CCS because of the country's lignite reserves in its energy mix. Germany has also positioned itself to be less dependent on CCS through legislation as well as a strong renewable energy drive.

On the other hand, CCSA is perceived as being a very helpful organization for the promotion and communication of CCS in the UK. Even though their reach is mostly limited to the UK, they are an active participant in directives and express interests in alliances (E4). It is clear that CCSA is in favor of CCS. They are also interested in the business opportunities that CCS may bring about for the sake of their membership. However, business opportunities must be promising enough to satisfactorily contribute to a business case. This shows that even those actors who are currently the most positive still need incentives to remain interested in and supportive of CCS.

Dimension 2 shows the UK located close to the bottom of the plot and the European-level government actors, the Commission, the Parliament, and EERA, at the top of the plot. See figure 8. However, even though the actors are on opposite sides of the dimension, they still share commonalities. This is especially the case for the Commission, the Parliament and the government of the UK, as these three actors carry a significant amount of risk with CCS-related decisions. Why is it then that the actors are on opposite ends of the dimension? The UK is willing to take on financial, technical and political risks and is said to have an "uncomfortable environmental truce" with environmental organizations because the government endorses a role for fossil fuels in the future where CCS was the technology which could allow for the expansion of the use of coal (E15). There is division over the role that the Commission plays in CCS decision making. On one hand, the Commission has the luxury of being the civil service of the European Union, as they are only responsible for proposing legislation (E7). On the other hand, the Commission has the task of only proposing legislation and does not carry significant responsibility with regards to risk associated with the implementation of CCS. Further, the funding of the initiatives the

Commission commits comes from member states. Since the Commission is expected to allocate member state funding in the most effective manner, they are indeed sensitive to CCS issues and have a lot to lose if CCS is implemented and technical or political problems are encountered (E15). It can be concluded that the Commission has risk, but they are hedging against this risk by diversifying their focus to other RES technologies.

Parliament sits at the helm of the public and is dependent on the public for re-election. An individual Member of Parliament's (MEP) support for CCS is highly dependent on their constituency. In addition, there are only a handful of MEPs in favor of CCS, whereas many Parliamentarians are completely uninterested in CCS and some have an interest in CCS *not* coming to fruition in Europe. The commitment to CCS poses significant risk and it can be concluded that the Parliament is simply avoiding this risk. The position of EERA is also most likely in line with the Parliament and Commission simply because their research funding is dependent on Commission. They do not necessarily carry risk if they carry out research for CCS or another RES technology, but instead they follow the same line of thinking as the Commission. If the Commission wants to move forward with CCS, the EERA will move forward with R&D for CCS. In sum, all actors face risk, but the actors at the top of dimension 2 are avoiding risks associated with CCS until the future of CCS is more certain.

7. Discussion and recommendations for future research

This chapter will present a discussion of the analysis and recommendations for further research. First, a discussion of the four themes regarding the level of commitment will be presented. This discussion is a continuation of the qualitative results of the analysis. Second, the four quadrants of the plot will be characterized with the intention of bringing forward the relationships between the set of actors in this study.

The four emergent themes from the qualitative analysis are visually represented in figure 10. Before CCS can take a salient position on an actor's agenda, two barriers must be overcome. The first barrier lies between the actor supporting CCS and the actor having authority to make financial and legislative decisions. Before this barrier, however, the actor must first have enough interest in CCS so that interest is channeled into supportive actions. The increasing interest and support in demonstrated in the black arrows at arrow 1. The black arrows represent increasingly intensified commitment to CCS. On the other hand, disinterest in CCS for reasons including technological, political or legal barriers sends the actor tumbling down the dotted red line at arrow 2. However, incentives and other mechanisms can prevent the actor from becoming completely disinterested in CCS at arrow 3. In order to break through the first barrier, the actor must have enough financial or political authority. Actors that can break through according to the experts are private companies, especially those in the oil & gas industry, and governmental bodies, especially member states. The second barrier lies between authority and salience. Decisions including FIDs must be taken at barrier 2. Thus the ability of the actor can increase up along arrow 4, but the lack of willingness can send the actor down arrow 5.

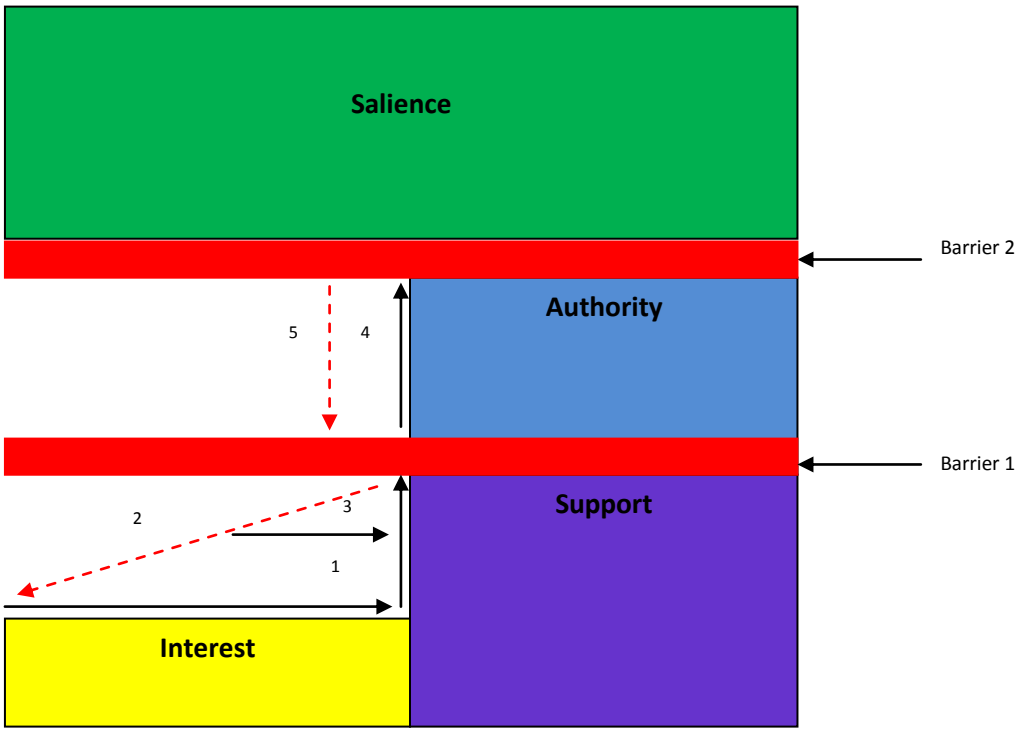


Figure 9. **Increasingly intensified commitment to CCS and barriers.**

Next, the characterized four quadrants of the plot reveal the relationships between the set of actors in this study. The quadrants will be characterized clockwise from the top left quadrant. See figure 11 for the plot with characterized quadrants. The first quadrant was characterized as actors who advocate CCS and criticize the lack of advocacy from other actors but have limited decision making capabilities. The actors in this quadrant include CCSA, IEA, Bellona, and the EERA. The second quadrant is characterized by actors who are avoiding real and perceived risks of CCS. The actors in this quadrant include the Commission, the Parliament, E. ON and Vattenfall. Germany sits alone in the third quadrant. Germany is a powerful decision maker with no desire for CCS. Finally, the actors in the fourth quadrant include Shell, National Grid, Statoil, the Netherlands, Norway and the UK. They are perceived to be willing to take some of the perceived and real risks associated with CCS for the benefit of their future.

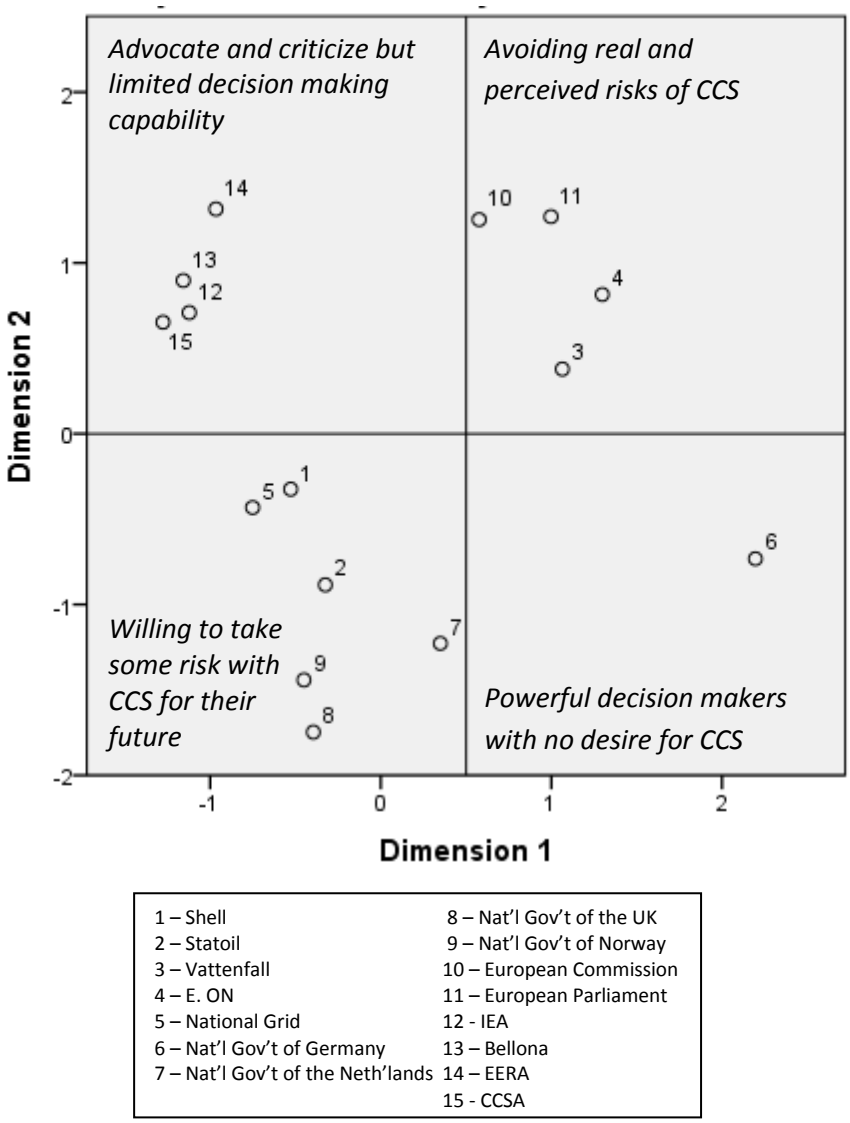


Figure 10. **Plot with characterized quadrants.**

The remainder of this chapter will discuss recommendations for the succeeding research. First, future research should attempt to tackle the limitations of this research. Although RGT is an efficient technique for constructing the entire set of constructs, it would still be beneficial to interview more experts with a wider scope so as to reach a wider range of views on the subject of CCS. Also, it would be interesting to conduct the RGT interviews with a group of experts. The groups could comprise experts from organizations with varying degrees of commitment to CCS. Experts would then deliberate over the position of the actor before determining the construct. The technique also recommends limiting the

number of actors to 15, but this is a severe restraint especially when addressing a complex issue with many stakeholders. Additional research should continue to analyze CCS technological and political developments in comparison with other RES developments.

Finally, a stakeholder dialogue is also important to further advance CCS in the EU. Before commencing a stakeholder dialogue, further research must be completed with regards to an actor which can act as a mediator. The results of the plot in this study show all actors located in a quadrant away from the center of the plot. An actor in the center of the plot would have a neutral, undecided or unknown position on the issue and could serve as a mediator in the dialogue. Since no actor is located in the center of the plot, further research must be conducted in order to elicit actors who could fulfill this role. Three additional recommendations for a stakeholder dialogue follow. First, there is clear a need for a business case for CCS because all actors are looking for soundness in an investment for CCS. The business case will not only benefit industries, but will also provide insight and restore confidence into governmental bodies. There is a need for more coordination between government and industry. Both must take up significant risk and overcome various barriers. So there should be an outlet for clear communication pathways for government and industry. Finally, additional actors should be invited to the dialogue. Experts suggested inviting additional actors in the oil & gas industry like BP and Schlumberger, equipment manufacturers including Alstom and Siemens, additional member state governments like Poland and Spain, as well as actors who are against CCS or have lost interest in CCS like Greenpeace and WWF.

8. Answers to research questions and conclusions

This research intended to provide insight in the current landscape of CCS-related European decision-making and how European-level actors put into practice their decision-making capabilities positively or negatively. A series of interviews were conducted using the Repertory Grid Technique in order to elicit the perceptions of experts on CCS-related decision making. The goal of the research was to gain insight into how different European-level actors put into practice their capabilities to positively or negatively reinforce CCS-related decision making. Financial and legislative capabilities allow for an actor to decide to make CCS a salient point on the agenda. These actors have the luxury to make this decision whereas other actors can only carry out supportive activities. Summary points of the research questions can be found in table 6.

Table 6. ***Answers to research questions***

Research Question	Addressed in Chapter(s)	Summary Points
How do different European-level actors put into practice their capabilities to positively or negatively reinforce CCS-related decision making?	5 & 7	•Actors with limited financial and legislative authority reinforce CCS-decision making through lobbying and advising. •Actors with financial and legislative authority have the capability to implement a project. They positively reinforce CCS-related decision making by making CCS a salient point on their agenda.
What is the position of the set of European-level actors on CCS and to what extent do the actors believe CCS as a priority?	5.1	• Most actors in the study are perceived by experts to be positive towards CCS. • Some governmental bodies have a less than positive outlook on CCS.
What characterizes the relationships between the set of fifteen actors in this study on CCS decision making?	6 & 7	•Actors with limited financial and legislative capabilities are positive towards CCS and advocate for its advancement, but those with the most capabilities are concerned about risks and are hesitant to commit to CCS.
What are the implications of the analysis for ZEP-led stakeholder dialogue?	7	•Further research should be completed in order to elicit a mediating actor in the discussion. •There is a need for a business case for CCS. •More coordination and communication between government and industry. •Include other stakeholders in the dialogue beyond those included in this research.

Before the potential that CCS can offer to meet emission reduction goals is realized, significant barriers must be overcome. ZEP can only facilitate the decision making process of CCS.

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Appendix A: EEPR Funded Projects

The **Don Valley (Hatfield)** project aims to be a new-build Integrated Gasification Combined Cycle (IGCC) power plant will compress CO_2 and transport it by pipeline to the North Sea for Enhanced Oil Recovery (EOR) or permanent storage in a deep saline formation (European Commission, 2012a).

The **Jänschwalde** project was terminated in December 2011 on the grounds of delays in transposing the CCS directive. The project was able to deliver front-end engineering design (FEED) studies for the capture plant, transport routes as well as characterization studies of potential CO_2 storage sites (European Commission, 2012b).

The **Bełchatów** project aimed to demonstrate the full CCS chain on a new supercritical unit that is part of the existing coal-first power plant. The estimates projected one million tons of CO_2 storage per year in an underground saline aquifer. The CO_2 was expected to be transported by pipeline (European Commission, 2012c).

The **Compostilla** project aims to demonstrate full chain CCS using oxyfuel capture technology. Captured CO_2 will be stored in a nearby saline aquifer with capabilities of storing five million tons of CO_2 in the first five years of operation (European Commission, 2012d).

The **Porto Tolle** project aims to install CCS technology at a new coal power plant. The project will capture CO_2 from fossil fuel-fired power plants, transport compressed CO_2 to an offshore saline aquifer and injected underground (European Commission, 2012e).

The **ROAD** project in Rotterdam plans to capture CO_2 from fossil-fired power station, compressing and transporting it and then storing it in saline formations or depleted oil and gas fields for permanent storage (European Commission, 2012f).

Photo credit: European Commission, 2013

Appendix B: Alphabetical list of interviewees

Mr. Jason Anderson
Head of EU Climate and Energy Policy
World Wildlife Fund – European Policy Office (WWF-EPO)

Ms. Ilinca Balan
Policy Officer
European Commission, Directorate-General for Energy

Dr. Simon Bennett
Energy Analyst - CCS Unit
International Energy Agency (IEA)

Dr. Jeff Chapman
Chief Executive
Carbon Capture and Storage Association (CCSA)

Ms. Beatrice Coda
Policy Officer
European Commission, Directorate-General for Climate Action

Mr. Chris Davies
Member of Parliament
European Parliament

Ms. Marie Donnelly
Director of New and Renewable Sources of Energy, Energy Efficiency, and Innovation
European Commission, Directorate-General for Energy

Mr. Paal Frisvold
Chairman
Bellona

Mr. Wolf Heidug
Senior Analyst
International Energy Agency (IEA)

Mr. Jonas Helseth
Director of Bellona Europa
Bellona

Dr. Vassilios Kougionas
Principle Research Programme Officer – Energy conversion and distribution systems
European Commission, Directorate-General for Research & Innovation

Ms. Juliette Langlais
Environmental Policy Officer
Alstom

Mr. Giuseppe Lorubio
Energy Policy Advisor for conventional energy and CCS
EURELECTRIC

Dr. Nils Røkke
Climate Director
SINTEF

Mr. Michael Schütz
Policy Officer
European Commission, Directorate-General for Energy

Mr. John Scowcroft
General Manager of Europe, the Middle East and Africa
Global Carbon Capture and Storage Institute (GCCSI)

Ms. Susan Shannon
Senior Government Relations Advisor
Shell

Dr. Graeme Sweeney
Chairman
Zero Emissions Platform

Dr. Derek Taylor
Director of the Bellona Environmental CCS Team
Bellona

Mr. Piotr Tulej
Head of Unit for Low Carbon Technologies
European Commission, Directorate-General for Climate Action

Mr. Paul van Slobbe
Project Director for CCS
Ministry of Economic Affairs (Netherlands)

Mr. Matthias Zelinger
Secretary General
EUTurbines

Appendix C: Interview protocol

Introduction – 5 minutes

Interviewer introduction and project explanation

Interviewee introduction questions

1. I would like to know more about your work at your organization. Could you please tell me your position and the areas of business you are involved in at your organization?

Interview – 45 minutes

2. I have a list of 15 actors that I would like you to rate as for or against CCS within the European Union on a scale of 1 to 5 where 1 = completely against, 2 = somewhat against, 3 = neutral/undecided, 4 = somewhat in favor and 5 = completely in favor.

3. Start of Repertory Grid:
    a. I have written all of the elements on cards. I would like you to identify how the different actors influence decisions related to CCS. The cards will help you identify differences in terms of decision influence.

    b. Here are three cards: In what ways are two of these actors alike and at the same time different from the third [in terms of the individual's influence on decision-making related to CCS?][3] [Interviewee identifies the emergent and implicit poles of the construct and gives explanation.]

    c. You just identified a link between the elements' influence decisions related to CCS in relation to the other two cards. Now I will present to you another three names and I would like you to tell me how two of the individuals are alike and how the third is different [in terms of the individual's influence on decision-making related to CCS].

    d. Steps a through c are repeated several times for approximately 30 minutes, or until the interviewee stops coming up with new links.

4. Rating of the two most important constructs:
    a. I would like you to select the two most important links that you have identified.

    b. Now, I would like you to rate all 15 actors on the first link on a scale of 1-5. 1 means the individual is more related to the text written on the top of the grid, 5 means the individual is more related to the text written on the bottom of the grid.

    c. Repeat step b for the other two most important constructs.

Conclusion – 10 minutes

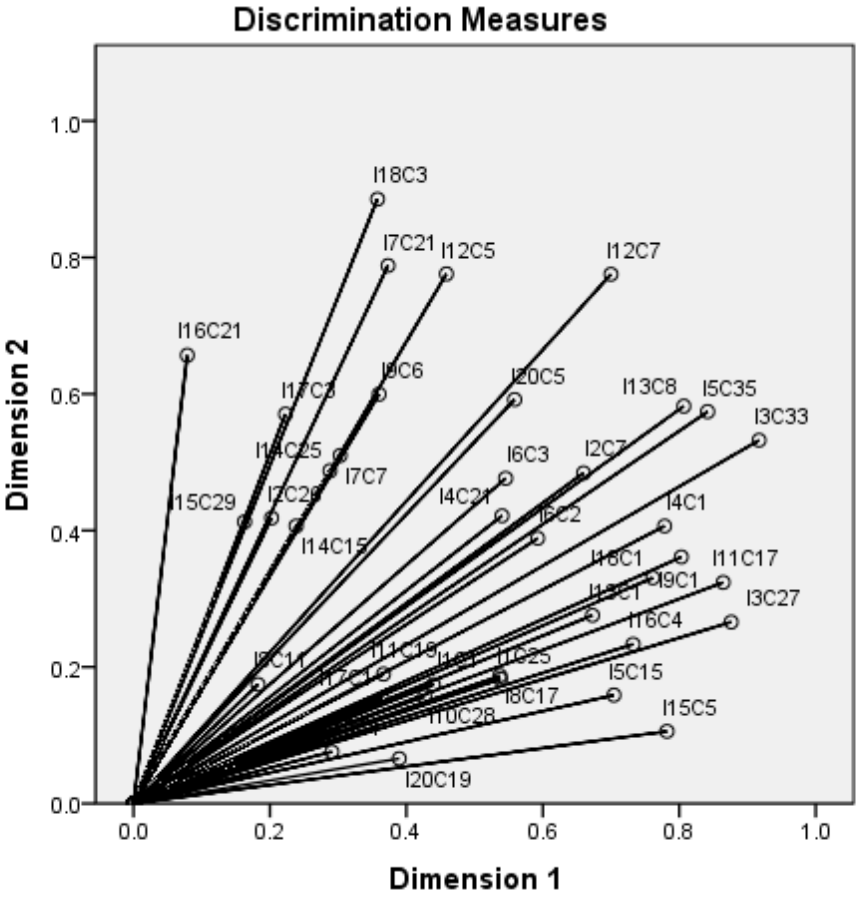
5. To what extent does your organization see CCS as a priority?

6. Do you think I am missing any important individuals that should be included as an important European-level decision maker?

[3] Text in brackets is the qualifying phrase and will be used to guide the interviewee in making links.

Appendix D: Discrimination measures

	Dimension		Mean
	1	2	
I1C25	,513	,047	,280
I1C1	,534	,484	,509
I2C7	,593	,075	,334
I2C26	,142	,137	,140
I3C27	,931	,824	,878
I3C33	,925	,894	,910
I4C21	,635	,660	,648
I4C1	,788	,543	,665
I5C35	,849	,785	,817
I5C15	,689	,189	,439
I6C3	,512	,325	,418
I6C2	,625	,496	,560
I7C7	,235	,365	,300
I7C21	,336	,498	,417
I8C11	,192	,181	,186
I8C17	,614	,542	,578
I9C1	,862	,753	,807
I9C6	,317	,217	,267
I10C28	,466	,084	,275
I10C1	,310	,062	,186
I11C17	,908	,751	,829
I11C19	,306	,273	,289
I12C5	,449	,441	,445
I12C7	,740	,388	,564
I13C1	,608	,389	,498
I13C8	,742	,114	,428
I14C15	,257	,334	,296
I14C25	,318	,154	,236
I15C5	,723	,074	,398
I15C29	,152	,352	,252
I16C4	,820	,878	,849
I16C21	,062	,438	,250
I17C1	,404	,329	,366
I17C3	,225	,400	,313
I18C3	,250	,712	,481
I18C1	,828	,759	,793
I20C5	,555	,596	,575
I20C19	,431	,249	,340
Active Total	19,846	15,793	17,820



Variable Principal Normalization.