Exploring southern Alberta energy discourses and web-based survey data quality issues: An application of Q-methodology

by

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Abstract

This thesis addresses two main goals that are outlined in two related studies. The first goal is to explore energy related debates occurring in southern Alberta through Q-methodology. Energy landscapes are continuously changing and evolving as technology advances and concerns such as climate change and energy security become more prevalent. The changes that occur within energy landscapes often stimulate responses within society that are captured within distinctive perspectives or discourses. Energy related discourses and their associated points of view are as diverse as the experiences that act to shape and define them. Drawing on Charles Taylor's concept of social imaginaries and Robert Entman's interpretation of frames, this study identifies dominant and minority energy related discourses in order to further our understanding of the experiences and views that surround energy development within Alberta. I distinguish minority discourses as discourses that are not commonly identified in the literature and study dataset. For this study, Q-methodology is utilized to identify and explore various discourses and their nuances. Focusing this study on the minority discourses, I conducted follow-up semi-structured interviews to explore the life experiences and interactions of research participants that helped to shape the foundation of these discourses. The selection of two case study areas (Cochrane and Pincher Creek) allowed for the elucidation of views and preferences associated with wind, hydraulic fracturing and other forms of energy development. Within this analysis two dominant discourses emerged: 'Climate Concerned Citizen' and 'Energy and Prosperity' - along with two minority discourses that are less prevalent within the public sphere: 'Over Consumption and Local Sustainability' and 'Power Inequality'. Follow-up interviews revealed that these minority discourses are deeply rooted and based upon an accumulation of life experiences and lessons. By comparing the identified discourse to those within the literature, I describe how social imaginaries and frames are utilized to approach and understand the concept of discourse. Further,

I demonstrate that despite the differences between the identified discourses, there are commonalities that tie them together. Such findings can assist those participating in energy conversations by illuminating the diversity and complexity of views that exist and also advance conversations through the identification of commonalities between potentially conflicting views.

The second goal of this thesis is to examine issues of data quality related to online Q-methodology studies. To overcome limitations of traditional in-person Q-methodology procedures, researchers have turned to web-based q-sort software. In doing so, researchers are able to engage with a greater number of participants over a wider geographical area, in a more cost effective manner. However, by utilizing web-based software, researchers separate themselves from participants and the more intimate processes of data collection associated with conventional face-to-face Q-methodology studies. This distance may lead to participant confusion, recruitment of disengaged participants, or inclusion of participants that do not have distinct or strong views about the subject under examination. In turn, these issues may lead to lower quality q-sorts that may significantly alter study results. In an effort to identify ways of detecting poor quality q-sorts, using completion time as a metric of effort, the relationship between participant effort and participant engagement was tested and revealed a low to moderate correlation. In order to explore the potential effects of low quality q-sorts on Q-methodology findings, two datasets of randomly generated q-sorts are utilized to simulate low quality q-sorts. These sorts are added to a web-based q-sort dataset of 105 participants; as well as two related datasets collected using in-person methods. In doing so, randomly generated q-sorts were found to have a significant effect on study findings as they impacted q-sort factor loading and altered q-sorts that were considered significant. Minority factors were found to have the highest susceptibility to the effects of randomly generated q-sorts. Given these findings, I recommend

that researchers connect and engage with the data and participants by examining various aspects of q-sort results, as well as potentially hybridizing aspects of web-based and in-person methods to ensure that participants are meaningfully connected to the research.

Preface

This thesis is an original work by Matthew Ryan Dairon. The research project, of which this thesis is a part of, received research ethics approval from the University of Alberta Research Ethics Board, Project Name “An examination of energy related discourses within the Province of Alberta and New York State”, PRP00050718, August 2014 – August 2015.

Dedication

To my grandparents, Allen and Eleanor Olsen

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Table of Contents

List of Tables

List of Figures

Chapter 1 - Introduction

The development of energy resources is receiving attention globally due its impact on society, the environment and the economy. The Intergovernmental Panel on Climate Change states that the burning of fossil fuels to meet the world's growing energy demand has been one of the primary drivers of increasing greenhouse gas emissions over the past decade (IPCC 2014). Some scholars also suggest that the global production of conventional oil has already or will in the near future reach its peak, resulting in the diminishing production of conventional oil (Chapman 2014). As new methods and technologies of energy development are introduced, debates and conflicts often erupt within communities and regions that are impacted by the development. As scholars have documented in relation to wind energy development, it is often these local debates or conflicts that can decide the future of energy development (Bell et al. 2005).

Given the highly contentious nature of many energy-related developments, the first goal of this thesis is to gain a greater understanding of the local and regional debates surrounding energy development in southern Alberta. To achieve this goal, this research focuses on debates related to the use of hydraulic fracturing in areas surrounding the town of Cochrane, as well as wind energy projects in Pincher Creek. Q-methodology (now referred to as Q-method) is utilized to analyze these debates and elicit insights into issues related to energy production and development within these two communities.

Q-method is recognized as a useful tool for exploring subjective views (Brown 1993). As the methodology advances, new approaches such as the use of web-based methods are being utilized to overcome limitations of traditional in-person techniques (Reber 2000). In an effort to advance the method and gain a greater understanding of the implication of using web-based methods, the second goal of this thesis is to explore data quality issues that may be associated with using these online data collection methods.

Energy Development in Canada and Alberta

Energy landscapes are constantly changing across North America and around the world. With these changes often come fierce debates regarding the risks, benefits and impacts of new energy developments. Energy technologies such as hydraulic fracturing and wind energy are currently at the forefront of many energy debates within North America.

Hydraulic Fracturing

Hydraulic fracturing allows oil and gas to be extracted from tight geographic formations such as shale and sand formations, which are inaccessible utilizing conventional extraction methods (Brasier et al. 2013). The process involves injecting drilling fluids consisting of water, sand and chemicals into the ground under high pressure in order to fracture the rock formation, allowing oil and/or gas to be extracted (Brasier et al. 2013). Hydraulic fracturing procedures often combine multiple extraction technologies, such as multistage hydraulic fracturing and horizontal drilling, to increase production. In areas where hydraulic fracturing is used or proposed for use, proponents often emphasize the economic benefits associated with this technology, while opponents highlight the social and environmental risks (Howarth et al. 2011). In the Canadian provinces of New Brunswick (Energy and Mines Office of the Premier 2014), Nova Scotia (Energy 2014) and Quebec (Vendeville 2014), policy makers have assessed existing information about hydraulic fracturing and have concluded that there are presently too many unknowns, and consequently, have placed a moratorium on the use of this energy extraction method. Other provinces, such as Alberta, have taken the opposite position, and have encouraged the use of this technology under the assumption that it can be implemented safely (Alberta Environment and Parks 2015).

Despite being the most prominent producer of oil and gas in Canada, the debate surrounding hydraulic fracturing within Alberta has not gained the same level of attention as it has elsewhere in Canada and the United States. Within the Alberta context, the focus is often on other higher-profile forms of energy development, such as the oil sands deposits located in the Fort McMurray region. While very little of the public's attention has been turned towards hydraulic fracturing, there are nevertheless important debates surrounding this approach to energy extraction. One of the most notable examples of conflict over hydraulic fracturing is the court cases of Jessica Ernst, a resident of Rosebud Alberta, vs. EnCana and the Alberta Energy Regulator (AER) (Ernst v. EnCana Corporation 2015). Ernst claims that hydraulic fracturing activity conducted by EnCana Corporation contaminated her groundwater and that the AER "breached its duty to protect her water and failed to respond to her complaints about EnCana's activity" (Ernst v. EnCana Corporation 2015). As per the Alberta Energy Resources Conservation Act, the AER argues that it does not have a "'private duty of care' to individual landowners when investigating issues of groundwater contamination" (Ernst v. EnCana

Corporation 2015). Currently, both court cases have yet to be settled and the Ernst v. Alberta (Alberta Energy Regulator) case has gone to the supreme court of Canada for final ruling.

Within the Cochrane area, some residents have raised concerns over the environmental and health effects they have experienced living near hydraulic fracturing wells. In response to these concerns, a project called Alberta Voices, consisting of students, professors and concerned citizens has conducted interviews and documented stories and experiences of people who have been negatively impacted by hydraulic fracturing within the province (Alberta Voices 2013). Stories told by citizens in the Cochrane area suggest that the air pollution produced by the flaring of hydraulic fracturing wastes is one of the primary causes of adverse health effects experienced by people living near these industrial activities. In 2011, the Protecting Our Water and Ecological Resource Society (POWERS), a group of locally concerned citizens, held a meeting in the town of Cochrane to increase awareness about issues related to hydraulic fracturing, and to allow those that have been affected to share their stories (Junkin 2011). Over the years, concerned citizens continue to band together and voice their concerns about hydraulic fracturing through various methods and media. In 2011, oil and gas companies operating in the Cochrane area formed an alliance in an effort to coordinate their actives and to communicate with the local community (LIPG 2013).

Wind Energy

Scholars exploring the sociology of wind energy development often identify a social gap with regards to the perceptions surrounding wind energy. This social gap is described as the observed difference between the public's general support for wind energy development, and the local opposition that is experienced when development is put forward or proposed (Bell et al. 2005; Wolsink 2007). Within the Canadian context, large-scale opposition to wind energy development is prevalent in Ontario. Much of this resistance is due to the 2009 *Green Energy and Economy Act*. The intention of this Act is to promote the development of renewable energy through the removal of barriers (Krogh 2014). In doing so, the decision-making process surrounding renewable energy development has become centralized, which in turn, has removed the ability of local municipalities and community members to directly engage in the approval process (Krogh 2014). As Jami and Walsh's (2014) case study of the Blue Highlands wind project in Ontario suggests, the removal of local communities from the decision making process

often leads to public opposition towards wind energy development. In contrast to Ontario, wind energy development in Pincher Creek, Alberta, is generally well received by local residents, and many community members acknowledge wind energy as a part of the community's identity (Andersen et al. 2012). General support for the development of wind energy within the region is attributed to the extensive public involvement and consultation that has taken place during the development of the various wind energy projects (Andersen et al. 2012). However, not all community members have embraced wind energy projects, and as a result, wind energy has become a topic of contestation for some within the community. For instance, concerns have been raised over the adverse visual impacts to the landscape cause by wind projects, with some community members feeling that the wind turbines are intruding on the surrounding natural mountain landscape (Andersen et al. 2012).

Q-methodology and Web-based Q-sorts

The appeal of Q-method comes from its ability to identify and explore subjective points of view (Brown 1980). Using Q-method, researchers ask informed participants to complete what is known as a q-sort in order to collect both qualitative and quantitative data. A q-sort exercise requires participants to prioritize a set of stimuli based on their level of agreement, and drawing from these stimuli, researchers ask participants to elaborate on their views and beliefs related to the subject matter. Within Q-method, stimuli represent the different values within a given concourse or universe of statements and are usually in the form of statements, but can also include other forms of stimuli such as photographs (Watts and Stenner 2012).

The goal of Q-method is "only to establish the existence of particular viewpoints and thereafter to understand, explicate and compare them" (Watts and Stenner 2012; 72). Due to this particular trait, Q-method is often contrasted with more traditional questionnaires or R-methodological forms of data collection and analysis. R-methodology can be described as research that employs "traits as variables and operate using a sample of persons" (Watts and Stenner 2012; 10). Unlike most R-methodological studies, Q-method does not seek to generalize or identify what proportion of a population which holds a particular point of view. As generalizability to a population is generally not an objective with Q studies, the number of participants within a study only needs to be large enough to illustrate the existence of particular viewpoints, and therefore, the study typically includes a small number of well-informed people. As R-methodology is

commonly used to identify findings related to associations and differences between variables at the population level, there is the potential that individual differences or more unique findings may be overlooked (Watts and Stenner 2012; 11). This is not to indicate that R-methodology cannot be utilized to explore individual differences, as the method can be adapted to do so. However, R-methodology generally falls short of providing a holistic analysis of the individual perspectives because the analysis often focuses on central tendencies of specific indicators, such as traits (Watts and Stenner 2012).

Q-method was developed to remedy the potential limitation of R-methodology by inverting the factor analysis techniques utilized in R-methodology. This inversion allows Q-method to identify correlations between people instead of variables "by employing persons as its *variables* and in which traits, tests, abilities and so on, are treated as the *sample* or *population*" (Watts and Stenner 2012; 12 original emphasis). Additionally, Q-method's ability to effectively explore individual differences allows it to identify minority discourses that may be overshadowed by more dominant or well established discourses. This makes Q-method a valuable technique for exploring the complex and diverse "rationales, narratives or perspectives" associated with different points of view within discourses (Wolsink and Breukers 2010; 538).

Due to the complexity of the q-sort exercise in which information is gathered from participants, q-sorts are traditionally conducted in person. This can place limitations on how the methodology is utilized, as examining the views of geographically diverse populations is costly (Reber 2000). Web-based q-sort software has been developed to help alleviate such limitations. Additionally, with the use of web-based q-sorts researchers are able to include larger numbers of participants within studies. Recently, the Q-method community has raised concerns over the use of web-based q-sort software. These concerns are based around the fear that the use of web-based q-sorts can have an adverse effect on the quality of Q-method findings by limiting the connection between researchers and participants, and thus, potentially reducing the reliability of the information collected. Currently there are only a handful of studies that have examined the differences between web-based and in-person Q-method study results, and the impact of web-based q-sorts on research findings (Reber et al. 2000; Davis and Michelle 2011). This suggests there is a gap within the literature that needs to be explored in order to help alleviate these concerns and ensure researchers utilize web-based q-sorts in the most appropriate manner.

Research Goals and Objectives

This thesis seeks to address two primary research goals with the intent of: i) gaining a greater understanding of the energy debates that exist in southern Alberta, and ii) examining the influence of low quality q-sorts on study findings, and exploring the relationship between participant effort and participant engagement in web-based q-sorts. The first goal outlined in chapter two seeks to explore the debates surrounding hydraulic fracturing development in the Cochrane area and wind energy development in Pincher Creek. To achieve this, the following two main objectives were addressed.

Objective 1) Identify and describe the energy related discourses that are present within Cochrane and Pincher Creek, Alberta.

Objective 2) Examine the less commonly held (minority) discourses in order to gain a greater understanding of the meanings behind these discourses and how participants came to hold such points of view.

The second goal of this thesis, which is examined in chapter three, presents a cautionary tale related to the use of web-based software in the collection of q-sort data. This goal is achieved through the following two objectives.

Objective 1) Examine the relationship between participant effort and participant engagement in an effort to discover ways of identifying poor quality q-sorts.

Objective 2) Demonstrate the influence of low quality data on the identification and interpretation of Q-method findings by introducing a number of randomly generated q-sorts into the data analysis.

Project Background

This thesis is part of a broader research project titled “Energy transitions in Canada: Exploring the social, cultural and ethical dimensions of a changing energy landscape” (here after referred to as ‘the project’) and focuses on the social challenges that are the result of changes within Canadian energy landscapes. Multiple studies conducted in relation to the project have addressed subject matter such as deliberative democracy, issues of trust and engagement in resource management, and public discourse surrounding energy development. These topics and more have

been explored in provinces across Canada, which include British Columbia, Alberta, Ontario and New Brunswick. Research conducted in relation to the project used a variety of techniques such as national surveys, elicitation and visual techniques as well as in person and web-based Q-method. With leadership from Professor John Parkins, the project is a collaborative effort of researchers from the University of Alberta, Dalhousie University and the University of New Brunswick. Funding for this project comes from the Social Sciences and Humanities Research Council of Canada.

Limitations

In addressing the first goal of this thesis, participant recruitment is one of the primary limitations affecting the process of exploring the debates surrounding energy development in Pincher Creek and the Cochrane area. To gain an understanding of the views within these energy debates, purposive and referral sampling techniques are utilized. Purposive sampling involves a deliberate selection of individuals based on their involvement and knowledge surrounding particular subject matter (Maxwell 2013), while referral sampling relies on participants to help identify additional potential participants. Although these sampling techniques are seen to be the most appropriate options, some groups of potential participants remained difficult to recruit. Within both communities, industry and government representatives were particularly difficult to gain access to and to establish study buy-in. Time is another factor that influences participant recruitment. To meet project deadlines, ideally participant meetings would have been scheduled within a time frame of two or three weeks for each community. However, due to participant schedule availability and the rate at which people agreed to participate, this was not achieved and meetings were scheduled over the span of four months. Recruitment issues within the Cochrane area were for the most part overcome. However, within Pincher Creek, low recruitment of industry and government participants resulted in these views being underrepresented or completely absent from this analysis. Additionally, due to the limitations of the methodology, the discourses and points of view identified within Pincher Creek and the Cochrane area should not be considered to be representative of the views held by Albertans.

When analyzing the influence of low quality q-sort data on study findings, the primary limitation is the restricted number and quality of metrics and proxies that were available to directly or indirectly measure participant engagement and participant effort. The limited availability of

desired metrics and proxies for participant effort and engagement was a result of the study dataset not being specifically designed to explore issues related to data quality.

The Researcher

While conducting data collection and analysis, a researcher's personal values and assumptions can have an influence on the process of inquiry. Such trains of thought view researchers as a part of the social world in which they are studying (Alvesson 2003). Therefore, by reflecting on and identifying their own views and perspectives, researchers are better equipped to perceive ways in which they can potentially influence study findings (Cunliffe 2003). While conducting a Q-methodological study, there are many instances where the researcher's views can infiltrate and affect study findings. For instance, during the analysis and interpretation stages researchers are presented with an almost endless possibility of solutions (Watts and Stenner 2012). Being cognizant of my own views and separating them from those of the participants is something that I had to continually remind myself of throughout the data collection and analysis process. During the initial phases of the research, I completed the q-sort exercise myself and through this process, was able to gain a greater understanding of my own views and their origins. As someone who has lived in Alberta my entire life, and who has focused their education and work around environmental and social issues, I have developed strong views regarding energy development within the province. These views are structured around concerns of climate disruptions and the deleterious impacts associated with energy development. During the interview process, I constantly reminded myself to keep my views separate and concealed in order to present myself as a neutral listener. I feel this approach was necessary in order to create an environment where the participant felt that they could present their views without being judged or ridiculed. Doing so was not always an easy task, as I found my instinctive reactions betraying me in some instances. For example, I became conscious of my facial expressions and body language which I sometimes believed to portray a look of uncertainty or questioning in response to views that were foreign or I personally disagreed with. In these instances, I found myself straining to keep a neutral or at least approving appearance; however, I fear that such efforts may have resulted in a look of discomfort or awkwardness instead. Despite this, all participants seemed to be very welcoming and unaffected by my personal struggles.

One aspect of the research I underestimated was the emotional impact of listening to people's stories, views and feelings. Many of the community members are deeply involved within their local energy debates and are angry and frustrated at what is occurring around them, and the level of response they are receiving from government and regulators. Some participants feel that they are being physically affected and are associating instances of cancer and other health issues with local energy development. Conversely, when I spoke to individuals who represented local energy companies, I was often surprised at how much their views diverted from the traditional profit driven perspectives. Several of the local community members spoke highly of some company representatives despite the conflict. These interactions helped break down any preconceptions of the local debates I may have unknowingly developed in the initial stages of the research process.

Orientation of Thesis

This thesis consists of two separate papers that are focused on different subject matter, but are connected by the common methodology that was used in both studies: Q-method. Chapter Two explores the energy debates occurring in southern Alberta. By exploring the views of local community members, government and industry representatives from Pincher Creek and the Cochrane area, this study identifies two dominant and two minority energy related discourses. Additionally, through the use of follow-up interviews, this study takes a deeper look at identified minority energy discourses in order to further our understanding about the origins of such discourses. Chapter Three examines the use of web-based software to gather q-sorts from large participant sets (p-set), which is a departure from the typical way of collecting q-method data, but is becoming increasingly used by a variety of researchers. Additionally, Chapter Three examines the relationship between participant effort and participant engagement in an effort to identify potential indicators of low quality q-sorts. This study finds that low quality q-sorts have the potential to adversely influence the identification and interpretation of dominant and minority discourses or factors. Minority discourses were found to be most susceptible to the influence of low quality data. In Chapter Four, I discuss key findings identified in previous chapters and ways in which these finding can help in advancing further conversations, research and policy development surrounding energy development in Alberta. Additionally, I describe ways in which results can be used to improve web-based Q-method research and identify potential future areas of research.

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Chapter 2 - Identifying dominant and minority discourses on energy production in Southern Alberta through Q-methodology

Introduction

In response to stimuli such as climate disruption and the depletion of conventional oil and gas resources, energy landscapes are changing all around the world, and energy development in Alberta Canada is no exception. The utilization of energy technologies such as wind and hydraulic fracturing is increasingly prevalent in Alberta, and with these changes to the Albertan energy landscapes, tensions have arisen between community members, industry, government and other actors. For instance, in Cochrane Alberta, the increasing utilization of hydraulic fracturing technologies in oil and gas development over the past five years has stimulated debates regarding the impacts and risks associated with such development. In Pincher Creek, although wind development has been present since the early 1990's (Alberta Energy 2015), tensions associated with wind and related infrastructure exists within the community as new land development advances. The goal of this study is to explore the debates surrounding hydraulic fracturing and wind energy development in southern Alberta and in doing so gain a greater understanding of the points of view among informed residents and stakeholders in the region. Although there is a burgeoning literature on conflicts surrounding hydraulic fracturing and wind energy development, few have examined this subject matter within an Albertan context. Given the significant role energy development plays within Alberta's society and economy and the increasing presence of hydraulic fracturing and wind energy development, it is important that the discourses driving these debates are understood and taken into consideration if Alberta is to conduct energy development in socially responsible manner. To achieve this research goal, the following primary objectives will be addressed in this chapter:

Objective 1) Identify and describe the energy related discourses that are present within Cochrane and Pincher Creek, Alberta.

Objective 2) Examine the less commonly held (minority) discourses in order to gain a greater understanding of the meanings behind these discourses and how participants came to hold such points of view.

These objectives are achieved by utilizing Q methodology to examine the energy related debates within each community. To help guide and situate the analysis within a broader conceptual field,

I draw upon Charles Taylor's (2004) interpretation of social imaginaries, as well as Entman's (1993) description of frames. Second, in order to gain a general understanding of the debates surrounding hydraulic fracturing and wind energy, I outline the common arguments and perspectives presented by the proponents and opponents of hydraulic fracturing and wind energy as well as the related discourses from the published literature. Third, I describe the study region and outline the methods used to interpret the four discourses that are identified within this study. Fourth, I provide a detailed description of the identified factors and how they relate to each other. Finally, to ground this study's findings, I analyze the identified factors in relation to the published literature on this topic.

Theory and Literature Review

Social Imaginaries

To address the outlined research objectives, ideas from scholarship on social imaginaries (Taylor 2004) and framing (Entman 1993) are utilized to understand how individual viewpoints are established and communicated within a social setting. The concept of social imaginaries was developed by Charles Taylor to describe his interpretation of the public sphere and the perceived gap that exists between the communicative public sphere and everyday practices (Lauristin 2007). According to Taylor (2004), social imaginaries can be viewed as the way in which

> "people imagine their social existence, how they fit together with others, how things go on between them and their fellows, the expectations that are normally met, and the deeper normative notions and images that underlie these expectations" (23).

In other words, social imaginaries can be seen as the basis upon which discourses are shaped and legitimized within society (Patomäkiand Steger 2010). The legitimization of imaginaries occurs as increasing numbers of people begin to accept and incorporate them into their perceived norms and views of what is possible (Taylor 2004). By doing so, an imaginary becomes the epicenter for the establishment of a common understanding within a group or society (Taylor 2004). According to Taylor (2004), it is through the slow process in which social imaginaries are incorporated into stocks of knowledge, eventually defining the contexts in which individuals and groups think and act that allows for collective action to occur. This is not to suggest that social imaginaries should be perceived as constant. Rather, social imaginaries are constantly in flux given the "unlimited and indefinite nature" of the imaginary (Taylor 2004, 25). As people

incorporate social imaginaries into their understanding, they incorporate new perspectives, adapt them to fit their needs or utilize them in different contexts. Through this ever-evolving process social imaginaries are able to change, creating new stocks of knowledge and forms of rationality.

Frames

To complement the concept of social imaginaries, the concept of framing helps to conceptualize the way in which energy discourses are communicated. Simply put, framing can be seen as a method of communication that "involves selection and salience" (Entman 1993, 52). This suggests that through the act of framing, a point of view or state of reality is advocated by providing a specific "problem definition, causal interpretation, moral evaluation, and/or treatment recommendations" (Entman 1993, 52). Similar to the concept of imaginaries, frames can be viewed as bodies of knowledge that are utilized to establish shared behaviors (Johnston 2002). By establishing a commonly accessible stock of knowledge that is employed in particular contexts, frames can be utilized to define the type of vocabulary used or actions taken by an individual or group.

When assessing or interpreting a frame, it is important to not only gain an understanding of the information presented, but also the information that is omitted. By taking into consideration both the included and omitted information, the frame can be viewed within a larger context, which can help provide a greater understanding of the intended argument (Entman 1993). For instance, arguments intended to advocate for the development of wind power energy can be framed in a way that focuses solely on the environmental benefits, such as wind power's relatively small carbon footprint (Varun et al. 2009); however, by doing so, the risks associated with wind energy are excluded from the argument.

Sociology of Energy Production

To assist in identifying and understanding the potential views that constitute the energy debates found in the study communities, the following review of literature provides insights into the public perspectives and discourses associated with hydraulic fracturing and wind energy development.

Hydraulic Fracturing

In North America and around the world, the use of hydraulic fracturing in oil and gas extraction has created tension and controversy regarding the economic, social and environmental trade-offs

associated with the technology. Arguing in support of hydraulic fracturing development, proponents often focus on the economic benefits perceived to be associated with the extraction method (Boudet et al. 2014; Howarth 2011). It is argued that hydraulic fracturing can provide individuals with economic benefits by creating jobs, increasing property values, and providing additional sources of income for those who sign leases on private lands (Boudet et al. 2014). Local and regional economies are also thought to directly and indirectly benefit as increases in economic activity can potentially help support and expand local markets and provide additional sources of tax revenue that can be used to improve public services (Boudet et al. 2014). Proponents also argue that by increasing domestic energy production, hydraulic fracturing can increase a country's energy security by helping to meet growing energy demands and reduce dependence on foreign oil and gas reserves (Boudet et al. 2014; Finewood and Stroup 2012). Another argument made by proponents is that hydraulic fracturing can help address climate change issues by reducing greenhouse gas production (Pacala and Socolow 2004). In this sense, when comparing natural gas to other fossil fuel resources, such as coal, natural gas is perceived to be a cleaner source of energy, and therefore, a potential transition fuel (Stephenson et al. 2012; Boudet et al. 2014).

Contrasting these perceptions, opponents of hydraulic fracturing often structure their arguments around the social-environmental impacts, and the risks and uncertainties associated with the extraction method (Boudet et al. 2014; Davis and Fisk 2014; Finewood and Stroup 2012; Howarth et al. 2011). One of the most common environmental and health concerns presented by opponents is those related to water management. Concerns related to water quantity are due to the use of large quantities of water—between 2 to 10 million gallons of water per fracture—during the extraction process (Soeder and Kappel 2009 as cited by Boudet et al. 2014). Water quality concerns stem from the threat of surface and groundwater contamination by fluids produced and/or utilized in the hydraulic fracturing process, such as fracking fluid and flowback fluid/produced water. Such concerns are supported by scientific studies that identify the toxicity and adverse health impacts caused by exposure to some of the known chemicals used or produced in the hydraulic fracturing process (Gordalla et al. 2013; Colborn 2011). Focusing more on the potential social implications, opponents suggest that hydraulic fracturing causes mental and physical health issues in surrounding communities. The changes induced by hydraulic fracturing development are also believed to negatively influence community character,

community interactions and community cohesion (Boudet et al. 2014). Such impacts are similar to those affecting boom town communities (Jacquet 2014; Stedman et al. 2012).

By examining the arguments and frames that are presented by proponents and opponents of hydraulic fracturing, scholars have identified several discourses that characterize these perspectives. Drawing on the work of Hajer (1993; 1995) to direct their discourse analysis, scholars such as Bomberg (2015), Cotton et al. (2014) and Schirrmeister (2014) examine media publications, policy documents and other related literature. Echoing themes outlined above, Bomberg (2015) describes two opposing discourse that represent the views held at the polar ends of the hydraulic fracturing debate. Through the use of interview data, Cotton et al. (2014) comes to a similar conclusion, but highlights slightly different arguments in the process. In addition to the two polarizing discourses, Schirrmeister (2014) classifies a third discourse that includes views that are concerned about the risks and threats of hydraulic fracturing, but do not wish for the technology to be prohibited. Instead, these voices call for further research and risk assessment is required before development is permitted to continue. Additionally, De Rijke (2013) describes "public discourse", which focuses on arguments that frame hydraulic fracturing as a clean transitional source of energy. Although De Rijke (2013) categorizes these views as a separate discourse, scholars such as Cotton et al. (2014) have deemed such views as part of the pro-hydraulic fracturing discourse.

Wind

Like all forms of energy, wind energy is contentious. Those who support wind energy development often cite the environmental benefits associated with the technology. Such benefits include a low carbon footprint, which is often framed in relation to meeting climate change and carbon dioxide reduction objectives (Mander 2008). Another argument made by proponents of wind energy focuses on economic benefits (Mander 2008; Brannstrom et al. 2011), as land leases and tax revenue are often beneficial to individuals and communities (Jepson et al. 2012).

Contrasting the views and arguments of wind energy proponents, opponents focus on the negative environmental impacts and also highlight ways in which the technology can potentially adversely impact individual and social wellbeing. Environmental impacts that are often linked to wind energy include the deleterious effects on bird and bat populations that are caused by fatal collisions and habitat loss and/or fragmentation (Madders and Whitfield 2006; Carneiro et al.

2013). Due to the large scale of wind turbines, the siting of wind farms can have a significant visual presence that negatively impacts landscape aesthetics, as well as peoples' association with the region (Pasqualetti 2000; Möller 2006). For instance, the introduction of wind farms can be viewed as an act of industrializing the landscape, and such landscape transitions can contradict traditional views and values of a particular area (Warren et al. 2005; Pasqualetti 2011).

Other visual impacts created by wind energy can be induced by flashing aviation lights and shadow flicker that occurs when the rotating turbine blades interrupt the sun's light (Harding et al. 2008). Visual impacts and noise pollution created by the blades passing through the wind are common concerns associated with wind technology, as these impacts are believed to potentially adversely impact local residents' health and well-being (Baxter et al. 2013; Carneiro et al. 2013; Knopper and Ollson 2011).

For opponents of wind energy, the distribution of the impacts and benefits present another area of contention. When wind development is located on private property, it is often only the land owner who receives compensation while neighboring residents do not, even though they may be exposed to adverse impacts (Jobert et al. 2007). It is also argued that because wind energy development is often sited in rural areas, the potential exists for pre-existing rural-urban tensions to be reignited due to the perceived unfairness of project siting (Warren et al. 2005). Finally, opponents have also questioned the efficacy of wind power to address climate or energy issues due to its perceived unreliability and disruption of electrical grid systems induced by fluctuating energy production (Szarka 2004).

In an effort to understand the arguments made for and against wind energy, scholars have classified several discourses. Historically within the literature, arguments made by opponents have been viewed as NIMBYism (not in my backyard), which describes people who want to benefit from energy development but do not want to incur any of the costs. As scholars continued to explore the debates surrounding wind energy, such conclusions became viewed as too simplistic and a misrepresentation of opponents' views (Aitken 2010). In an effort to progress beyond such notions, Bell et al. (2005) introduce the concepts of place protectors and qualified supporters to further explain the reasoning behind local wind energy opposition. The concept of place protectors focuses on the non-monetary values people place on a given landscape. Such values are thought to be derived over time through personal experiences and the

sense of place people associate with a particular landscape. Qualified supporters on the other hand, describe individuals or groups who support wind energy development (or other forms of energy), but outline conditions or general controls and limitations that need to be in place before they will support a given project. As Bell et al. (2005) describes, these limitations or conditions usually are presented in hopes that the impacts associated with the project can be mitigated.

Drawing on a variety of sources such as interviews, literature, and policy documents to conduct their discourse analysis, Mander (2008), Jessup (2010), and Szarka (2004) present additional discourses to describe the views held by wind energy opponents and proponents. Although each author describes different and unique findings, due to the overlap between them, I focus primarily on the three discourses[1] described by Szarka (2004). The first, "pro-wind coalition", focuses on the arguments made by wind proponents. The second discourse, labelled as "dilemma and dissent", presents a cautionary tale by stating that when moving forward with wind energy development, long-term sustainability issues need to be balanced with the immediate impacts caused by such development. Such views can be seen as similar to those described by Bell et al.'s (2005) qualified supporter. The final discourse presented by Szarka (2004) is characterized as "anti-wind" and describes the perspectives of wind opponents.

In an effort to gain a deeper understanding of more localized discourses, studies such as Jepson et al. (2012) provide nuanced descriptions of discourses that are relatively unique to localized populations. For example, in Sweetwater, Texas, a unique perspective, described as "not taking the pledge", was identified that captured "a view that accepts the economic products, processes, and policy innovations advocated by ecological modernization without accepting the core claim that innovations are required to adapt to environmental change" (Jepson et al. 2012, 851). Studies such as this demonstrate that discourses related to energy development within a relatively localized region are diverse and complex, and that a careful examination of local perspectives can provide a nuanced understanding of the views that surround particular forms of

[1]Szarka (2004), Mander (2008) and Jessup (2010) utilize a discourse analysis framework outlined by Hajer (1993). In doing so, each author identified discourse coalitions through qualitative methods including policy analysis (Szarka 2004), semi-structured interviews (Mander 2008), and literature analysis (Jessup 2010). According to Hajer (1993) discourse coalitions can be described as "the ensemble of a set of story lines, the actors that utter these story lines, and the practices that conform to these story lines, all organized around a discourse" (47, as cited by Szarka 2004). As a given discourse acts as the foundation of a discourse coalition, to maintain language consistency, the discourse coalitions identified within these studies have been described simply as discourses.

energy development. Toward this end, this study contributes to this literature by using Q-method to identify discourses related to energy development in the southwest region of Alberta.

Study Region

Cochrane and Area

As with much of central and southern Alberta, conventional oil and gas development has been a prominent feature within the landscape of the Cochrane area. Over the past 4 to 5 years, as conventional sources of oil and gas become more and more scarce, hydraulic fracturing technologies have become increasingly utilized within the area to gain access to unconventional sources of oil and gas. In response to this development, some residents living near the local hydraulic fracturing wells have voiced their concerns regarding the environmental and health effects they have experienced.

Pincher Creek

Located near the Rocky Mountains, the town of Pincher Creek and the surrounding area experiences warm Chinook winds that are compressed as they travel down the eastern mountain slopes, making it a highly suitable location for wind energy development (Town of Pincher Creek Alberta 2014a). At present, there are 8 wind energy projects currently in operation near the town. This amounts to 272 wind turbines that have the potential to produce a total of 291.93 megawatts of energy (Town of Pincher Creek Alberta 2014a). More wind energy projects are already planned for the area, with a total of 5 energy projects with the potential to produce an additional 580.70 megawatts of energy currently approved or in the project planning stages. Other forms of energy are also produced in the region, including hydroelectricity from the Oldman River dam (Town of Pincher Creek Alberta 2014b) and natural gas from the Shell Canada Waterton Gas Complex (Town of Pincher Creek 2014c).

Discourse and Q Methodology

According to Watts and Stenner (2012), a discourse can be defined as "bodies of knowledge…that represent the substantive, cumulative and publicly accessible products of innumerable human selections" (46); however, other scholars argue that there are multiple competing definitions of discourse (McGregor 2004). For example, Hajer (1995) defines discourse as "ideas, concepts and categorizations…through which meaning is given to physical and social realities" (44). Moreover, Hajer (1995) states that although discourses tend to produce

and reproduce themselves, they are not completely static. This is because discourses do not exist within a vacuum, suggesting that interactions occur between discourses that allow for transformation within them. Therefore, discourses can be viewed as enabling: allowing development within bodies of knowledge but also constraining or maintaining particular bodies of knowledge by rejecting alternatives (McGregor 2004). Although the definitions of discourses described here utilize different terminology, they are viewed to complement each other by describing the active and/or selection and accumulation of aspects of available social imaginaries. Linking the concepts of discourse and social imaginaries, Taylor (2004) views social imaginaries as the basis on which discourses are shaped and legitimized within society. By interpreting discourse in this manner, it provides useful insights into how people's points of view are establish and transformed within an environment of supporting, opposing and competing imaginaries.

Q-method was originally utilized in 1935 by William Stephenson (Watts and Stenner 2012), and was selected for this study due to its reputation as an effective method for examining and identifying discourses (Brown 1993). Within the area of environmental sociology, scholars have utilized Q-method to explore subjects such as policy (Wolsink and Breukers 2010; Dayton 2000), restoration (Woolley and McGinnis 2000), wetland management (Clare et al. 2013), and energy development (Cotton and Devine-Wright 2011; Ellis et al. 2007; Brannstrom et al. 2011; Jepson et al. 2012, Cuppen et al. 2010; Wolsink and Breukers 2010).

By utilizing an inverted form of factor analysis, Q-method provides a structured platform for qualitative examination and comparison of subjective states by measuring quantifiable responses to various stimuli (Wolsink and Breukers 2010). Within Q-method, stimuli represent the different values within a given discourse and usually take the form of statements, but can also include other forms of stimulus such as photographs. One commonly identified strength of Q-method, is its ability to identify less well known discourses that may be overshadowed by more dominant or well established societal discourses. This subtlety in identifying discourses makes Q-method a valuable technique for exploring the complex and diverse "rationales, narratives or perspectives" associated with different points of view within discourses (Wolsink and Breukers 2010, 538). As with other Q-method studies, the descriptive factors identified within this study

are considered to be representative of discourses. Watts and Stenner (2012) support this notion by stating:

> [A] participant's Q-sort was seen as an expression of their subject position, while the interpreted factors allowed the constructionist to understand and explicate the main discourses at work in the data. (42)

Based on this interpretation of discourses as applied to Q Methodology, I now turn to the data collection procedures in this study.

Data Collection

Participant selection

Before identifying participants to take part in this study, effort was taken to gain an understanding of the different energy related controversies, issues, initiative and related debates occurring within the two study regions. This was achieved by examining local media sources and web-sites dedicated to examining local energy issues. Purposive sampling was utilized to identify participants who are influential in advocating diverse points of view related to local energy development. According to Maxwell (2013), purposive sampling is where "particular settings, persons, or activities are selected deliberately to provide information that is particularly relevant to your questions and goals, and that can't be gotten as well from other [sampling] choices" (97). As participants completed the q-sort exercise, further details emerged related to the local conversations and debates surrounding energy development. Drawing on this information, referral sampling techniques were utilized to identify additional points of view and participants in order to explore the diverse spectrum of energy related discourses that existed within each community. This diversity included community members, industry and government representatives.

As the intent of Q-method is not to generate findings that are generalizable to the population in this region, a limited number of participants are required to identify and explore the various discourses (Watts and Stenner 2012). The initial goal was to have 25 participants from each community take part in the study; however, due to low participant recruitment in Pincher Creek, the final participant numbers were 8 from Pincher Creek and 25 from Cochrane. The low

participant recruitment in Pincher Creek resulted in an under-representation of the perspectives surrounding wind energy development in this region.

Q-methodology Procedures

This study draws primarily on the Q-methodological procedures outlined by Watts and Stenner (2012) to guide the methods of data collection and analysis. Other studies, such as Brannstrom et al. (2011), Jepson et al. (2012) and Parkins et al. (2015) also provided methodological guidance. Similar to the methods utilized by Jepson et al. (2012), the study's procedures can be broken down into 4 general stages.: 1) develop/identify concourse and statements; 2) participant completion of q-sort exercise; 3) analyze and interpret information; and 4) conduct follow-up interviews and incorporate findings into analysis. The first stage of developing/identifying a concourse can be described as an "identifiable universe of statements for, and about, any situation or context" (Watts and Stenner 2012, 45). For this study, a pre-existing energy related concourse that was developed for studies in Peace River Alberta, Mactaquac New Brunswick and rural southwestern Ontario was utilized (Parkins et al. 2015). For a more detailed explanation of the concourse and the conceptual categories utilized in its development, refer to Parkins et al. (2015).

From the concourse, a set of stimulus items, or Q set, is developed to represent the full spectrum of potential views related to the subject under investigation (Watts and Stenner 2012). For this study, the Q set of 48 statements developed by Parkins et al. (2015) was utilized. The Q set provides the primary means of data collection in the second step of the Q-method procedure, which includes asking participants (members of the P set) to arrange the statements from strongly disagree to strongly agree on a pre-defined bell curve, also known as the Q-sort board (Table 2.1) (Watts and Stenner 2012). Arranging the statements on the Q-sort board allows participants to compare and prioritize statements placed within the different columns, while holding different statements within each column at an equal value. After participants finished sorting the various statements, the arrangement of the statements (which is now known as a Q-sort) was recorded on a separate sheet along with participant's age, gender and occupation.

Table 2.1- Q-Sort Configuration

Column Ranking	Strongly Disagree					Neutral				Strongly Agree	
	-5	-4	-3	-2	-1	0	1	2	3	4	5
Spaces Per Column	1	2	4	6	7	8	7	6	4	2	1

Following the completion of the Q-sort, an in-person semi-structured interview was conducted to gain a greater understanding of participant's viewpoints related to the different statements and how they sorted them. As statements on the polar ends of the board are those that stimulated the strongest reactions, the interview focused on these statements to start the conversation. To continue the conversation, participants were given the opportunity to further explain additional statements they felt were important as well as subject matter they felt was not captured within the Q set. To close each interview, participants were asked to provide a brief description of two scenarios: an energy future they would look forward to, and the energy future they expect. These questions were intended to provide additional understanding of the participant's general views towards energy development. All interviews were recorded on an audio recorder and transcribed to ensure accuracy and reliability of the data.

The Q sort data from both communities was analyzed together using principal component analysis (PCA), followed by Varimax factor rotation using freely available software designed specifically for Q methodological studies (PQmethod version 2.35, Schmolck Atkinson 2014). Following the quantitative analysis of the data, qualitative analysis and interpretation of the identified factors was completed using transcription coding and factor crib sheets. Of the identified factors, those that were considered to be minority discourses were selected for further investigation[2]. Here I define minority discourse as a discourse that is less commonly held within the dataset and the related literature. To gain a greater qualitative understanding of the deeper meanings behind these factors, participants who were associated with each minority discourse were contacted for an additional in-person interview. During the interview, the results of the factor analysis were discussed with the participant in such a manner that they were able to

[2] Factors that were considered to be dominant discourses were not selected for follow-up interviews with the assumption that previous studies such as Parkins et al. (2015) had provided sufficient confirmation of the existence and interpretation of these particular discourses.

generally understand how the researcher identified the particular discourse. This was achieved by first presenting the participant with a copy of their Q-sort to remind them of the different statements and how they sorted them. Factor arrays were also presented to the participants to allow them to see how their Q-sort related to the factor on which they loaded, and to allow them to compare the various factors identified through the study. Second, the researcher identified which statements were the most important in the establishment of the minority discourse, and then described how the participants' arrangement of these statements varied from others who took part in the study. Third, the participant was asked whether the identified discourse accurately described their view of energy development, and the researcher continued the conversation to determine what contributed to the development of these particular points of view.

Results

Factor Analysis

Using factor analysis techniques provided in the PQMethod software, a PCA four-factor solution was extracted, which was considered to be an accurate reflection of the dominant and nuanced aspects of the sorts collected in this study. To confirm the appropriateness of this four factor solution, eigenvalues were assessed as an initial indicator of the explanatory ability of each factor (Brown 1980; Watts and Stenner 2012). Both rotated and un-rotated eigenvalues were greater than one, suggesting that the identified factors are reliable. Particular attention was also given to the level of correlation between the identified factors. Although some of the factors demonstrated a low to moderate relationship to one another, the difference between the factors was sufficient enough that a clear and unique description of each factor could be made (Table 2.2).

Table 2.2 - Factor Correlation Matrix

	1	2	3	4
1	1.00	-	-	-
2	0.09	1.00	-	-
3	0.11	0.11	1.00	-
4	0.30	0.28	0.17	1.00

To further test the robustness of the four identified factors, the factor arrays from the identified factors were utilized in a second order factor analysis. This test was conducted to determine if all four factors would remain independent or if they would combine to form what Watts and Stenner

(2012) call a super factor. The results of this test indicated that all four factors remained separate, with rotated eigenvalues greater than one. Un-rotated eigenvalues were also graphed to depict changes in slope and leveling off of values to determine which factor solution was most appropriate. From this graph, it was found that eigenvalues begun to level off after factor 3. Due to the other quantitative indicators and supporting qualitative data, I concluded that factor four remained valid and would provide additional insights into the prevalence of discourses within the region.

Follow-up Interviews

Follow-up interviews were conducted with the four participants who contributed to the definition of the two minority discourse, factor three and two. After reviewing the descriptions of all the identified factors, all four participants confirmed that the factor they identified with accurately described their point of view towards energy development. Any changes that were recommended to the descriptions were to further emphasize aspects of the factor description that had been previously discussed in the initial q-sort exercise. For factor three, this meant that participants thought a greater focus on local sustainability could be brought out in the description, while factor four participants wish for more focus on power inequality. Follow-up interviews demonstrated that participants were consistent in how they described their views towards energy development. When asked to discuss the origins of their views on energy development, participants described their views as the result of a life time of accumulated experiences. These views were said to be constant and not the result of recent experiences with energy development.

Factor Narratives

To help provide context as to how the factors were interpreted, the statement number and its related scoring are provided in parentheses. For example, (2: +2) refers to statement number two, found in column number +2. Refer to Table 2.3 for a full list of the statements utilized in the Q sort.

Factor One – Climate Concerned Citizen

The views held within factor one are primarily motivated by concerns related to the dangers of climate change (36: +5) and anthropogenic impacts that are pushing the global environment beyond a self-correcting state (17: -5). Energy development is viewed as having a prominent role in the disruption of natural systems, as both living and energy systems are considered to be

interconnected (26: +2). While describing their concerns of climate change and nature's ability to self-correct, participants made statements such as:

> There are a lot of people that really think that global change is not imminent, global change isn't going to really affect them sitting in the middle of Alberta. They are not worried about the oceans rising and stuff like this. But I actually think that, just from knowledge that I have gathered that we are drastically losing arable land. I think that glaciers, which I would relate to as a water source, are receding. I think that our ground water is becoming polluted. You look at how much population is growing and how much the world can sustain itself. I see a collision course. So you have the water forces and I think increased population, increased pollution and as a result you have this global warming that just seems to be snowballing.

When addressing the role energy development has within Canada, the views held in factor one are not supportive of Canada's prosperity and economy being strongly reliant on fossil fuel development (18: -2; 34: -2; 24: 0). Instead, participants desire the diversification and advancement of the Canadian economy to one that is no longer reliant on fossil fuel development and exportation (20: +1). Supporting this notion, one community resident stated that:

> [I]t's because it's a monetary driven thing, they are not thinking outside the box. You know they are stuck in a box, this province is a stunning example of that. Putting all their eggs in one basket, when are you guys going to wake up. When are you are going to wake up and it doesn't matter if its energy or what it is, when are you going to wake up and say we have to diversify this thing we have to go into this. That certain players have got a fairly large stranglehold on how they do business in this province with the provincial government and this is monetary driven the whole thing. If that's what has to drive how you operate a country that's just wrong, it's just completely wrong. We had a discussion the other day about a capitalist model and it's not even capitalism. It's not; it's a perversion of capitalism.

To achieve a shift away from Canada's current dependence on fossil fuels, factor one participants suggest that governments provide incentives to support clean energy technology (46: +3; 21: +1) and tap new resources to advance renewable energy development (25: +4). As climate change is seen to be a threat of high importance, the shift towards clean energy technologies that produce close to zero carbon emissions is viewed as urgently needed (45: +2). Additionally, the excuse that no action is needed to reduce greenhouse gas emissions due to Canada's "tiny" contribution to global emissions is not accepted (44: -4). Other negatively viewed arguments that are used to justify the continued rapid extraction of resources and high

levels of carbon dioxide include "Canada's commitment to democracy makes it an ethical supplier of energy". In describing their views regarding the ethics of the hydraulic fracturing development occurring in the Cochrane area, one community member in this factor stated:

> The human rights things that have been mentioned and being an involved stakeholder and engaged in all of this, I believe is so important. Our human rights have been so trashed with this whole development around us."… "I know water has been affected around us in other places and I know people who have been paid off for the water that has been affected. I know cattle have died because of what they have been drinking; you know, talking to farmers around us. It's scary. You know, it impacts you in a very unfair way. Number one, you are now worried about your water. I have been impacted by the emissions around us, I was sick, I had to leave the property. I have lost hair, more than once, significant amounts of hair. Neighbours have gone completely bald. It seems to affect women in that case. It's affected our family life, our son and daughter in-law are pregnant and it has been shown in many studies that these emissions really affect the unborn and children significantly even more than adults. So now our children can't come out here and spend time with us because they are worried about it affecting their children and justifiably so. But it has impacted us and we have had no say, no consultation, and no stakeholder involvement in any of these travesties that has happened to us. So how is Canada being an ethical supplier of energy when ordinary people like us out in the country are having to live this way?

In addition to introducing advancements in energy technologies to help address climate change, it is believed that energy consumption levels need to be reduced, as current trends are seen to be unsustainable (19: +3; 40: +2). When compared to citizens of other countries, the views within factor one suggest that Canadians are guilty of consuming obscene amounts of energy (5: +1). Such high levels of energy consumption are viewed to be immoral and considered unnecessary to have a good life (4: +1; 6: -2). Given the importance of climate change, it is believed that Canada needs to address its issues of consumption and in doing so, become a global leader in its efforts to reduce energy consumption (2: +3). Methods to achieve this reduction that are supported in factor one include placing monetary penalties on dirty sources of energy (40: +2) and providing more energy options, such as renewables, at the household level (35: +2). Other actions to reduce pollution and consumption, such as "going green", are also viewed as important contributions to improved outcomes (7: -3).

Factor Two – Energy and Prosperity

The views represented by factor two primarily focus on the relationship between energy development and Canada's prosperity and economic progress (18: +5; 24: +4). Canada's ample fossil fuel resources are viewed as key to this prosperity, as fossil fuels offer an affordable source of energy for citizens (24: +4; 40: -3) and position Canada as a powerful global leader (47: +4). As one participant put it "if you are going to have an economy, you are going to have an energy source, and it has to be affordable." For Canada to continue experiencing economic progress and secure its standing in the global economy, it is believed that fossil fuel resources should continue to be extracted (9: -4) and exported (34: +3; 16:-1). The continued development of energy resources is embraced in factor two, as it is viewed as an important part of Canada's modern identity (12: +3), with energy infrastructure being looked upon positively as something that can be beautiful (10: +2).

The relationship between energy development and prosperity is also reflected in this factor, with higher energy consumption being viewed as an important component of what is considered the good life (6: +2). In general, current trends in energy consumption are not viewed as an issue of urgent concern (6: +2; 5: -2; 4: -3; 19: -2) because there is a belief that any future energy problems will be solved through new technology and innovation (3: +3). When addressing advancements in the hydraulic fracturing industry, one participant stated:

> I think mankind is very innovative if forced to come up with new technologies they will be doing that. I spent this summer [working] for a company that is in the oil and gas industry and they were talking about how they are using Debolt water to inject into the fracking wells instead of freshwater potable water. And are you familiar with Debolt water? Its saline water or water that they take out that's been contaminated from the ground, has a lot of salt and stuff in it and they are using it now to inject down into the deep wells so they are not using, they are reducing the amount of potable water [used]. That's really a new, and it's on the forefront... So that's innovations... I really do believe that we will come up with better ways to do things. We have seen that through history…sometimes it doesn't happen until it has to happen.

Advancements in technology are thought to not only assist in the continued development of fossil fuel resources but also renewable energy resources (25: +1). Investments in clean energy are viewed as a way in which Canada will be able to boost the economy and improve the environment (33: +2). However, implementation and transition to energy sources that produce

close to zero carbon emissions are not viewed as urgently needed (45: -2). In addition to low concerns regarding energy consumption, a reason for such views towards clean energy sources is that climate change is not viewed as an urgent threat (36: -2).

Even though energy development is regarded as essential to Canada, the impacts of energy development are not overlooked. It is understood that no energy source is perfect, and that there are trade-offs between economic development and environmental protection (13: +3). These trade-offs include a "polluter pay" approach to mitigating pollution (1: +2). Additionally, the views held in factor two recognize a limit to nature's robustness and ability to correct itself and therefore energy development does have the potential to have long lasting effects on the environment (17: -5). This indicates that although energy development is of high importance, humans need to be aware of the interconnection of energy systems with all other living systems (26: +1). Awareness of the trade-offs and impacts of energy production suggests those who identify with factor two realize that there is always room for technological advancement and improvements in industry practices and legislation within the energy sector. For instance, when speaking about how changes can be made to energy legislation to help continue energy development within the province while incorporating people's concerns, one government representative stated that:

> Give us good legislation that speaks to the people, that speaks to the pockets of people that said "I am leaving my home"... Let's sit together and decide what's best for us all and take real leadership… I don't want to argue the science, let's just keep getting better at it. Just get better and continue to go [forward].

The views represented by this factor strongly embrace the notion of trade-offs, which also includes the siting of energy infrastructure in landscapes that may be considered by some to be off limits (31:-4). To exclude such areas from development could lead the prioritization or favoring of particular communities over others.

Factor Three – Over Consumption and Local Sustainability

Views held within factor three, the first of the identified minority discourses, are orientated around the topic of consumption and the view that current rates of energy consumption are unsustainable and have reached immoral levels (4: +5; 19: +4; 2: +3; 6: -4). Although this factor views Canadians as over-consumers, it is not suggesting that Canadians rid themselves of all

modern comforts. It is instead indicating that unnecessary energy consumption is becoming prevalent within Canada, and has led to unsustainable energy development practices. As one participant stated:

> I like the modern conveniences but I don't feel it's my right to use everything. I feel that what I use in one way or another should be in a sustainable manner.

One unique feature that separates factor three from factor one is that the desire to reduce energy consumption is not driven by concerns associated with climate change (36: -4). This is because concerns of climate change are questioned and are seen as exaggerated, with issues of over consumption being viewed as a much higher priority. Although climate change is not a primary concern within factor three, the effects of energy development on the landscape are not overlooked, as the interconnection between energy systems and other living systems is recognized (26: +3). Further, there is a concern that over consumption is leading to unsustainable energy development and industrialization of landscapes (10: -5). Instead of being concerned about global sustainability issues such as climate change, there is a greater focus on local sustainability. It is also thought that the current utilization of large concentrated energy production is unsustainable and results in unnecessary adverse effects (28: -2). For instance, transmission lines and other energy infrastructure are viewed as aesthetically unpleasing (10: -5), or as one participant indicated, a form of "environmental ruin". To alleviate such adverse impacts associated with centralized energy production, there is support for transition towards small and distributed energy sources (14: +3). By transitioning to localized forms of energy production it is believed that the need to industrialize landscapes through the development of energy infrastructure will be reduced. Additionally, if Canadians were to reduce their consumption by changing practices and using available energy saving capabilities such as increasing efficiency through technology, there would be less demand for the continued expansion of energy systems.

Small and distributed localized forms of energy production are also seen as a way to allow local communities to decide on the energy system that is best for them (39: +2), enabling them to maximize the benefits and reduce the costs of the chosen energy source (13: -2; 43: +2). As local energy development should be directed to address local needs and limitations, decisions relating to local energy development should be made by locals and not by outside experts (37: -3).

However, local decisions need to be informed decisions and thus scientific experts still have a role to play in assisting locals in becoming informed.

When shifting to more localized forms of energy production, renewables are not necessarily prioritized over fossil fuels. For example, one participant stated:

> I wouldn't even want to make a preference for renewables or gas or biofuels or anything. [It depends on] what works best for the region, what works best for the community, what keeps transmission to a minimum, because I think my energy future would be getting away from large conglomerates like the large utilities and basically move power generation into the hands of the community. They decide and they manage their own power generation.

Although the views held within factor three recognize the current role fossil fuels have in Canada's energy mix, it is not suggested that energy development continues at is current rate. As one participant explained it:

> We don't have to rape and pillage the earth either. You know many times the oil industry especially feels that instead of pumping a little bit today for a hundred years, we have to pump it all today and not worry about tomorrow. To me it doesn't matter what you are doing, as long as it's done in a sustainable manner.

Additionally, the current need for fossil fuels within Canada's energy mix (9: -3) is partly due to the localized capability for renewables to produce sufficient energy (43: +2). Incentive programs used to support the development of either form of energy is viewed negatively (33: -1), this is because programs are believed to create unsustainable environment for forms of energy to succeed in the long run. The branding of Canada as a leader in renewable energy is also viewed negatively (20: -2) as such actions are seen as a red herring, distracting people from the reality of the situation as Canada is not a leader in the renewable energy field.

Despite a focus on community-led energy production, it is acknowledged that not all people will accept the chosen energy developed (41: -2). One reason for this is that even though the community may benefit as a whole, individuals will often face the burden of the cost such as infringements on their personal property or the reduction of the enjoyment of their surroundings.

Factor Four – Power Inequality

The views held within factor four, the second of the two identified minority discourses, are centered on concerns over power inequities that are associated with energy development in Canada (1: +5; 11 -5). These views are balanced by the recognition of the importance of Canada's energy resources to the prosperity of the country (47: +3; 24: +3; 9: -1). However, within factor four, the view is that the benefits of energy development are not being distributed justly. As one participant stated:

> [T]he energy that we use and that drives the development and conservation of energy should benefit all classes of citizens in Canada and right now it doesn't, it only benefits the very rich…

The primary power inequality issues which factor four focuses on are those related to companies' responsibility for pollution and adverse impacts produced during energy production. Views shared in factor four suggest that currently energy companies (particularly oil and gas) are not held responsible by the government and its regulatory bodies for all the pollution produced during energy production (1: +5). Instead, participants associated with factor four are of the opinion that the responsibility and cost of pollution, including the cost of proving the pollution is harmful, is placed upon the individual. For instance one participant stated:

> I know that I need gas, but make oil companies responsible for any faults or problems that come from [them]. They say 'well you have to prove that your water is going to be unsafe'. Well there is no way that I can prove it; I am not a scientist in any way shape or form. … I went to [the] government to get them to set up a program where if the oil company did something wrong that they pay for the mistakes so I don't have to, but that is not the case.

The transfer of responsibility for pollution to the individual is viewed to be encouraged given that market forces no longer dictate how energy resources are developed or conserved (11: -5). Instead the desire of the elite to acquire further profits determines how energy resources and their impacts are managed. At the local level, the prioritization of profit is viewed to have taken away an individual's power to adequately voice their concerns, or to influence how energy is produced in their community. On a broader scale, by encouraging rapid extraction and exportation of Canada's energy resources (34: -2; 9: -1), the benefit realized by Canadians is seen to be reduced, as citizens are left to deal with the personal, social and environmental consequences

associated with energy development (16: +4). By ensuring that the benefits to Canadians are maximized and the costs to society and the environment minimized, this will help transfer the power over energy resources back to Canadians and away from the power elite.

According to the views expressed within factor four, one reason why local and national environmental and social issues continue to be overlooked is due to the general population's limited awareness of the environmental impacts of energy development and how these impacts affect people (27: -4). Canadians' limited awareness of environmental and community impacts are partly a result of the general public's separation from energy development. As the majority of the Canadian population lives in urban environments they are viewed to seldom come into contact with, or be directly impacted by, resource extraction activities and energy development. This limited interaction allows the majority of Canadians to separate themselves from the impacts of energy development, thus continuing to allowing inequitable power distributions to exist.

One solution to the power inequalities identified in factor four is increased investment in, and development of, clean and efficient energy technologies. By utilizing clean and advanced energy technologies, Canadian energy development would be able to be managed in a way that prioritizes benefits to Canadians (21: +2; 16: +4), while also employing more people and boosting the Canadian economy (33: +4). However, for the implementation of clean energy technologies to be conducted properly, the maximization of affordable energy production, although important (43: +3), must not be the only variable considered. For instance, non-monetary quantifiers such as values associated with cherished landscapes (31: +2) should also be considered. Similar to current forms of energy development, any company developing new energy technologies should be responsible for the impacts associated with the development. To further address issues of power inequality, groups such as environmentalist can help the greater public become more aware of these and other issues related to local energy development (42:-3). By creating more awareness, those subject to the existing power inequality may gain more support.

When it comes to addressing issues of energy consumption, participants identifying with factor four do not feel that Canada should become a global leader in its efforts to reducing consumption (2: -4). This is because, as Canada is a northern country with a large geographical area, it is

necessary for Canadians to utilize a certain amount of energy. However, this is not to suggest that Canada should not take steps to reducing its energy consumption. Participants still feel that Canada needs to join the global community in the effort to reduce consumption as it is believed that currently Canada is falling behind in its efforts to reduce consumption.

Table 2.3 - Q Statements and Factor Arrays[a] for Each Factor

Statements		Factor				Avg
		1	2	3	4	
1	Companies must take responsibility and pay for the pollution they produce	4	2	1	5	3.0
2	Canadians have a duty to be global leaders by reducing our own energy consumption	3	1	3	-4	0.8
3	Our energy problems will be solved in the future through new technology and innovation	0	3	1	2	1.5
4	Consuming too much energy is immoral	1	-3	5	-3	0.0
5	Compared to citizens of other countries, Canadians consume an obscene amount of energy	1	-2	-1	-1	-0.8
6	A high level of energy consumption is part of the good life	-2	2	-4	-1	-1.3
7	The current fad for "going green" will accomplish nothing	-3	-1	0	1	-0.8
8	Canada's commitment to democracy makes it an ethical supplier of energy	-3	0	2	0	-0.3
9	Fossil fuels should not be burned…they should just be left in the ground	-2	-4	-3	-1	-2.5
10	Energy structures, like transmission towers, hydroelectric dams or wind turbines, can be beautiful	-1	2	-5	-3	-1.8
11	Market forces, not incentives or taxes, drive development and conservation of energy	0	1	1	-5	-0.8
12	Energy infrastructure is part of our modern Canadian identity	0	3	2	2	1.8
13	No energy source is perfect; there are trade-offs between economic development and environmental protection	2	3	-2	-1	0.5
14	Small and distributed energy sources are more resilient than centralized production	0	-1	3	0	0.5
15	NIMBYism (Not In My Back Yard) poses a real threat to becoming a cleaner and greener society	1	1	-3	-1	-0.5
16	Our national energy resources should be used in Canada for the benefit of Canadians	0	-1	-1	4	0.5
17	Nature will be fine no matter what humans do; it is a robust, self-correcting system	-5	-5	1	-2	-2.8
18	Growth in energy production is key to Canada's economic progress	-2	5	1	0	1.0
19	Current trends in energy consumption are clearly unsustainable and must be reduced immediately	3	-2	4	-2	0.8
20	Canada should brand itself as renewable energy innovators	1	1	-2	1	0.3
21	Improved power grid technology will help us manage energy better	1	1	-1	2	0.8
22	Renewable energy options are too expensive right now	1	0	1	0	0.5
23	Only the world's poorest people will suffer from climate change	-3	-3	-1	-2	-2.3
24	Canada's prosperity is based on ample supplies of affordable energy	0	4	3	3	2.5
25	We need to find ways to develop untapped resources for renewable energy	4	1	0	-1	1.0
26	Energy systems are interconnected with all living systems	2	1	3	0	1.5
27	Most Canadians are well aware of the environmental impacts of energy development	-3	0	-3	-4	-2.5

28	Large facilities and concentrated production is the smartest way to provide energy	-2	0	-2	0	-1.0
29	Renewables cannot generate enough energy to significantly reduce greenhouse gases	-2	-1	-2	0	-1.3
30	Energy, not money, is the vital essence that flows through human societies	-1	2	1	1	0.8
31	Energy infrastructure does not belong in our cherished landscapes	-1	-4	-1	2	-1.0
32	All forms of energy should be more expensive	-1	-3	-2	-2	-2.0
33	Increased investment in clean energy will boost our economy while improving the environment	3	2	-1	4	2.0
34	Our standing in the global economy depends upon maximizing fossil fuel energy exports	-2	3	2	-2	0.3
35	We should have more energy choices at the household level	2	-1	0	3	1.0
36	Climate change poses a grave and urgent threat to our planet	5	-2	-4	-1	-0.5
37	Scientific experts should decide how resources should be developed	0	-2	-3	2	-0.8
38	Canadians would conserve more energy if it saved them more money	1	-1	2	0	0.5
39	The local community should decide on the energy systems that are best for them	-1	-2	2	1	0.0
40	Energy from dirty sources should be more expensive for consumers	2	-3	0	-2	-0.8
41	People accept energy projects when there are benefits to the local community	0	2	-2	1	0.3
42	Environmentalists are standing in the way of economic development	-4	0	-1	-3	-2.0
43	Renewable energy options like wind, solar or geothermal should be placed only where the potential is greatest	-1	0	2	3	1.0
44	Canada's greenhouse gas emissions are justified because they are tiny compared to other countries	-4	0	0	-3	-1.8
45	Any energy source that produces close to zero carbon emissions (wind, solar, hydroelectric, nuclear) is urgently needed	2	-2	0	2	0.5
46	The government should provide incentives to support clean energy development	3	0	0	1	1.0
47	Canada's energy resources make it a powerful global leader	-1	4	4	3	2.5
48	We need to reduce pollution and consumption, not find ways to develop more resources	2	-1	0	1	0.5

[a] Factor arrays describe how each statement was ranked within the "ideal" q-sort that represents each factor

Table 2.4 - Factor Defining Statements

Factor One – Climate Concerned Citizen
Climate change poses a grave and urgent threat to our planet (+5)
Companies must take responsibility and pay for the pollution they produce (+4)
We need to find ways to develop untapped resources for renewable energy (+4)
Environmentalists are standing in the way of economic development (-4)
Canada's greenhouse gas emissions are justified because they are tiny compared to other countries (-4)
Nature will be fine no matter what humans do; it is a robust, self-correcting system (-5)
Factor Two – Energy And Prosperity
Growth in energy production is key to Canada's economic progress (+5)
Canada's prosperity is based on ample supplies of affordable energy (+4)
Canada's energy resources make it a powerful global leader (+4)
Fossil fuels should not be burned…they should just be left in the ground (-4)
Energy infrastructure does not belong in our cherished landscapes (-4)
Nature will be fine no matter what humans do; it is a robust, self-correcting system (-5)
Factor Three - Over Consumption and Local Sustainability
Consuming too much energy is immoral (+5)
Current trends in energy consumption are clearly unsustainable and must be reduced immediately (+4)
Canada's energy resources make it a powerful global leader (+4)
A high level of energy consumption is part of the good life (-4)
Climate change poses a grave and urgent threat to our planet (-4)
Energy structures, like transmission towers, hydroelectric dams or wind turbines, can be beautiful (-5)
Factor Four – Power Inequality
Companies must take responsibility and pay for the pollution they produce (+5)
Our national energy resources should be used in Canada for the benefit of Canadians (+4)
Increased investment in clean energy will boost our economy while improving the environment (+4)
Canadians have a duty to be global leaders by reducing our own energy consumption (-4)
Most Canadians are well aware of the environmental impacts of energy development (-4)
Market forces, not incentives or taxes, drive development and conservation of energy (-5)

Discourse Comparison - different but common goals

The four discourses identified represent a diverse range of views and perspectives related to energy development in southern Alberta. Each discourse is centered upon different and sometimes conflicting concepts; however, despite these differences, common goals and perspectives can be found between the discourses. For instance, although the views around climate change expressed in factor one and four are different, both factors voiced concerns over power inequalities that exist between local communities and the energy industry. Similarly, while factor one and four have conflicting views on climate change and the solutions for how to address it, they share the opinion that energy consumption and development should be practiced more sustainably. While comparing the different factor arrays and discussing their experience on a local committee during the follow-up interview, one factor three participant reflected on the relationship between factor one and three by stating that:

> [T]he more I was on the committee with [one particular committee member], and over the course of time the more I realized that even though I didn't agree with what he was saying, we both had the same long range goals in mind. It was just that we had come at it from total different aspects…. So the same here, I look at it from a totally different perspective than factor one but in the end game we want long term sustainability, it's just how we look at arriving at that. So the factor one people, I don't agree with them, but I understand what they want to achieve.

Similarities can also be found between the two most opposing discourses identified within the study: factor one and two. For instance, factor one and two have opposing opinions when it comes to climate change and the relationship between fossil fuel development and Canada's prosperity. However, despite these differences, both factors were found to describe the self-correcting characteristics of nature as having limits – limits that if put under enough pressure, can be violated by human activities. Additionally, both factors agree that companies should take responsibility for the pollution they produce. These similarities demonstrate that factors one and two are not as polarizing as they first appear.

When examining the participants that significantly loaded on each factor, we see that factor one – the most dominant factor – is the most diverse. This factor had a total of fifteen people (male and female) from both Cochrane and Pincher Creek contributing to its definition. The second most dominant factor, factor two, consisted of two female and two male participants from local

Government, energy regulator or industry backgrounds. With regards to the two minority discourse, two male participants, both of whom are involved in the debates related to the energy development occurring in the Pincher Creek area, significantly associated with factor three, while two male ranchers from the Cochrane region associated with factor four.

Several of the prominent themes identified within factor four are similar to those found within Allen Schnaiberg's (1980) concept of the "treadmill of production". Central to this concept is the notion that the drive for economic expansion creates the need for resource extraction, which in turn, results in resource consumption and environmental degradation (Hooks and Smith 2004). Due to inequalities that exist within society, the deleterious effects and risks associated with the extraction and production of resources are disproportionately placed on select groups of people. Given that continued economic growth and development is promoted as beneficial to society, the treadmill continues to turn, thereby sustaining the inequitable distribution of its effects. When the concepts of the treadmill of production are compared to the views held in factor four, it can be said that according to these views, the hydraulic fracturing activities within the Cochrane region has disproportionately impacted rural residents, putting them at risk for the sake of economic gain.

Table 2.5 - Study Participant Factor Loadings for Each Rotated PCA Factor

	Participant geographic and occupation description	Factor[a]			
		1	2	3	4
1	Cochrane Region – Health Professional	**0.6807**	-0.281	0.0411	0.2101
2	Cochrane Region – Rancher	0.1718	0.0788	0.1073	**0.6580**
3	Cochrane Region – Dentist	**0.7194**	0.0497	0.2044	-0.0038
4	Cochrane Region – Retired Educator	**0.7471**	-0.0258	0.0158	0.1689
5	Cochrane Region – Engineer	0.4999	-0.053	0.2336	0.5302
6	Cochrane Region – Retired Educator	0.0287	0.1538	-0.054	**0.7903**
7	Cochrane Region – Property Manager	0.4045	-0.1296	0.246	0.6189
8	Cochrane Region – Retired Educator	0.3292	0.4231	0.1784	0.3795
9	Cochrane Region – Retired Engineer	0.5329	0.186	-0.2165	0.4792
10	Cochrane Region – Retired Educator, Government Representative	0.4792	-0.5397	0.1553	0.3052
11	Cochrane Region – Geologist	**0.7089**	0.2569	0.0147	0.1255
12	Cochrane Region – Government Official	**0.5605**	0.0637	-0.0303	0.2955
13	Cochrane Region – Non-profit executive	0.5535	-0.1339	0.5683	0.2313
14	Cochrane Region – Government Representative - Energy	0.1863	**0.7128**	-0.0799	0.3236
15	Cochrane Region – Government Official	0.05	**0.7786**	-0.169	0.1971
16	Cochrane Region – Government Official, Engineer	**0.5487**	-0.2016	0.07	0.3062
17	Cochrane Region – Government Representative - Development	-0.0344	**0.7757**	0.1169	-0.003
18	Cochrane Region – Energy Industry Business Owner	0.04	0.5684	0.5407	0.0884
19	Cochrane Region – Energy Industry Business Owner	0.0703	**0.5321**	-0.0065	-0.0504
20	Cochrane Region – Environmental Consultant	**0.7384**	0.321	0.0443	0.0579
21	Calgary[b] – Energy Industry Executive	0.5933	0.4148	0.1089	-0.0141
22	Cochrane Region – Government Official, Government Representative - Parks	**0.8017**	0.1191	-0.0763	0.1548
23	Calgary[b] – Ecologist, Environmental Consultant	**0.7162**	0.0769	0.0226	0.338
24	Calgary[b] – Energy Industry Executive	-0.4309	0.7291	0.1394	0.0037
25	Cochrane Region – Educator	**0.7668**	-0.1046	0.222	0.1939
26	Calgary[b] – Engineer, Land Management Association	0.3343	-0.2484	**0.6046**	-0.1189
27	Pincher Creek – Government Representative – Parks	**0.4065**	-0.349	0.1983	0.2715
28	Pincher Creek – Educator	**0.7848**	-0.1601	-0.1946	0.2883
29	Pincher Creek – Rancher	-0.1627	0.2886	**0.7522**	0.2175
30	Pincher Creek – Retired Nurse	**0.4881**	-0.1641	0.1763	0.0468
31	Calgary[b] – Energy industry Executive	0.6353	0.2342	-0.0842	0.4309
32	Pincher Creek – Government Official, Financial Manager	**0.6286**	-0.091	0.1707	-0.0501
33	Pincher Creek – Government Representative – Development	**0.8184**	-0.0932	0.0593	0.1855
	Variance explained (%)	29	13	6	10
	Eigen values (non-rotated/rotated)	11.1/9.5	4.5/4.3	1.9/2.1	1.7/3.3

[a] Boldface values represent defining sorts with a significance of $p<0.01$ (critical loading = +/- 0.38)

[b] Participants living in Calgary, Alberta were selected due to their involvement in either the Cochrane region or Pincher Creek energy debates

Discussion

This study sought to examine energy related discourses in the southern Alberta communities of Pincher Creek and Cochrane. The first objective of the study was to identify and explore dominant and minority discourses present in both communities. To do this, I compared the discourses identified within this study to those from the literature, in order to gain an understanding of the relationship between them. Factors one and two resemble the opposing discourses that are common among opponents and proponents of energy projects. Similar to the discourses described by Bomberg (2015), De Rijke (2013), Schirrmeister (2014), and Cotton et al. (2014), factor one focuses on the deleterious impacts associated with energy development, while factor two tends to emphasize the economic benefits. In their examination of Canadian energy discourse, Parkins et al. (2015) also identify discourses similar the factor one and two. Parkins et al. (2015) most dominant discourse focused on concerns of climate change similar to factor one of this study, while Parkins et al.'s fourth discourse, "Markets and corporations will lead", closely resembles factor two of this study. The recurrence of these polarizing discourses in this study does not come as a surprise. As other scholars have noted, information presented by proponents of hydraulic fracturing and wind energy development is often framed in the language of economics, while opponents utilize frames related to the environment, health and climate change (Finewood and Stoup 2012; Brannstrom et al. 2011; Bomberg 2015). Drawing on Taylor's (2004) interpretation of social imaginaries, by continuously advocating these two polarizing frames within the energy debates, energy development opponents (e.g., David Suzuki Foundation; Suzuki 2012) and proponents (e.g. Canadian Association of Petroleum Producers; CAPP 2012) promote particular imaginaries within the public sphere. By dominating the debates on energy development, these imaginaries come to represent the norms and context upon which energy debates are centered.

Although the two dominant discourses do share strong resemblances to the two polarizing views discussed in the literature, some aspects of these discourses are novel. For instance, although factor two focuses on the connection between energy development and prosperity, it also recognizes the limits of nature's ability to recover from anthropogenic impacts. Further, views within factor two also support the notion that companies should take responsibility for the pollution they produce. Such perspectives are also prioritized within factor one, which is consistent with those who are concerned with climate and environmental impacts from energy

development. The coexistence of competing views within a discourse indicates that those who identify with this perspective are not limited to the bodies of knowledge presented by a given set of imaginaries. Instead, they have access to a wide spectrum of social imaginaries that contribute to constructing their views about energy development.

With reference to other commonalities, factor three incorporates several views prevalent within factor one, including the need for sustainable energy production and the reduction of energy consumption. However, in the same instance, factor three dismisses the urgency of threats related to climate change, which is the foundation of factor one. In doing so, those who identify with factor three shift to a more localized frame of sustainability. Looking at factor four, it is apparent that the views found within this discourse are sometimes incorporated with views related to climate, environmental, and health concerns. Although those who identify with factor four recognize these concerns, they prioritize issues of power inequality over all other concerns. In doing so, factor four clearly frames its arguments around power inequality imaginaries, defining itself as a distinct discourse. Supporting the notion of common threads between discourses, several of the discourses identified by Parkins et al. (2015) were found to have a high correlation with the study's most dominant discourse on climate concerns. These findings suggest that although the main focus of a discourse is distinct, contributing views can be common between competing discourses.

The identification of overlapping views between dominant and minority discourses not only furthers our understanding of the spectrum of views present within the Cochrane region and Pincher Creek, but also demonstrates potential areas in which communication between these groups can occur. By accepting similar imaginaries, those who associated with the identified discourses have established a common thread between them. This commonality can be described as the desire to improve upon how energy development is conducted within Alberta. Although the end goal and the manner in which change is achieved may be defined differently between each factor, the common desire for improvement provides a footing on which progressive conversations can be established.

The second objective of this study involves an examination of the two minority discourses in order to gain an understanding of their meanings and how participants came to hold such perspectives. This objective was achieved through information collected in the q-sort, as well as

initial and follow-up interviews. Results of the follow-up interviews provided confirmation of both factor three and four interpretation and provided insights into the origins of these particular discourses. During the interviews, the four participants who associated with factors three and four reiterated the key themes they had focused on during the initial interview. When asked about where their views originated, all four participants attributed their views toward energy development as being part of a value system that has been developed throughout their life, and thus, were not the result of a single event or interaction. Participants indicated that the values they draw on to frame their views of energy development have been shaped by various sources, such as mentors, as well as life experiences that go beyond interactions with energy development. Given these findings and the consistency between post q-sort interview and follow-up interview, I observed that views structuring these minority discourses are deeply rooted. To assist in conceptualize these findings within the context of social imaginaries (Taylor 2004) and discourse (Hajer 1993), we are reminded that social imaginaries and discourses are thought to be continuously in flux due to the interaction between discourses and the introduction of new or modified imaginaries. Taking this into consideration, the existence of deeply rooted values suggests that those who identified with factors three and four actively and/or passively selected or rejected imaginaries in a manner that is consistent with their established value system. This is not to say that the values and norms held by these individuals are completely inert to the changes around them. However, the acknowledgement of structural consistency with the minority discourse does suggest that for these particular participants, the values or imaginaries they draw upon to address energy development issues are part of their moral foundation with enduring qualities.

Conclusion

In this study I examined the debates surrounding hydraulic fracturing development in the Cochrane region, as well as wind energy development in Pincher Creek, and in doing so, have identified two dominant and two minority discourses. Similar to the findings of other studies, the dominant discourses identified in this study resemble the polarizing arguments and perspectives presented by proponents and opponents of energy development. Separating our findings from the common understanding of these polarizing perspectives involved attention to the commonalities between discourses. The identification of dominant and minority discourses also helps to illuminate nuanced between discourses, while at the same time bringing to light areas of

contention and pathways for change that may be under-examined within this context. Such findings can help those who are engaged in energy debates better understand what motivates particular points of view, thereby helping to uncover common threads between viewpoints on which understanding and dialogue can germinate. Energy production from wind and hydraulic fracturing is becoming increasingly prevalent in Alberta, but despite this, our understanding of the local energy debates associated with these forms of energy is still in its infancy. Given this, additional studies such as this one are warranted in order to gain a better understanding of the energy-related conflicts that exist within communities in Alberta and elsewhere. Such research will help ease the transitions that are occurring in energy landscapes, and will allow for more inclusive discussions on the impact of energy transition by increasing our understanding of the present discourses and their similarities.

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Chapter 3 - Identifying low quality q-sorts and their influence: A cautionary tale of large p-sets and web-based q-sorts

Introduction

Since its development in 1935 by William Stephenson (Watts and Stenner 2012), Q-method has proven itself as a useful and versatile tool in the exploration of subjective points of view (Danielson 2009). To analyze subjective views, Q-method requires participants to complete what is known as a q-sort by prioritizing a set of stimuli and providing an explanation of their views using the provided stimuli as a guide. As the q-sort process can be complex for participants, this process is traditionally conducted in-person (Watts and Stenner 2012). While conducting q-sorts in-person is the preferred way of employing this method, it does have drawbacks, including placing limits on the geographical study range and increasing time and travel costs (Reder et al. 2000). Due to these limitations, some scholars are turning to web-based q-sort methods. Although it is currently uncommon, with the adoption of online q-sort methods a growing number of scholars are gathering information from larger groups of participants (Davis and Michelle 2011). In doing so, researchers are expanding their selection of participants beyond a select few key informants, and are beginning to use Q-method to examine the views of the general public. In doing so, researchers are diverting away from traditional Q-method procedures which focus on a small group of carefully selected participants who are considered to be well-informed about the topic under examination. Such divergence has brought forward a number of concerns within the Q-method community. For instance, some scholars are of the opinion that the use of web-based q-sorts and larger participant sets may have a negative effect on participant engagement, thus adversely influencing the quality and interpretation of Q-method data.

To further our understanding of how web-based methods can potentially influence Q-method findings, this study examines issues of data quality that are associated with large p-set datasets collected using on-line methods. In an effort to find ways of identifying levels of participant engagement, the first objective of this study is to examine the relationship between participant effort and participant engagement. For this analysis, both total word count of participant responses and factor loading status are tested as potential proxies of participant engagement, while q-sort completion time is used as a metric of participant effort. The second objective of this study is to demonstrate the potential influence of low quality q-sorts on the identification and

interpretation of Q-method findings. This analysis is intended to reveal how disengaged participants can adversely influence study findings.

To achieve these goals I begin by taking a broader look at the benefits and costs of using online methods in sociological research. Second, I describe how web-based q-sort methods have advanced and provide further description of the concerns surrounding their use. Third, a brief description of the dataset utilized in this study is given to outline its intent and reasoning for using web-based q-sort software. Fourth, I outline the various tests conducted to explore the relationship between participant effort and participant engagement, as well as the influence of random q-sorts, as representatives of low quality q-sorts, on study results. Finally, I discuss these findings and possible ways in which researchers can connect with participants to ensure high quality q-sort data.

Online Methods

Review of Online Surveys

Online survey methods have dramatically changed how researchers connect with and gain information from participants (Evans and Mathur 2005). Analyzing the role of online methods in survey research, Evans and Mathur (2005) outline a detailed list of the strengths and weaknesses associated with the approach. Several of the key attributes of online survey methods identified by Evans and Mathur (2005), have the potential to provide researchers with greater control over multiple aspects of the survey process. For instance, with online methods researchers are often able to ensure that questions are presented to participants in a particular order. Greater control over presentation also makes the utilization of skip patterns more seamless as the automation of skip questions can screen out questions or sections not applicable to the participant, therefore eliminating the risk that participants complete the survey incorrectly (Schonlau et al. 2001). Online methods also provide flexibility to both researchers and participants as online approaches can be initiated in several formats such as website links and email notifications. Contacting participants through email makes it easy and cost effective for researchers to add additional participants (Dillman et al. 2009) and to send follow-up and reminder messages (Evans and Marthur 2005).

Although there are many benefits of using online methods, there are also disadvantages. For example, response rates of online methods are thought to be equal to or lower than other methods (Evans and Mathur 2005). This is partly because online surveys sent via email are often viewed as junk mail or a threat, and therefore, it is likely that would-be participants will delete or ignore invitations. Participants are also noted to question the security of the information they provide through online methods. For instance, participants are often concerned with how their information will be used, whether provided information can be intercepted or stolen, and the risks associated with taking part in a study. Researchers are also limited in how they can contact participants online, as email addresses are not publicly available and ethical requirements of internet based studies often require the establishment of a prior relationship before a participant can be contacted via email (Dillman et al. 2009). Representativeness is another issue often highlighted when discussing online methods. Fricker and Schonlay (2002) argue that the differences between populations who utilize online sources and those who do not is decreasing and could potentially be insignificant within developed countries in the future. Although accessibility to the internet is increasing, a large proportion of users remain internet illiterate (Fricker and Schonlay 2002). When using online polling methods, representativeness comes into question, as these participants are viewed as volunteers or self-selecting (Dillman et al. 2009). Although Q-method does not typically seek to identify generalizable findings, issues of representativeness remain relevant, as it is important to understand what parts of the population researchers have access to through online methods. A growing challenge for initiating research online is the onset of mobile devices such as smartphones and/or tablets (Stern et al. 2014). Because of this shift, survey formats or software packages may not be accessible or compatible with mobile devices, making these formats ineffective (Stern et al. 2014).

Review of Online Q-method

Regarding online q-sort software, a number of options include "Q-Assessor, WebQSort, Web-Q, QSorter, FlashQ and Hotspot" (Davis and Michelle 2011; 575). As online q-sort software has advanced, steps have been taken to emulate the traditional sorting process by incorporating drag and drop capabilities, thus creating a more user friendly interface (Davis and Michelle 2011). For instance, software packages that offer drag and drop functionality, such as FlashQ, first present one statement at a time allowing participants to sort them into one of three piles, agree, neutral, and disagree. After all statements have been sorted, participants are transferred to another screen

with the three piles of statements and a digital representation of the q-sort board. Participants then move the statements from the three piles onto the q-sort board by dragging and dropping the statements as before. As with traditional q-sorts, participants have the opportunity to rearrange the statements on the board once they have been placed. Some software packages allow researchers to track the time it takes participants to complete different parts of the exercise. With this feature, researchers can document the duration of time it takes participants to complete both the initial and final sorts, providing a greater understanding of how the participants' time was spent (Reber et al. 2000).

In addition to providing access to larger and more geographically diverse populations, web-based q-sorts offer other benefits that may attract researchers. For example, in their analysis of Q-Assessor, Reber et al. (2000) notes that web-based q-sorts reduce the time needed to gather and process data. In the case of Q-Assessor and other software packages, q-sort data is instantly transferred to the researcher once the participant has completed the exercise. In cases where participants type in their responses, the results of the q-sort exercise do not have to be transcribed, which helps reduce error and saves time and money. Reber et al. (2000) also note that with web-based q-sorts there is the potential for faster response times, as some participants are able to complete the q-sort immediately after it has been sent. As online methods reduce the cost of including additional participants (Dillman et al. 2009), web-based q-sorts allow researcher to more easily connect to larger portions of the public. The use of large p-sets is commonly viewed as unnecessary within the Q-method literature, as the intent of Q-method is to identify and explore subjective points of view, not to produce generalizable findings (Brown 1980). If appropriately executed however, large p-sets may enable researchers to expand the use of Q-method to explore the views of the general public and not just those of experts or major stakeholders. By doing so, researchers can use Q-method to identify under-examined points of views within the general public that challenge mainstream thinking – views that are overshadowed by dominant perspectives.

Although web-based q-sorts do offer several benefits, there are also disadvantages that are unique to this approach. Unlike traditional q-sort methods, web-based versions do not allow for the participants to view all the statements or stimuli at once (Reber et al. 2000; Watts and Stenner 2012). Therefore, scholars such as Watts and Stenner (2012) question if web-based q-

sorts can achieve the level of comparative evaluation needed to effectively complete the sorting process. Another weakness of web-based q-sort is related to browser compatibility, as some of the software packages may not function on certain browsers or versions of browsers (Reber et al. 2000). Similarly, if participants are not comfortable with computers or using new software, they may find it difficult to complete the q-sort exercise or choose to avoid it all together (Reber et al. 2000). Depending on how participants are selected for a study, the differences in participants' willingness and ability to participate in a study may have an influence on which groups or points of view are represented in a p-set (David and Michelle 2011). Additionally, given that researchers are not present and cannot provide assistance when using web-based methods, the instructions provided to participants are critical to ensure that the q-sort process is completed correctly and with minimal frustration. Along these lines, Watts and Stenner (2012) suggests that good written instructions should be "self-contained, explicit and very transparent" (87). Given the opportunities and challenges associated with web-based Q-method research, further examination and critique of web-based Q-techniques are needed to ensure the quality of Q-method findings.

Critique of Web-based Q-sorts and Large P-set Studies

A limited number of studies have examined web-based q-sort methods in detail. Reber et al. (2000) is the most prominent of these studies, and these scholars suggest that web-based and in-person q-sort methods are comparable with in-person q-sorts in terms of reliability or validity. One notable forum that is dedicated to Q-method research and the advancement of the methodology is the Q-method Listserv. On the Q-method Listserv, participants voice concerns over the potential for web-based methods to influence the outcomes and results of Q-method research. One such concern relates to the increased separation between researchers and participants that results from web-based approaches (Brown 2015). It is feared that as researchers become further detached from participants and subsequently the information they provide, a researcher's ability to understand and interpret the data will be diminished. Referring to his study "A feeling for the organism: Understanding and interpreting political subjectivity" (1989), Brown suggests there needs to be a greater focus on the feeling and connection to the data, rather than solely on the statistical procedures (Brown 2015).

Another concern presented within the Q-method community involves the relatively short completion times of some web-based q-sorts, and whether short completion time is an indication of a lack of engagement on the part of the participant. In web-based q-sorts, participants are, in some cases, completing q-sorts in much shorter periods of time than is the case in traditional q-sort methods. For instance, in the web-based dataset used in this study, some participants completed the q-sort exercise in less than 10 minutes. Scholars within the Q-method community remind us that q-sort exercises are intended to be thought provoking experiences that ask participants to actively compare a group of stimuli, and because of this, they question whether the q-sort exercise can be effectively completed in such short periods of time and still provide meaningful data (Ramlo 2015). Thus, the question of whether participant effort, as a measure of completion time or some other quantifiable metric, can be a reliable measure of participant engagement is important for understanding the utility of on-line delivery methods.

As there are no studies within the Q-method literature that have explored the link between participant effort and participant engagement, I turn to the survey and panel study literature to identify potential variables that influence participant effort. Studies suggest that variables such as participant age, education, and experience with web-based surveys can all influence survey completion time (Yan and Tourangeau 2008 as cited by Malhorta 2008). Other variables that may impact a participant's completion time include, the participant's motivation or cognitive skills, which can have an influence on how much thought a participant puts into each question (Malhorta 2008). Personal characteristics that have been found to lead to shorter completion times include the participant being generally opinionated, knowledgeable, and/or having strong views towards the subject matter (Malhorta 2008). These studies demonstrate that completion time is a complex metric of effort, and therefore the link between completion time and participant engagement may not be as clear as believed by some within the Q-method community.

Although the effects are not well understood at this point, in the case of panel studies it is believed that when participants are exposed to multiple surveys they may invest less effort into providing responses, potentially diminishing data quality (Dillman et al. 2009). It is also thought that the presence of incentives, such as bonuses or money, may encourage participants to complete as many surveys as possible while only putting in minimal effort (Malhorta 2008;

Dillman et al. 2009). However, Goritz (2004) indicates that the presence of incentives is not considered to have influenced response quality, survey outcome, and sample composition with regards to her findings. With this in mind, the impact of incentives on participant effort likely varies from study to study.

To address concerns related to the use of web-based q-sorts and large p-sets that may lead to low quality data, scholars working with such datasets suggest that additional steps be incorporated into the data analysis process. One way in which this can be accomplished is through the integration of reliability/replicability tests (Ramlo 2015). Such tests would consist of collecting preliminary web-based q-sorts to determine the range of time that is needed to adequately complete the q-sort exercise. This information can then be used to eliminate q-sorts from the study that do not fall within what the researcher considers an acceptable range based on the complexity of the subject and the number of statements included in the sorting exercise. Similarly, researchers could potentially conduct a statistical analysis of aspects of the q-sort data, such as completion time, to identify potential outliers that would require additional attention (Pruneddu 2015).

Charles Davis and his colleagues who are currently using a web-based q-sort approach to conduct audience research have collected nearly 5000 responses from participants around the world. For this research, Davis and his colleagues have taken several steps to identify and remove what they consider to be low quality q-sorts (Davis per comm. 2015). For example, they analyze the responses provided for the different questions outlined in the post q-sort exercise questionnaire. If the responses to these questions are not meaningful or are left incomplete, the q-sort is further scrutinized or removed. Initial sorts where participants place statements into three piles are another potential way to identify low quality q-sorts. If it is found that statements are sorted in a manner that is clearly inappropriate, such as placing all the statements in one pile, the q-sort is removed. Davis and his colleagues also examine which factors a particular q-sort loads on, as they have observed that low quality q-sorts tend not to load on major factors. Therefore, q-sorts that do not load on major factors, and instead load on factors with less than 5 or 6 defining sorts, are identified for further inspection (Davis per comm. 2015).

Dataset and Related Research

To address the objectives outlined in this study, I use data collected from web-based q-sort software through an online polling firm. This dataset consists of 105 participants responses from across Alberta, Canada, and is a part of a larger web-based q-sort dataset that consists of participants responses from two additional Canadian provinces: New Brunswick and Ontario. The intent of collecting such a large p-set with high geographical diversity is twofold. First, the research team wished to explore and compare the general public's views related to energy development. Q-method traditionally focuses on members of the public "who have a defined viewpoint to express and, even more importantly, [those] whose viewpoint *matters* in relation to the subject matter (Watts and Stenner 2012; 70-71 original emphasis) and because of this, views of the general public, or lay people, are often excluded. However, the views held by the general public are often important to the conversations and debates related to energy development. Consequently, it is essential to gain a greater understanding of the views held by these groups. With this in mind, the second intent of administering a web-based q-sort was to test the capabilities and limitations of Q-method to examine views held by the general public.

Corporate Research Associates Inc., a polling firm, was used to initiate the web-based q-sorts and to gain access to participants through a panel of potential online participants. Polling firms establish a contact database by recruiting individuals to take part in future studies. Participants are recruited in a variety of ways, including different types of internet and email advertisements and via the telephone (Dillman et al. 2009). By having a set pool of volunteers, firms and researchers are able to understand the demographics of the people who opted in and those who opted out of the study (Evans and Mathur 2005). When collecting responses for the web-based q-sort dataset, an effort was made to ensure that the participants taking part in the study were representative of the demographics within each of the three provinces that were focused on in the broader dataset. Further, the polling firm used in this study provided incentives to participants taking part in the study, which included giving participants points that could be put towards the purchase of items from the firm's catalogue.

Due to compatibility issues, the polling firm was unable to utilize existing drag and drop web-based q-sort software. Instead, the firm developed their own version, which was based off of existing drag and drop software. Similar to FlashQ, participants were first presented with

instructions outlining how to complete the exercise and then were directed to sort 48 statements by dragging and dropping the statements first into three piles, and then onto the digital q-sort board (Figures 3.1 and 3.2). Following the completion of the q-sort exercise, participants were asked to provide further explanation of the meanings they placed on the statement with which they most agreed and most disagreed. Other collected data included demographic information such as gender, age, household income, and information related to the sorting process, such as total q-sort completion time.

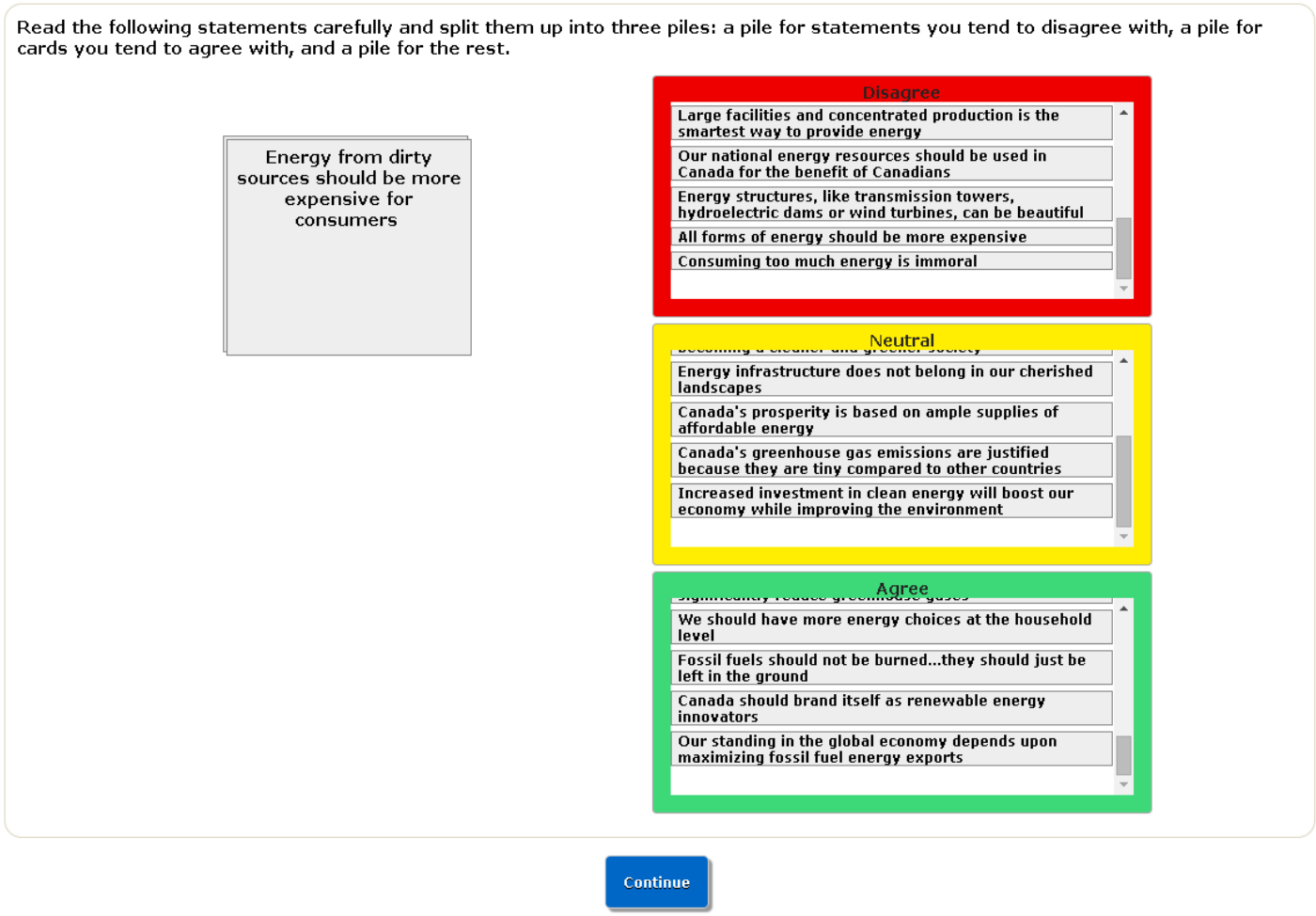

Figure 3.1 – Example screen shot of initial sort within the online q-sort software tool developed by Corporate Research Associates.

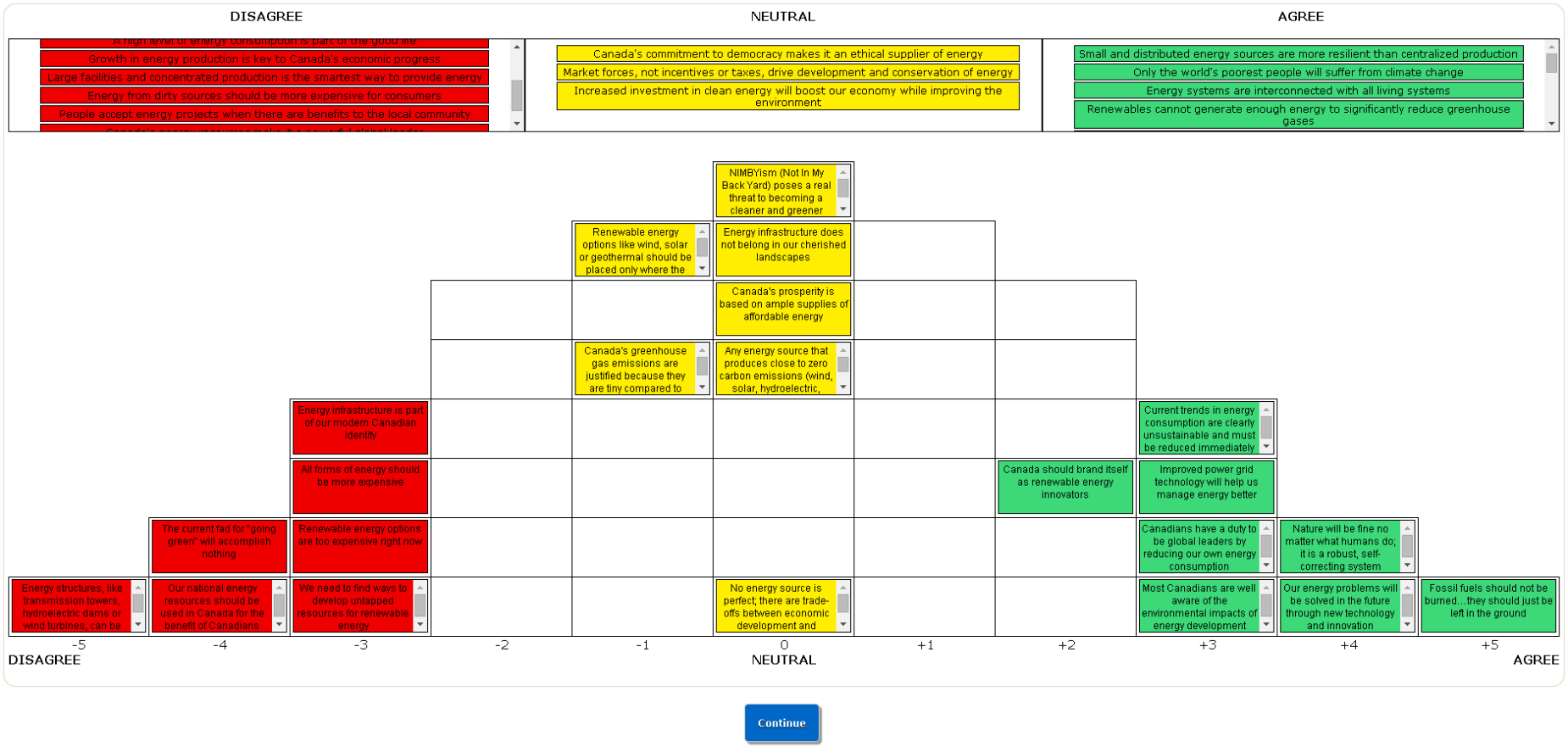

Figure 3.2 – Example screen shot of final sort within the online q-sort software tool developed by Corporate Research Associates.

As this study is a part of a broader research project that seeks to explore views related to energy development, both the concourse and statements developed by Parkins et al. (2015) were utilized to conduct the web-based q-sort. This particular concourse and set of statements were selected for this study because the statements are designed to be general in nature and were therefore considered appropriate for exploring the viewpoints of the public as they are not focused around one specific energy debate. This means that the statements are not directed at any one form of energy in particular, and therefore, can explore wide ranging views on energy development in Canada. For a detailed description of the concepts and process utilized to structure the concourse and statements, refer to Parkins et al. (2015). The utilization of a pre-existing concourse and statement set also allows for the findings from the web-based p-set acquired through this study to be compared and tested against two related studies. The first of these studies was conducted by Parkins et al. (2015) and utilized in-person q-sorts to explore the energy related views of community members in Peace River and Edmonton, Alberta; Mactaquac, New Brunswick; and rural southwest Ontario. This study identified five energy related discourses that suggest the energy related points of view within these regions go beyond an environment versus economy debate (Parkins et al. 2015). The second study, which is discussed in chapter two of this thesis, uses in-person q-sorts and follow-up interviews to identify four discourses that describe aspects of the debates surrounding energy development in Pincher Creek and Cochrane, Alberta.

Procedures and Results

Examining the Relationship between Participant Effort and Engagement

Completion Time and Total Word Count

To examine the relationship between participant effort and participant engagement, completion time was compared to the total word count of the responses provided in the post q-sort exercise. Q-sort completion time was selected as a metric for participant effort as it was assumed that participants who take longer to complete q-sort put in more effort. Total word count was selected as a proxy for participant engagement as it was assumed that a higher word count is indicative of responses that are thoughtful and thoroughly describe the meanings behind the information provided. Q-sort completion time was plotted against total word count using a simple scatter plot (Figure 3.3) to gain a preliminary understanding of the relationship between the two variables. The results of this examination show no strong patterns or relationship between the number of

words included in the post-sorting responses and the q-sort completion time. A Spearman's correlation test was conducted to provide a statistical assessment of the relationship between total word count and q-sort completion time. With an r-value of 0.415, the results of this test indicate that there is a low to moderate significant relationship between the two variables.

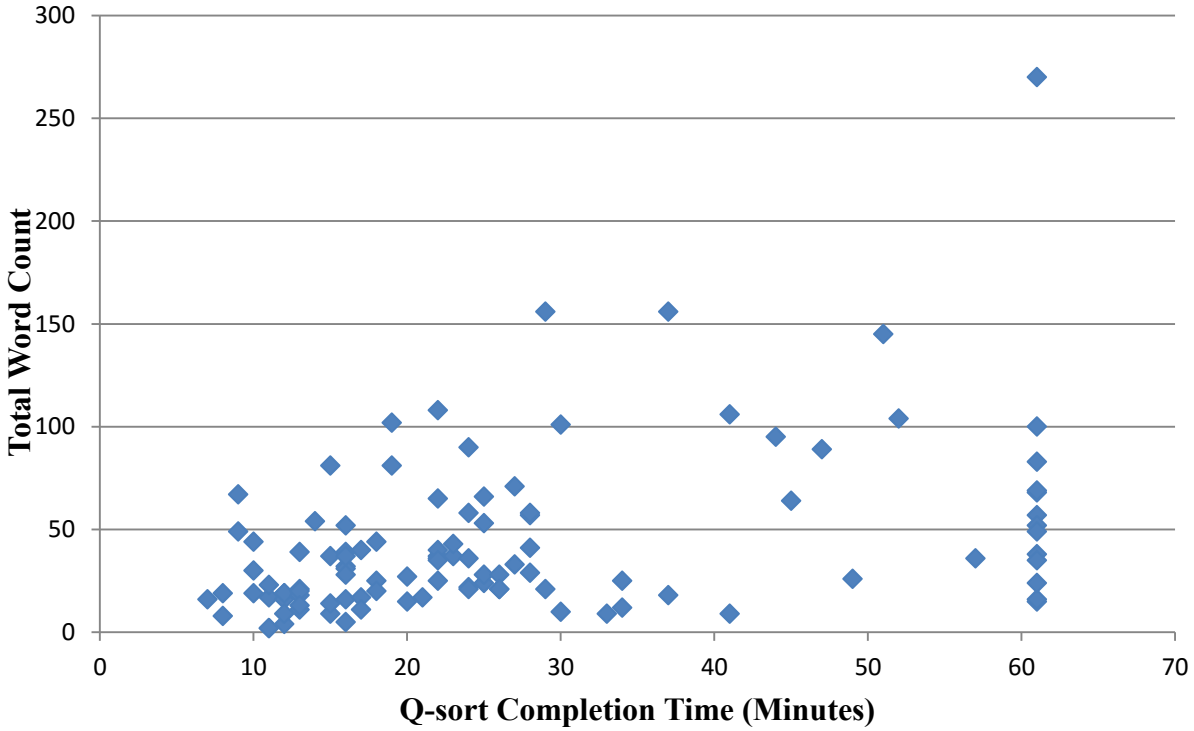

Figure 3.3
– Q-sort Completion Time in Minutes Compared to Total Word Count of Participants Qualitative Responses

Completion Time and Q-sort Loading Status

In an effort to further test the relationship between participant effort and participant engagement, completion time was compared to the loading status of each q-sort. Loading status is defined as whether a q-sort was found to be statically significant (loaded), confounded, or not statistically significant (did not load). It is assumed that if the q-sort is confounded or did not significantly load on a factor, the thought that directed the sorting process was not as focused or consistent as q-sorts that successfully loaded. It is understood that loading status is not the most reliable of proxies for participant engagement or q-sort quality, as participants who have thoughtfully completed the exercise can still end up being confounded or not loading. Despite this, I continued with the analysis with knowledge of its limitations. To test the relationship between completion time and q-sort loading status, a t-test was conducted with 0 representing q-sorts that significantly loaded and 1 representing q-sorts that either did not load or were confounded. The

results of this test show no significant relationship between q-sort loading status and completion time. To gain a general understanding as to whether a relationship exists between completion time and factor loading values, participant completion time and factor loading values for each factor in a PCA 5 factor analysis were visually compared using a scatterplot. Results of this visual comparison suggest that for the first two factors, there is no apparent relationship between factor loading values and completion time, as the q-sorts load in a similar pattern regardless of completion time (3.4.A and 3.4.B). When calculating the proportion of q-sorts that significantly loaded in each ten minute completion time category (Table 3.2.A), we can see that there is no clear linear trend of longer completion times having higher proportions of significant loading q-sorts. This supports the findings found in the examination of factor loading status.

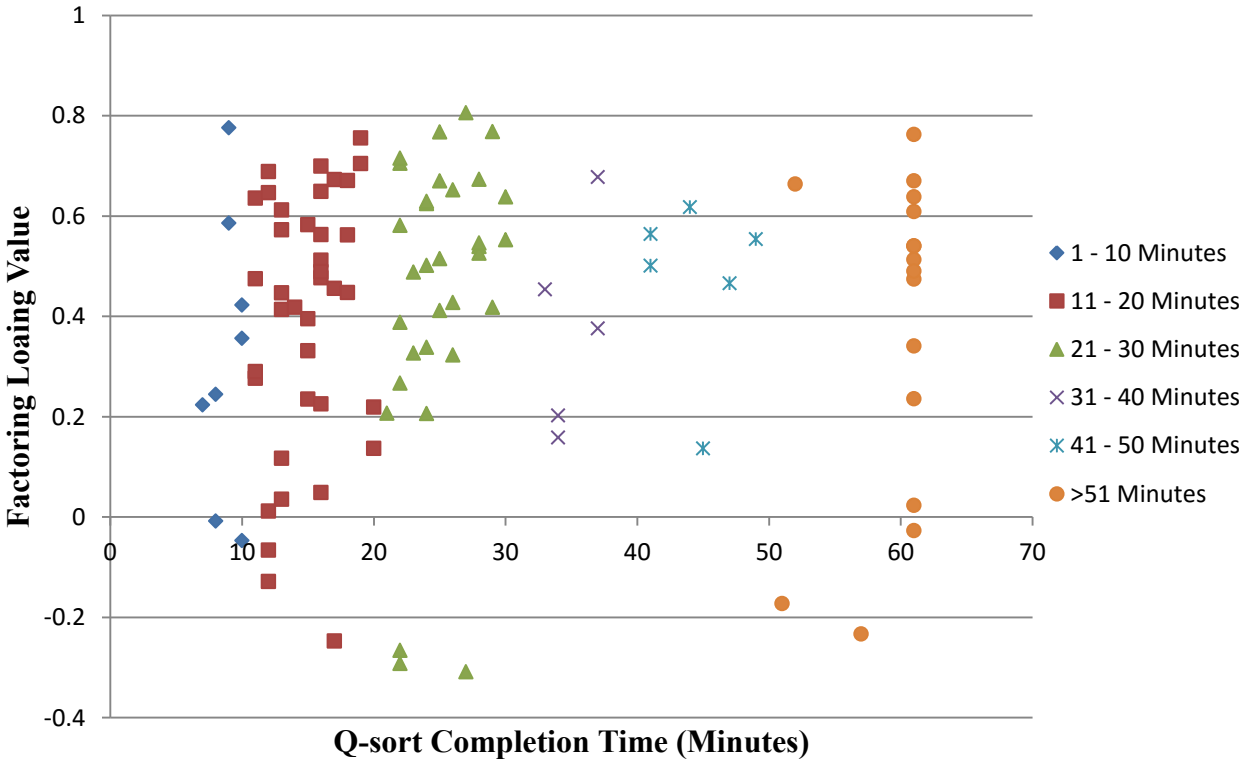

Figure 3.4.A – Factor One of a PCA 5 factor analysis – Q-sort completion time compared to factor loading values

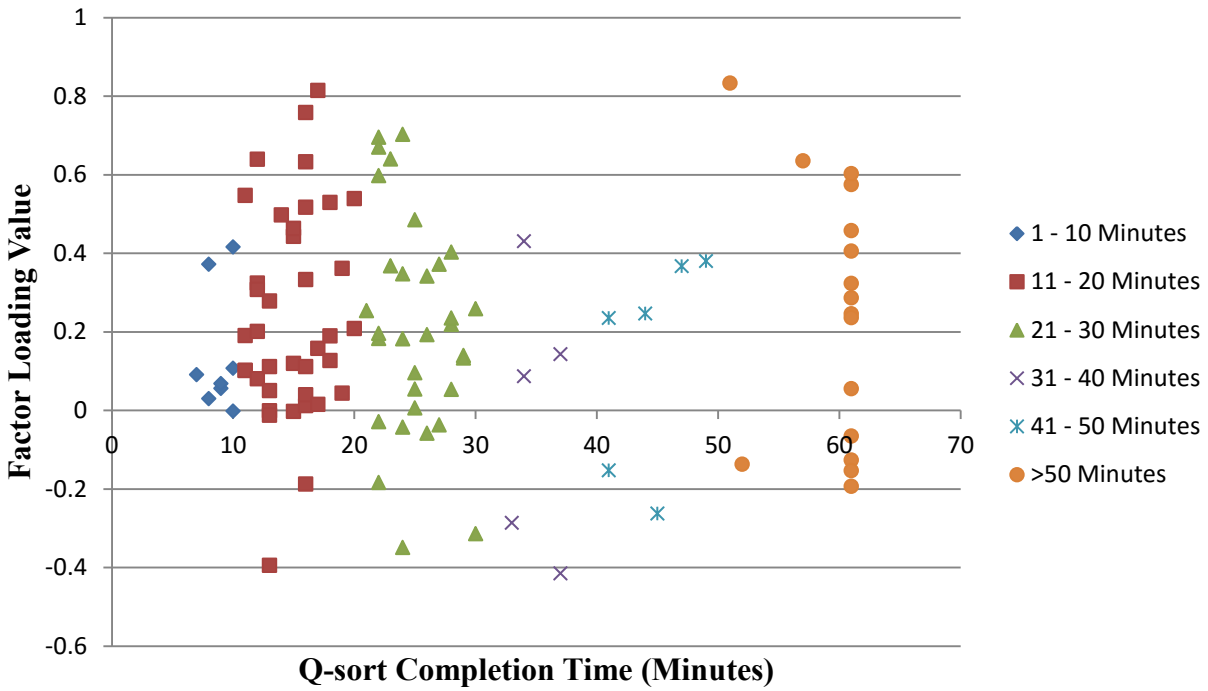

Figure 3.4.B – Factor Two of a PCA 5 factor analysis – Q-sort completion time compared to factor loading values

Examining The Effect of Low Quality Q-sorts on Q-method Findings

To address the second study objective of examining the potential influence of low quality q-sorts on the identification and interpretation of q-method results, randomly generated q-sorts were introduced to the web-based q-sort dataset. Randomly generated q-sorts are seen to be an extreme representation of a q-sort generated with little to no effort, as there is no cognitive reasoning behind the ordering of the statements. Using Microsoft Excel, two datasets of randomly generated q-sorts were created: the first dataset consisting of 25 randomly generated q-sorts and the second set of 15 randomly generated q-sorts. The first dataset of randomly generated q-sorts acted as the primary set of q-sorts utilized in the various tests, while the second dataset of q-sorts was utilized to confirm observed results. Results of these tests demonstrated that although the randomly generated q-sorts were found to significantly load, the manner in which the q-sorts loaded and observed statistical trends varied when compared to non-random data. Using the web-based dataset and the dataset described in Chapter Two for comparison, it was found that unlike non-random data, factor one was not the most dominant factor. Instead, the distribution of loading q-sorts was found to be slightly concentrated in the middle factors. Furthermore, the observed eigenvalues were found to be more consistent that those observed in

non-random analyses. Eigenvalues of random q-sort analysis tended to be of lower value and decreased a more consistent rate, suggesting a flatter slope between values. Percent variance explained of each factor followed similar trends, with variance remaining relatively constant at 9% (Table 3.1).

Table 3.1 – Factor loading and statistical description of randomly generated dataset of 25 q-sorts and web-based dataset of 105 q-sorts

		Factor				
		One	Two	Three	Four	Five
Randomly generated dataset of 25 q-sorts	Eigenvalues	2.79	2.277	2.13	1.91	1.80
	% Variance explained	10	9	9	8	8
	# of sig. q-sorts	3	5	6	3	3
Web-based dataset of 105 q-sorts	Eigenvalues	31.93	10.73	3.81	3.76	3.30
	% Variance explained	24	12	5	7	3
	# of sig. q-sorts	41	14	4	3	5

In order to test the effects of low-quality q-sorts on Q-method findings, changes in factor loading values are examined to determine the influence of the introduction of randomly generated q-sorts. Factor loading values provide insights into how significantly q-sorts contribute to the definition of a given factor (Brown 1980); thus, by assessing factor loading values, one can gain an understanding of how factor interpretation is affected by the introduction of randomly generated q-sorts. For each test intended to examine the effects of poor quality q-sorts, a principal component factor analysis (PCA) and Varimax rotation factor analysis was conducted. PCA was selected as it produces a single solution that is considered mathematically the most appropriate (Watts and Stenner 2012). Although PCA is seen by some Q-method scholars as restrictive, for the purpose of this study, PCA is viewed as an asset as it reduces the variability that would have otherwise been introduced by the researcher if other factor analysis techniques had been used (e.g., centroid factor analysis). Similarly, Varimax rotation was utilized as it automatically rotates the data based on statistical criteria ensuring that "the factors account for the maximum amount of study variance" (Watts and Stenner 2012; 122). To conduct both the PCA and Varimax factor analysis, PQMethod freeware version 2.35 (Schmolck and Atkinson

2014) was utilized, as it is considered to be a proven platform in conducting Q-method factor analysis.

In order to gain a preliminary understanding of how randomly generated or low quality q-sorts influence Q-method factor analysis, and to determine if factors can be identified within a completely randomized dataset, the entire dataset of 25 randomly generated q-sorts was first analyzed separately. The dataset was analyzed four times, each time extracting a different number of factors to examine how the number of factors extracted influenced results. To confirm that results were not a unique trait of that particular dataset, the second randomly generated dataset was subjected to a three factor solution. The results of the tests conducted on both datasets were similar and demonstrate that a sample that consists completely of randomly generated q-sorts can significantly load and thus form factors.

To examine how low quality q-sorts can potentially influence the results and interpretation of factor analysis, the 25 randomly generated q-sort dataset was introduced stepwise into the web-based q-sort dataset of 105 participants. Each time a group of randomly generated q-sorts were introduced, a three, four, five and six factor solution analysis was conducted. Multiple factors were extracted each time randomly generated q-sorts were introduced into the web-based q-sort dataset in order to gain an understanding of how the number of factors extracted influenced loading patterns of the randomly generated q-sorts. To confirm and compare the findings obtained from these tests, similar tests were completed using the dataset of 15 randomly generated q-sorts.

In all but two of the tests conducted, randomly generated q-sorts significantly loaded on at least one factor. This included tests where only five randomly generated q-sorts were introduced. As more randomly generated q-sorts were introduced, an increasing number of the randomly generated q-sorts significantly loaded on one or more factors. Similarly, as more factors were extracted, a greater number of randomly generated q-sorts significantly loaded (Table 3.1).

Table 3.2 – The number of the random sorts that significantly loaded on each factor, as a function of the number of factors that were extracted and the total number of randomly generated q-sorts introduced into the factor analysis

Number of Factors Extracted	Number of random Q-sorts introduced into analysis					
	5 (R1 – R5)[a]	5 (R6 – R10)[a]	5 (R11 – R15)[a]	5 (R16 – R20)[a]	10 (R1 – R10)[a]	25 (R1 – R25)[a]
3	0	2	2	1	2	4
4	0	1	2	3	2	6
5	1	3	2	1	4	11
6	3	3	4	2	5	13

[a] Identifies which randomly generated q-sorts were introduced from the dataset of 25 randomly generated q-sorts

In all cases, there is a tendency for randomly generated q-sorts to load on non-dominant factors. For instance, if a five factor solution had been extracted, the low quality q-sorts typically loaded on the third, fourth, and fifth factors, rather than on the first two factors. When randomly generated q-sorts did load on a dominant factor, they did so negatively. These instances would occur more frequently when fewer factors were extracted. Additionally, as the number of randomly generated q-sorts was increased, there was a tendency for the non-random q-sorts to become more concentrated on the two dominant factors. Tables 3.2.A and 3.2.B illustrate how q-sorts loaded on each factor prior to, and after the introduction of randomly generated q-sorts. The increase in the total number of q-sorts that load on factors one and two after the introduction of the random data (Table 3.2.B) suggests that the non-random q-sorts have been crowded out or have shifted from minority factors to more dominant factors. Furthermore, Tables 3.2.A and 3.2.B organizes the q-sorts into categories by completion time, to help illustrate patterns between completion time and significant loadings. By categorizing the web-based q-sorts in this manner, one can see that the largest proportion of non-random q-sorts were completed within 11 to 30 minutes (n=105, mean=27 minutes, median= 22 minutes).

Table 3.3.A – Results of a 5-factor PCA with no random sorts (n=105). The number and proportion of significant loadings for each factor is presented by completion time category

	Factor					Number of sorts per grouping	Prop. of sorts found significant
Completion Time	One	Two	Three	Four	Five		
1-10 Minute	2	0	1	0	1	8	0.50
11-20 Minutes	12	6	1	0	2	38	0.55
21–30 Minutes	18	4	1	1	2	32	0.81
31-40 Minutes	1	0	0	1	0	5	0.40
41-50 Minutes	2	0	0	1	0	6	0.50
>51 Minutes	6	4	1	0	0	16	0.69
Total # of Non-random sorts	41	14	4	3	5		

Table 3.3.B – Results of a 5-factor PCA with 105 non-random and 25 random sorts (n=130). The number and proportion of significant loadings for non-random sorts presented by completion time. The number of random sorts that significantly loaded on each factor is also provided

	Factor					Number of sorts per grouping	Prop. of sorts found significant
Grouping	One	Two	Three	Four	Five		
1-10 Minute	3	1	1	1	0	8	0.75
11-20 Minutes	18	7	0	0	1	38	0.68
21–30 Minutes	21	5	0	0	0	32	0.81
31-40 Minutes	1	0	0	0	0	5	0.20
41-50 Minutes	5	0	0	0	0	6	0.83
51 Min. and >	6	4	0	0	0	16	0.63
Random q-sorts	0	1	5	3	2	25	0.44
Total # of Non-random sorts	54	17	1	1	1		

In order to confirm observed findings, the influence of low quality q-sorts was explored using q-sorts collected via traditional in-person methods by drawing on datasets from Parkins et al. (2015) as well as the dataset described in Chapter Two. To achieve this, the first 10 q-sorts were selected from the 25 randomly generated q-sort dataset and were added to the Parkins et al. and Chapter 2 datasets. The Parkins et al. dataset was then subjected to a five factor solution, while the Chapter 2 dataset was subjected to a four factor solution. Factor solutions of five and four were chosen because these are the number of factors selected for interpretation in each of the original studies, and therefore, gave the best indication of how the introduction of randomly generated q-sort data impacted study results. Similar to the web-based dataset tests, when

randomly generated q-sorts where introduced to both the Parkins et al. and Chapter 2 datasets, minority factors (typically factors three, four and/or five) were impacted the most, as defining sorts significantly changed and factors were polluted by randomly generated q-sorts. More dominant factors(factors one and two) were also affected, as factor loading values and defining sorts were altered with the introduction of random sorts, thereby changing how the non-random sorts contribute to the definition of the factor (Table 3.3: sort #16 and 19).

To help clarify the impact of randomly generated q-sorts further, Table 3.3 shows the factor loadings for the Chapter 2 dataset. For the Chapter 2 dataset, the introduction of randomly generated q-sorts resulted in the defining sorts in both factor three and four to become confounded. The introduction of randomly generated q-sorts also caused changes in how non-random q-sorts loaded on dominant factors, with some sorts (e.g., sort #9 and 31) changing from non-significant to significant on factor one. When assessing loading values in more detail, we also see that some of the loading values have been altered when compared to the original data analysis (e.g. sort #16 and 19).

Table 3.4 – Factor Loading Information for study described in Chapter 2, demonstrating the effect of randomly generated sorts on factor loading

	Factor Loading Without Randomly Generated Q-sorts [a]				Factor Loading With Randomly Generated Q-sorts [a b]			
Q-Sort	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
1	**0.6807**	-0.2810	0.0411	0.2101	**0.6619**	-0.2259	-0.0602	0.3146
2	0.1718	0.0788	0.1073	**0.6580**	0.2931	0.2012	0.1269	**0.5065**
3	**0.7194**	0.0497	0.2044	-0.0038	**0.7249**	0.0714	-0.0421	-0.0545
4	**0.7471**	-0.0258	0.0158	0.1689	**0.7382**	-0.0085	0.1087	0.1655
5	0.4999	-0.0530	0.2336	0.5302	0.5938	0.0758	-0.1163	0.4453
6	0.0287	0.1538	-0.0540	**0.7903**	0.2021	0.1961	0.3958	0.4330
7	0.4045	-0.1296	0.2460	0.6189	0.5386	-0.0431	0.0890	0.4719
8	0.3292	0.4231	0.1784	0.3795	0.3397	0.4866	-0.0249	0.4169
9	0.5329	0.1860	-0.2165	0.4792	**0.5592**	0.1976	0.2486	0.3288
10	0.4792	-0.5397	0.1553	0.3052	0.5756	-0.4418	-0.1676	0.1742
11	**0.7089**	0.2569	0.0147	0.1255	**0.7145**	0.2213	0.1495	-0.0216
12	**0.5605**	0.0637	-0.0303	0.2955	**0.5621**	0.0747	0.0909	0.2806
13	0.5535	-0.1339	0.5683	0.2313	0.6577	0.0227	-0.4461	0.1976
14	0.1863	**0.7128**	-0.0799	0.3236	0.1999	**0.6910**	0.3188	0.1508
15	0.0500	**0.7786**	-0.1690	0.1971	0.0733	**0.7303**	0.3382	-0.1050
16	**0.5487**	-0.2016	0.0700	0.3062	**0.6200**	-0.1479	0.0361	0.1343
17	-	**0.7757**	0.1169	-0.0030	-0.0479	**0.7416**	0.1672	-0.0566
18	0.0400	0.5684	0.5407	0.0884	0.0920	**0.7123**	-0.3540	0.0799
19	0.0703	**0.5321**	-0.0065	-0.0504	-0.0562	**0.4869**	-0.0547	0.2388
20	**0.7384**	0.3210	0.0443	0.0579	**0.7003**	0.2894	0.0885	0.0492
21	0.5933	0.4148	0.1089	-0.0141	0.5953	0.4000	0.1076	-0.1727
22	**0.8017**	0.1191	-0.0763	0.1548	**0.8055**	0.0705	0.2049	-0.0165
23	**0.7162**	0.0769	0.0226	0.3380	**0.7431**	0.1314	0.0124	0.2045
24	-	0.7291	0.1394	0.0037	-0.4248	0.7270	0.0601	-0.0229
25	**0.7668**	-0.1046	0.2220	0.1939	**0.7913**	-0.0496	-0.1496	0.1833
26	0.3343	-0.2484	**0.6046**	-0.1189	0.4205	-0.1040	-0.5290	-0.1708
27	**0.4065**	-0.3490	0.1983	0.2715	0.4296	-0.2240	-0.3490	0.4115
28	**0.7848**	-0.1601	-0.1946	0.2883	**0.7823**	-0.1912	0.2336	0.1914
29	-	0.2886	**0.7522**	0.2175	0.0280	0.5154	-0.4497	-0.0127
30	**0.4881**	-0.1641	0.1763	0.0468	**0.5138**	-0.1250	-0.0930	0.0309
31	0.6353	0.2342	-0.0842	0.4309	**0.7038**	0.2494	0.2468	0.1215
32	**0.6286**	-0.0910	0.1707	-0.0501	**0.6152**	-0.0478	-0.1851	-0.0419
33	**0.8184**	-0.0932	0.0593	0.1855	**0.8156**	-0.0934	0.0580	0.1565
R1	-	-	-	-	0.2525	0.0034	0.1710	0.3474
R2	-	-	-	-	-0.0798	-0.0437	-0.0091	**-0.6447**
R3	-	-	-	-	-0.0423	0.0860	0.1825	**-0.5211**
R4	-	-	-	-	0.1431	0.0172	-0.1584	-0.1831
R5	-	-	-	-	0.0729	-0.0308	0.3502	0.0911
R6	-	-	-	-	-0.0125	-0.0846	-0.1678	0.0489
R7	-	-	-	-	-0.2266	0.2315	-0.0418	**-0.4051**
R8	-	-	-	-	-0.0622	**-0.6163**	0.1560	0.1406
R9	-	-	-	-	0.3501	-0.1079	0.2183	-0.3635
R10	-	-	-	-	0.1801	-0.1046	**0.6132**	-0.0874

[a] Boldface values represent defining sorts with a significance of $p<0.01$ (critical loading = +/-0.38)

[b] Grey highlighted values indicate changes in loading patterns due to introduction of random q-sorts

Discussion

The first objective outlined in this study was to examine the relationship between participant effort and participant engagement. This relationship was analyzed in response to concerns within the Q-Method community that short q-sort completion times are an indication that participants are not putting in the level of effort needed to effectively engage in the q-sort exercise (Ramlo 2015). To test this relationship, Q-sort loading status was used as a proxy for participant engagement and compared against completion time. It was hypothesized that q-sorts that were completed more quickly would be of lower quality, and would therefore be more likely to be confounded or found statistically insignificant. The result of this test demonstrates that there is no significant relationship between completion time and a q-sort loading status. This is most likely because even expertly crafted q-sorts can be confounded or not load significantly. Q-sort loading values within each factor of a PCA 5 factor analysis were visually compared to completion time to help further explore the relationship between completion time and loading values. Through this visual comparison it was determined that for this particular factor analysis, regardless of completion time q-sorts loaded in a similar manner.

A statistical comparison of completion time and total word count of participants' qualitative explanations was also conducted to test the relationship between participant effort and participant engagement. This test demonstrates that for the web-based p-set of 105 participants there is a low to moderate correlation between participant completion time and word count. These results suggest that participants who take more time to complete the q-sort exercise are slightly more likely to be more engaged in the q-sort exercise. It is hypothesized that the correlation between completion time and word count is only observed to be low to moderate because of the multitude of variables that influence participants' effort. Survey research shows that variables such as a participant's age, level of computer experience, confidence and knowledge of the subject matter can all have an influence on how quickly web-based exercises are completed (Malhotra 2008). As Malhotra's (2008) examination of survey results suggests, completion time as a metric of participant effort is not highly reliable due to its complexity. Despite this, Malhotra (2008) does recognize the usefulness of completion time as a preliminary indicator and suggest that researchers keep it within their toolkit to assist in filtering out potential unwanted responses. Given the observed level of correlation between completion time and total word count found in this study, it is suggested that completion time should only be utilized as one of many methods

used to identify potential low quality q-sorts and not as a definitive criteria for removing q-sorts from a dataset.

Additionally, due to the multiple variables that contribute to a participant's level of effort, it is suggested that q-sorts with short completion time should not be the only q-sorts questioned for their quality. With web-based q-sorts researchers are unable to observe how participants utilize their time, and therefore, it is unclear if participants became distracted with other tasks during the q-sort exercise, thus increasing their completion time. Alternatively, participants with poor computer skills may also take longer to complete the sorting exercise. Given these uncertainties, a participant's completion time on its own is not a reliable indicator for predicting participant engagement. For instance, when calculating the proportion of significant loading q-sorts in each ten minute completion time category, no linear relationship could be identified. Instead, the 21-30 minute category had the highest proportion, followed by the >51 minute category. All other categories were found to have between 40 and 55 percent of the q-sort significantly loaded.

The second objective of this study is to explore the impact of randomly generated q-sorts on Q-method study results. In an effort to address this objective, first a dataset consisting of only randomly generated q-sorts was subjected to PCA and Varimax factor analysis to determine how q-sorts of this nature would be treated within a Q-method analysis. The findings of this test demonstrate that randomly generated q-sorts by themselves can form factors. Building off these results, randomly generated q-sorts were introduced into three different datasets. The results of these tests demonstrate that even when a small number of random q-sorts are introduced, these q-sorts can significantly load on a number of factor solutions. The impact of these q-sorts varies depending on the level of loading and the number of defining sorts within a factor. For example, with only a few random q-sorts contaminating a dataset, the interpretation of a factor would only be minimally impacted, as the contribution of each q-sort to a factor array is weighted (Brown 1980). However, as more randomly generated q-sorts populate a dataset, the impact to findings can become significant enough to cause concern. For example, in tests where 10 or 25 randomly generated q-sorts were introduced to the three datasets, randomly generated q-sorts seemed to crowd out q-sorts that had previously loaded on minority factors. The crowding out observed in these tests is seen as a considerable concern, as this phenomenon can affect the interpretation of factors in several ways. First, when low quality q-sorts crowd out reliable q-sorts, the defining

sorts for the dominant factors change, thereby affecting how these factors are interpreted. Second, as higher numbers of low quality q-sorts populate a dataset, a researcher's ability to reliably identify and interpret minority factors is reduced. The tendency for randomly generated sorts to load on minority factors is of particular concern. Given that minority discourses appear to be the most susceptible to the influence of low quality sorts, serious attention needs to be given to ensuring that only q-sorts of the highest quality are included so as not to contaminate these minority perspectives. The third manner in which low quality q-sort are perceived to affect Q-method findings is by diminishing the ability of researchers to come to nuanced and/or accurate conclusions. Even though each q-sort's contribution to a given factor array's definition is weighted, the slightest change in statement(s) position can have a deleterious impact on the finer details of a factor. For example, if the loading values of a factor are changed due to the introduction of low quality q-sorts, the manner in which each q-sort contributes to the factor changes, potentially changing details within the factor definition.

Q-method is praised for its ability to provide detailed analyses of both dominant and minority points of view, and based on the results of this study it is clear that low quality q-sorts present a serious threat to the interpretation of results for both web-based and traditional Q studies. Therefore, steps to identify and remove low quality sorts, such as those suggested by members of the Q-Method Listserv (Ramlo 2015; Pruneddu 2015) and Davis and his colleagues (per comm. May 2015), are imperative to ensuring quality and accurate findings. Equally important, researcher utilizing web-based q-sorts should also ensure that participants who are unlikely to engage in the study at the level necessary are not included in the first place. One way in which this can be achieved is through a more stringent participant selection process. Drawing on the critique that web-based q-sorts have increased the gap between researcher and participant (Brown 2015), another potential method of reducing the instances of low quality q-sorts is to hybridize the q-sort exercise by combining elements of traditional and web-based methods. One manner in which hybridization can be achieved is to utilizing the web-based q-sort interface for the sorting process and following this by having a researcher connect with participants for the post-sort qualitative data collection (Davis and Michelle 2011). This could be achieved by having a post-sort interview occur in person, over the phone or via an online chat or video. By connecting with the participant, researchers are able to probe for further explanations or deeper meanings. In doing so, researchers gain a greater sense of the participants' understanding and

points of views of the subject matter. Connecting with participants in this manner would also provide the participant opportunities to discuss additional statements or themes that are important to how they completed the q-sort exercise. Such an approach would help build a greater qualitative understanding of the rationale behind participant responses by providing insights into a broader range of statements. Knowing that a researcher is waiting to interact with them may also encourage participants to put forward higher levels of effort and become more engaged in the sorting process. If participants do put little effort into the sorting exercise and are not engaged, by communicating with the participant, researchers may be better equipped to recognize this based on the participants' responses. By taking steps to identify poor quality q-sorts and to reduce the gap between researcher and participant, researchers will most likely see an increase in the resources spent assessing web-based q-sort datasets. For instance, the introduction of web or phone based post q-sort interviews will most likely restrict the number of participants included in a web-based study. However, it is believed that although study costs and time needed for data analysis may increase because of the recommendations presented here, these costs are justified, as they help ensure the quality of study findings.

In addition to these recommendations, it is suggested that before researchers commit to large p-set, that they question if it is truly necessary to divert away from traditional p-sets approaches. As more participants are incorporated into a study p-set, researchers increase the probability that low quality q-sorts are incorporated into the dataset, thus potentially contaminating study findings. Researchers should question what value is added by gathering large p-sets, and should consider whether the benefits of large p-sets outweigh the risks. Scholars such as Brown (1980) argue that with well-crafted p-sets, Q-method research does not require large numbers of participants because "all that is required are enough subjects to establish the existence of a factor for purposes of comparing one factor with another" (192).

When considering utilizing Q-method to explore the views of the general public, it is suggested that researchers question what additional insights are gained by examining the views of the general public, as compared to key informants that are likely to be highly engaged participants. Although the views of the public will vary with the subject matter under investigation, in many cases, the views of the public may be very similar to those of key informants or community leaders traditionally selected by Q-practitioners. It is suggested that in some cases, researchers

may obtain clearer results by studying the views of highly engaged key informants, as compared to the views held by the public. The rationale for this is that without careful selection of research participants, there is a higher probability of obtaining low quality q-sorts from the general public, who may not be as well-informed on the topic under investigation, and therefore, may not have well-established or strongly defined views. This may lead to low levels of engagement, which in turn may restrict a participant's ability to thoughtfully and meaningfully prioritize and organize all the statements on the q-sort board. Responses that are not driven by careful consideration may more closely resemble a "random" sort, and may significantly influence the interpretation of the factors that result from the inclusion of such sorts. If views of the general public are of interest, due to the structural limitations of Q-method born from its need for clearly thought out and defined views, it is recommended that researchers ensure that the participants that are included are adequately engaged and that steps be taken to identify and remove low quality q-sorts.

Conclusion

With the growing use of web-based q-sort software, researchers have overcome some of the limitations of traditional Q-method procedures and in doing so have be able to examine the views of larger and more geographically diverse groups of people. However, by utilizing web-based q-sort software researchers sacrifice a high level of participant oversight and connection often found in traditional q-sort methods and in doing so, increase the potential for poor quality q-sorts to pollute study datasets. Although some researchers currently taking advantage of web-based technologies have recognized this issue and are taking steps to identify such q-sorts in their dataset, the full impact of poor quality q-sort has yet to be extensively explored in the Q-method literature. In an effort to address this gap in the literature, this study first explores the relationship between participant effort and participant engagement. These tests demonstrate that although there is a correlation between participant effort and participant engagement, metrics of participant effort such as completion time, should only be used as an initial indicator of q-sort quality and not a definitive criterion for exclusion. It is recommended while searching out poor quality q-sorts, that researchers take the time to explore and connect with the information by examining different aspects of each q-sort. This will not only increase the quality of study datasets but will also help with the interpretation process as researchers will be encouraged to become more engaged with the data. Based on the findings of this study, the identification and removal of poor quality q-sorts is viewed to be an integral part of all Q-method studies as poor

quality q-sorts can potentially have a significant impact of study finding. Whether it is through altering the defining sorts, reducing the ability to identify minority factors, or diminished accuracy of nuanced findings, poor quality q-sorts are a problem that should not be overlooked.

It is recognized that in our examination of poor quality q-sorts, the metric of participant effort and the proxy for participant engagement were limited. Therefore for future studies that seek to analysis similar subject matter, it is recommended that additional metrics of participant effort and engagement be collected in online studies and tested to determine their effectiveness. Software packages such as FlashQ may help achieve this as they allow researchers to record the time of multiple aspects of the q-sort exercise, thus providing additional insights as to how participants allocate their time. It is recommended that researchers question what value is being added from utilizing web-based and large p-sets to address research questions. In some instances it may be more appropriate to stick to more traditional Q-method procedures or even chose a different method entirely depending on the subject matter. Furthermore, in our analysis of the impact of poor quality q-sorts on Q-method findings, the various datasets were only subjected to PCA and Varimax factor analysis. As Centroid Factor Analysis and manual rotation is believed to provide researcher with greater control and opportunity to explore the data further (Watts and Stenner 2012), results using these methods may produce different findings. This is because unlike PCA, which calculates "a single, mathematically *best* solution" which "*should* be accepted" (99 original emphasis), centroid factor analysis, presents an indeterminate amount of solutions allowing researcher to analysis the data set from multiple perspectives (Watts and Stenner 2012). If centroid factor analysis's open approach provides researcher the ability to identify and isolate poor quality q-sort more effectively, such insights would provide further guidance as to the most appropriate approach to web-based data analysis. Therefore, it is recommended that in future research, both PCA and Centroid Factor Analysis be tested to see if the impact of poor quality q-sort is comparable. Results from such research may provide also valuable insights into the PCA/centroid factor analysis debate. Despite the factors limiting this study, the findings of this study offer some initial insights into potential issues within Q-method research that has yet to be adequately explored. In doing so, this study lays the groundwork for future research and discussions within the Q-method community.

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Chapter 4 – Conclusion

This thesis sought to address two primary goals, the first of which - discussed in chapter two, - explores the energy related debates in the southern Alberta communities of Pincher Creek and the Cochrane area. Through the use of Q-method and the concepts of social imaginaries and frames, I sought to identify and explore dominant and minority discourses within local energy debates surrounding hydraulic fracturing and wind energy development. Further, as minority discourses are viewed to be less understood, using follow-up interviews I sought to confirm the interpretation of the identified minority discourses and gain a greater understanding of their origins. Through the analysis of energy related debates in Pincher Creek and the Cochrane area, two dominant and two minority discourses emerged. The two dominant discourses were found to resemble the arguments made by proponents and opponents of hydraulic fracturing and wind energy development. However, similarities between these two discourses indicate that these discourses represent a divergence from the traditional polarized understanding of these perspectives. Such similarities include their common recognition of the connection between nature and energy development as well as the limits to which nature can recover from energy development impacts. The two minority discourses identified within this study broaden our understanding of the wide spectrum of views existing within the energy related debates in southern Alberta. Follow-up interviews demonstrated that the views held within the identified minority discourses are deeply rooted in nature and originate from experiences and lessons learned throughout the participants lives. These discourses are therefore consistent with Taylor's (2004) conception of social imaginaries as deeper normative notions. By examining the four identified discourses within the context of social imaginaries and frames, we see how the continued use or advocacy of certain imaginaries within prevalent frames can shape dominant discourses within energy debates. Additionally, the coexistence of competing views within discourses and the identification of minority discourses demonstrates that because of the wide spectrum of imaginaries available to individuals, imaginaries from the entire spectrum can be incorporated together to form unique discourses. This outcome suggests that the debates surrounding energy development in southern Alberta are not simply two sided; they are instead diverse and complex and therefore should be examined further to gain an accurate understanding of the diversity of perspectives that exist.

The findings of this research demonstrate that even within competing views there are also notable commonalities. By using these commonalities as a starting point, this research can be used to help advance the debates surrounding energy development in southern Alberta by establishing grounds for active and meaningful engagement. Additionally, by enhancing our understanding of energy discourses, study findings can assist in the development of energy policy that is more representative and responsive to the diversity of views and concerns that exist. Further, by presenting some of the discourses that exist within Alberta energy debates, it is hoped that the findings of this research stimulate additional studies within the province. With resource and energy development being highly prevalent within the province of Alberta, it is important to understand the views and concerns surrounding energy development if the province is to move towards a socially responsible energy future as new technologies and methods of resource extraction are introduced.

It is suggested that future research continue to explore and seek to understand the diversity of energy related views that exist. By doing so, researchers may reveal new trains of thought or areas of contention and concern that have yet to be identified or fully understood. It is also suggested that additional research be conducted to examine Albertans' knowledge and understanding of the social and environmental impact of energy development in the province. Several participants indicated that they felt that many Canadians are unaware of the impacts associated with energy development. Therefore, additional studies should be conducted to examine if such a knowledge or information deficit exists, and in what capacity. In doing so we will be able to gain a greater understanding of the barriers that limit people's access and/or willingness to accept different sources of information. By conducting such research at a regional or community level, researchers will be able to explore how such barriers and willingness to access change are influenced by social attributes such as resource dependence. Regionally focused research can also be utilized to gain a deeper understanding of how the imaginaries that shape local views are influenced by prominent advocacy groups or media. In doing so we may gain a greater understanding of how and why such messages are incorporated or rejected by local community members.

The second goal of this thesis, discussed in chapter three, sought to examine the effect of low quality q-sorts on study findings. In order to overcome limitations associated with conducting the

q-sort exercise in-person, researchers are turning to web-based q-sort software allowing them to recruit larger numbers and more geographically diverse participants. However, in doing so researchers forfeit some control and oversight over the q-sort process, increasing the potential for low quality data. In an effort to explore ways of identifying low quality q-sorts, I first explored the relationship between participant effort and participant engagement. Using completion time as a metric of participant effort and total word count and loading status as a proxy for participant engagement, it was found that completion time by itself is a unreliable indicator of participant engagement. Therefore without the use of other indicators or methods, it is suggested that completion time on its own should not be used to eliminate low quality q-sorts from datasets.

In identifying potential ways in which low quality q-sorts can affect study findings, by using randomly generated q-sorts to represent low quality data, it was concluded that findings can be influenced in three significant ways. These include, altering how defining sorts influence the definition of factors by changing loading values, diminishing the ability of researchers to identify minority factors, as well as reducing the accuracy of nuanced findings through the contamination of datasets.

Although such impacts have yet to be documented in the Q-method literature, researchers collecting large p-sets via web-based q-sorts have already taken steps to identify and remove low quality q-sorts. These steps require the researcher to become more deeply engaged with the dataset by reviewing multiple aspects of the information provided by participants. Remedies also include hybridizing aspects of web-based and in-person q-sort process to help bridge the gap between participant and researcher. Such an approach could involve conducting a post-q-sort interview via online chat or telephone call to gain a greater understanding of the participant's views and meanings place on influential stimuli. By creating greater connection between participants and researchers this may also establish higher levels of study buy-in and thus greater levels of engagement by participants.

It is suggested that future research be conducted to further explore the differences between web-based q-sort and traditional methods in an effort to understand how these differences impact data quality and results. For instance, with web-based q-sort methods participants may be restricted in their ability to express their views and opinions related to the various stimuli and subject matter, as post q-sort questionnaires often focus on a limited number of stimuli. Similarly, participants

may be limited in their ability or desire to elaborate on subject matter that may or may not be identified within the stimuli. Through future research, researchers can determine to what extent such limitations exist and to what degree their impacts are detrimental to Q-method findings. As web-based q-sort methods continue to advance, it is suggested that additional research be conducted in an effort to identify other indicators of data quality. In doing so, researchers will have greater access to tools that will help ensure that study findings are accurate representations of the views associated with a given subject matter.

The findings from this research help shed light on some of the concerns related to data quality that have recently surfaced within the Q-method community. Given that web-based q-sorts are becoming increasingly prevalent within Q-method research, findings from this study will help ensure that Q-method research remains a powerful tool in exploring subjective points of view. Q-method practitioners should continue to examine how Q-method findings will be influenced as the methodology continues to adapt to meet the needs of new and changing research environments.

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Appendix A – Information Sheet

Public Values and Energy Production in North America

This study seeks to explore the energy related views and beliefs held by citizens in the Province of Alberta and New York State. Within both of these regions, energy development is a topic of primary interest as citizens and government officials grapple with the issues that come with adapting to a changing energy landscape. As peoples' views and beliefs can vary between regions, it is hoped by involving people with different energy related experiences unique points of view can be identified.

To explore energy related views and beliefs, I would like to invite you to take part in what is known as a Q sort. To complete the Q sort, you will be asked to arrange 48 energy related statements on a bell shaped board from strongly disagree on the left, to strongly agree on the right. I ask that you only place one statement in each of the spaces on the board. When sorting please do not be concerned about how the statements are arranged within each column as all statements within each column will be assign equal values.

After you have completed arranging the statements on the board, I would ask that you take part in a short interview in order to discuss how you sorted the different statements. With your permission, I would like to record this conversation on an audio recorder in order to reduce the probability that I misinterpret your comments. Once the conversation has been transcribed word for word, all audio files will be deleted, and the transcript will be accessible by the research team listed on this sheet

This exercise will take approximately 60 minutes (1 hour) to complete. You are completely free at any time during the exercise to withdraw and have your information removed from the study. Additionally, if you decide to withdraw from the study, you will have 30 days (4 weeks) after completing the exercise to have all your information removed from the study. All information and data that is recorded will be kept completely confidential and anonymous. One way in which this will be achieved is by keeping all information on a password protected server at the university. Information collected during this study will be kept indefinitely and made available for follow-up research conducted by members of the research team.

Once the information you and other participants have provide has been analyzed, there is the potential that I will contact you to discuss the results of the study. The purpose of this meeting will be to provide a greater understanding of the results obtained from the information you have provided. You will only be contacted for a second interview if you give me permission to do so.

It is hoped by taking part in this study you will further your understanding of the issues surrounding energy development within your area and abroad. The information gained may also help increase our understanding of the views and beliefs surrounding energy related issues we face now and in the future as our energy landscapes continue to change.

If you have any further questions about this study, please feel free to contact myself (Matthew Dairon) or my supervisor (John Parkins).

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If you have any concerns or questions about this project or the conduct of the investigators, please also feel free to contact the following:

Research Ethics Office, University of Alberta: 308 Campus Tower, 8625-112 Street, Edmonton, AB, T6G1K8, Phone: 780-492-2615, Email: reoffice@ualberta.ca

Appendix B – Initial Post Q-sort Interview Guide

Date/Time:
Location (city/town):

Participant information

Name:	
Gender:	
Occupation:	
Age:	

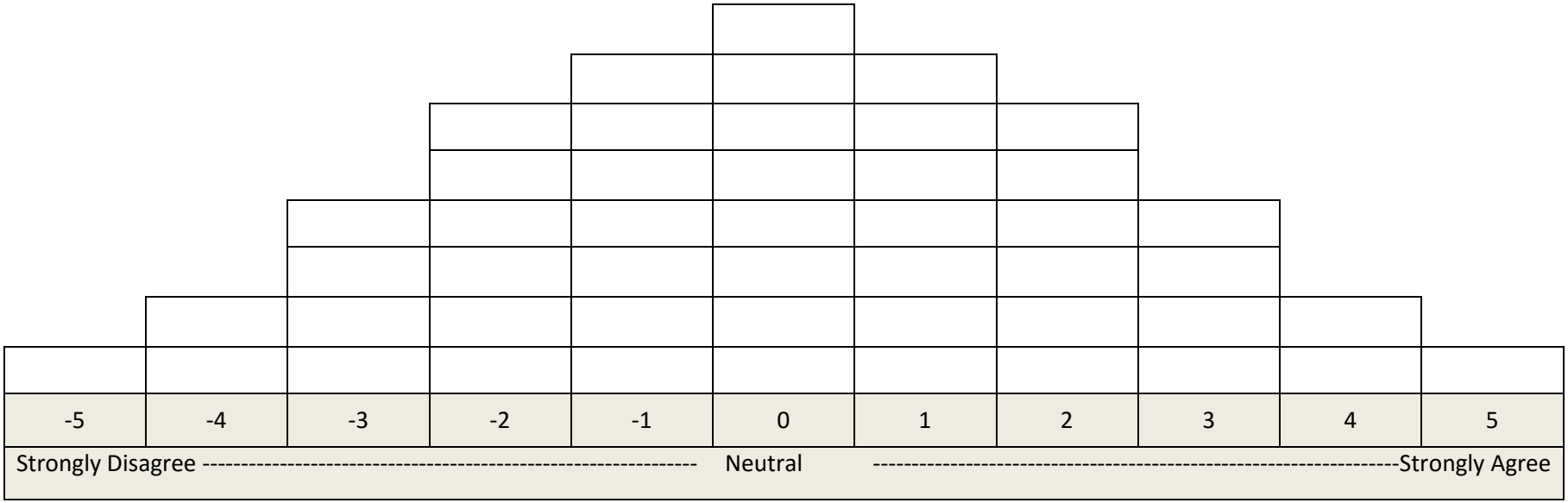
Interview Questions

- What do the statements at the polar ends of the board (-5,-4, +4, +5) mean to you? In your own words what are the meanings behind these statements?
- Why do you feel so strongly about the statements at the polar ends?
- While sorting did you feel that some statements were related or associated with one another? If so how?
- Are there any other statements that struck you as important? What do these statements mean to you?
- Are there any statements that confused you or you felt uncertain about?
- Are there statements with multiple means? Would the different means influence how you sorted these statements?
- Is there areas or subject matter related to energy development that you feel were not captured by the statements? If so what are they and what means do they have? Where on the board would you place a statement associated with such subject matter?
- Taking a broader look at how you view energy and energy development, how would you describe your overall (or general) view of energy development?
    - What kind of energy future would you prefer or hope for?
    - What kind of energy future do you expect?

Please make on the provided sheet how you would section of the statements you disagreed with, felt neutral about and those you agreed with.

Appendix C – Q-sort Data collection and Comment Sheet

Name:
Date:



Comments:

Appendix D – Information Sheet for Follow-up Interview

Public Values and Energy Production in North America

This study seeks to explore the energy related views and beliefs held by citizens in the Province of Alberta and New York State. Within both of these regions, energy development is a topic of primary interest as citizens and government officials grapple with the issues that come with adapting to a changing energy landscape. As peoples' views and beliefs can vary between regions, it is hoped by involving people with different energy related experiences unique points of view can be identified.

In analysis the information you and other participants have provided, unique points of view have emerged. As the results gained from your participation are of particular interest to this study, I invite you to take part in a follow-up interview. The intent of the interview is to refine and clarify the results obtained from the information you provided in the previous interview. Additionally, during this interview we will try to gain a greater understanding of where and how the identified point of view originated and/or evolved.

In order to gain a greater understanding of the unique point of view discovered in the results, I will ask questions that focus on topics such as your involvement in local energy issues, debates and conversations. Other potential questions utilized to further our understanding of your point of view, will focus on aspects of your life that have contributed to the way you view energy development (ex. occupation, education, community involvement, etc.).

With your permission, I would like to record this conversation on an audio recorder in order to reduce the probability that I misinterpret your comments. Once the conversation has been transcribed word for word, all audio files will be deleted, and the transcript will be accessible by the research team listed on this sheet. All information and data that is recorded will be kept completely anonymous. One way in which this will be achieved is by keeping all information on a password protected server at the university. Information collected during this study will be kept indefinitely and made available for follow-up research conducted by members of the research team.

This exercise will take approximately 60 minutes (1 hour) to complete. You are completely free at any time during the exercise to withdraw and have your information removed from the study. Additionally, if you decide to withdraw from the study, you will have 30 days (4 weeks) after completing the exercise to have all your information removed from the study.

It is hoped by taking part in this study you will further your understanding of the issues surrounding energy development within your area and abroad. The information gained may also help increase our understanding of the views and beliefs surrounding energy related issues we face now and in the future as our energy landscapes continue to change.

If you have any further questions about this study, please feel free to contact myself (Matthew Dairon) or my supervisor (John Parkins).

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I have read and understand the terms and conditions outlined in this form. I have been given the opportunity to ask questions and my questions have been answered.

_____	_____	_____
Signature of Participant	*Name of Participant (printed)*	*Date*

I agree, as the researcher, to uphold the terms and conditions outlined in this form.

_____	_____	_____
Signature of Researcher	*Name of Researcher (printed)*	*Date*

Appendix E – Interview Guide for Follow-up Interview

Name: _____

Date/time: _____

After presenting to the participant a copy of their previous Q-sort to help refresh their memory of the statements and how they sorted them in the past, explain to them the discourse that was identified. This can be achieved by identifying the key statements that contributed to development of this discourse. If deemed necessary, you may also show them copies of the data output to indicate how these statements were identified (do not spend much time on this as it is not imperative they understand how factor analysis works). Once they have gained an understanding of the discourse you are basing this conversation on, you may move on to the questions.

*Please note you may need to define discourse to the participant. In basic terms, it represents a "point of view" that is shared by more than one person in the study. I might be easier to refer to a discourse as a point of view throughout the conversation.

Potential introduction to questions: Now that you have gained an understanding of how I have interpreted the information you had provide me, I would like to gain your opinion on the point of view (discourse) I have identified.

- Do you agree that the point of view I have described outlines your views surrounding energy development?
    - If not, why? How would you say your views differ or diverge from this point of view that I just described?
    - If this information correctly describes your views, can you think of anything else you would add to this description? Or would you describe it in any other way?
- Do you think the point of view I have just described to you outlines your view on energy development as a whole, or does it only describe a section or portion of your views towards energy development?
    - Does it only apply in certain circumstances, if so what are they?

Once you and the participant have discussed and refined the discourse of interest in such a way that they are satisfied, begin to ask questions regarding the sources of these points of view and the meanings behind them. **Focusing on the statements that define the discourse.**

- What kind of values do you think drove you to view energy develop in this way?
    - Where do you think these values originated?
        - What aspects of your life (ex. school, jobs, family, community, environment, and religion – social structures) helped you come to these conclusions?
        - What aspects of your involvement in local energy issues, debates, conversations?
- How long have you held such views and values? Have your views changed over time? (this can help identify where the point of view originated)
    - If they are new, can you recall how you viewed energy development before and why that was?