The European Commission 2050 Energy Road Map - Implementation effects for Finnish energy firms

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1. Acknowledgements:

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2. Abstract:

This research examines Finnish firms challenges and successes in implementing the European Commissions 2050 energy road map, and may assist policy makers in gaining a deeper understanding of implementation disruption, limitations and successes. The Nordic cooperation and Finnish national policy were also included in the analysis. The study used content analysis to examine annual reports from 41 Finnish energy industry operators over the years 2012 to 2015. 161 annual reports were analysed for impacts on awareness, attitudes and actions in relation to the policy goals of the 2050 European Commission road map. Results showed consistent themes in areas of investment uncertainty, lack of strategic pathways, policy sustainability, national and supranational synergies and firm capability gaps. Themes highlighted the importance of strategic pathways for current and future energy industry growth and investment. Specifically, Finland lacked solar technology but leveraged bioenergy and hydro. Policy makers must engage in interactions with firms and other policy makers, due to the cruciality of clarity, intention and sustainability. Lack of policy cohesion between member states affected investment decisions and created price disparities. Gaps in technological capabilities emerged in carbon capture and storage commercial viability, and energy storage limitations concerning energy management and infrastructure demands.

3. Introduction:

Sustainability as a concept, has promoted new ways of thinking about ethical and environmental considerations of human actions (Carpenter & Gunderson, 2001). The UN Millennium Ecosystem Assessment report (2005), found humans are over consuming the planet, and this can only change if we change the way we use and manage resources (Brown, Mackensen, Rosendo, 2006). These environmental and ethical considerations have been confirmed by large general scientific agreement around climate change and the implications this can have for humankind and the planet (Doelle & Sinclair, 2006; IEA, 2016; Doyle, 2016; Dormer, 2018). The effects and impacts of climate change have increased the economic motivations and opportunities for climate change management across the globe (WRI, 2005; Houser, 2015;Huet, 2018). The modern energy landscape in recent decades has seen systemic changes in automation, digitalisation, internationalisation and disruptive technology. The ethical and economic developments have promoted and incentivised action, and have arguably been orchestrated to an extent by supranational and international legislation and policy (Kirsten, 2014; Pichler & Sorger, 2018). Therefore, benefits to practice and literature can be gained by understanding policy implementation and how change, ambiguity and conflicts are formed and resolved by polices (Chang et al. 2017).

In 2011 the European Commission established the 2050 Energy Road Map (2050ERM) outlining directions for all European Union countries. The 2050ERM specifically outlines energy goals for decarbonising energy systems, increasing sustainable energy market share, integrating local resources and centralising energy systems (European Commission, 2011). The 2050ERM, outlines a path and goals for specific milestones and capabilities to be developed across the European Union. This research, sought to examine factors in relation to the 2050ERM as a guiding policy document, and how Finnish energy firms must, over time, implement the 2050ERM.

The very nature of the 2050ERM defines its purpose, as a guiding long-term-goal oriented document. The 2050ERM purpose, is critical to understanding the scope and intention of the research, as this research did not seek to critique or evaluate the goals of the 2050ERM. Rather, the focus of the research is on the firms themselves - their implementation approaches, challenges and interpretations of the

2050ERM and, thereby, forming an understanding of how and why firms have recognised and taken action on 2050ERM goals. A broader picture of firm action and multiple policies layers must be considered, as this research recognised significant policy layers being: the European Commission, Nordic Cooperation and the Finnish government.

The actions of governments, such as that of Finland, provide potential insights into the 2050ERM policy and its implementation. Finland is, by default, obligated and committed to the 2050ERM as a European Union member state. Due to the rules and nature of the European Commission, Finland has established their own policy actions and goals that align with the 2050ERM. This is exemplified with the goal towards energy interdependence for Finland and other European Union states. This independence must also support other member states that are directly affected by Finland's energy practices and needs. In considering this situation, it is important to recognise Nordic countries and their policy relationships. Therefore, the Nordic Cooperation provides a supranational policy layer.

By analysing annual reports, this research sought to develop an understanding of conflict, ambiguity and change in relation to Finnish energy firms and the 2050ERM. The constructs of conflict, ambiguity and change are fundamental elements in policy implementation research for both governmental and firm level research. These elements provide, critical insights into firm justifications, reactions and limitations. Each element outlines a broader understanding and firm dispositions towards the 2050ERM. By collecting multiple firm actions a wider general disposition towards the 2050ERM can be seen, allowing an industry-wide perspective to be formed.

Economic and ecological sustainability assessments of energy policy are common (Pollitt & Mercure, 2018; Gillingham & Palmer, 2017; Molle, 2017; Hoffman & Jorgenson, 1977). However, there is little social research carried out on sustainable energy policy (Shortalla & Kharrazi, 2017). To understand specific government and country implementation, progressive countries such as Finland, provide insights into successful policy implementation. Finland has a considerably higher sustainable energy generation per capita than other states in the European Union (Lyytimäki & Lähteenoja, 2016). Finland also has, a reputable and positive

tendency towards European Commission policy in relation to compliance and implementation (Aslani, Helo & Naaranoja 2014).

This research, aims at developing a firm perspective of policy implementation impacts relating to the 2050ERM, focusing on firm changes, conflicts and ambiguity. The study utilised the contextual approach of content analysis, such data provided insights into firms implementation relative to awareness, attitudes and actions in relation to the 2050ERM. In so doing, examples of firms that have successfully implemented sustainable energy policy can be identified, and the context for policy makers and firms to understand success was identified.

The 2050ERM goals are not expected to be met overnight. Research on the 2050ERM implementation presents an interesting opportunity. By understanding why there is success in implementation, insights and learning can be applied by both policy makers and firms. Firms can adapt organisational approaches that limit conflict, resources and maximise implementation to their own contexts, through understanding what has worked within the energy sector. Whilst, for policy makers, actor perspective build on how policies are developed for implementation relative to the current situation.

4. Literature Review:

4.1 Introduction

Countries use a range of different energy policies, due to differences in infrastructure, cultures, political dynamics, economics and geography. This literature review aims to understand the role of energy policy implementation, specifically the implementation pathways firms can take, whilst focusing on the Finnish, Nordic and European Union context of implementation. The literature review focuses on understanding Finnish sustainable energy policies (SEP). Finland's SEP provide a geographical, cultural and specific example to assess the uptake of sustainable energy, while putting global problems, influences and challenges of the European Commission 2050 Energy Roadmap into context.

The Finnish market size consists of approximately 190 moderate to large operators that contribute to the Nordic Pool Spot, a common market place for the sale of energy across all Nordic countries (Energy Authority, 2014). Hence, the research conducted, aims to be comparable to other Nordic situations, due to the relative cross border operations, trade and collaboration (Haakana et al., 2017). Finland has a positive history of European Commission policy adoption and integration (European Commission, 2014; European Commission, 2016). Finland is second in Europe for total sustainable energy with 39.5% of gross final energy consumption, while Sweden is first at 54.1% gross final energy consumption (European Commission, 2017) . Table one provides the full member-state list.

Table 1 EU Member-state renewable Energy Share List:

Country	Renewable Energy Share (2015)	Country	Renewable Energy Share (2015)
Austria	33.60%	Ireland	9.00%
Belgium	7.30%	Italy	17.10%
Bulgaria	18.40%	Lithuania	24.30%
Cyprus	9.10%	Luxembourg	5.00%
Czech republic	13.60%	Latvia	39.20%
Germany	14.50%	Malta	5.30%
Demark	30.60%	Netherlands	6.00%
Estonia	27.90%	Poland	11.80%
Greece	15.50%	Portugal	27.80%
Spain	15.60%	Romania	24.70%
France	14.50%	Sweden	54.10%
Finland	39.50%	Slovenia	21.80%
Croatia	27.50%	Slovakia	11.90%
Hungary	9.40%	United Kingdom	8.20%
		European Union 28 member average	16.40%

(European Commission, 2017)

This literature review focuses on themes of: Defining renewable energy; Energy policy formation; SEP evaluation; SEP industry impacts; SEP policy implementation; and the Finnish SEP context. These themes established the framework and theoretical underpinning to understand and evaluate the specific piece of European Union policy, being the European Commission's 2050 Energy Road Map at a firm level and its broader impact on firms within Finland.

4.2 Defining Sustainable Energy

In 2011, the European Commission established the 2050 Energy Road Map (2050ERM) outlining directions for all European Union countries (European Commission, 2011). The policy affects all European Union member states and specifically outlines energy plans for decarbonising energy systems, increasing renewable energy market share, integrating local resources and centralising energy systems (European Commission, 2011).

It is important to clarify the aim of SEP, which consists of three overarching themes: Firstly, it requires globally problem thinking; Secondly, thinking how to take rapid co-ordinated actions; and, Thirdly how actions can be concurrent, and across the board at national and firm level (Hamdouch & Depret, 2010).

To start the discussion on SEP, an understanding of what sustainable energies are, and are not, must be outlined. Sustainable energy can be termed in many ways such as: Renewable energy sources (Menanteau, Finon & Lamy, 2003); renewable energy systems (Migion & Barek 2016); renewable energy (Kahia et al., 2017); renewable energy resources (Aslani, Helo & Naaranoja 2014) and sustainable energy (Del Rio & Unruh 2007). For the purpose of this literature review, all of the above are referred to as "sustainable energy" as they similarly define sustainable energy as "energy technologies [which] include solar power, wind power, hydroelectricity, micro-hydro, biomass and biofuels" with the element of intergenerational usage being the aim of sustainability, a key factor for 2050ERM in long-term change for current and future generations (Chel & Kaushik, 2017, p.8).

This literature review has consciously removed nuclear energy from consideration, even though it is used in Finland, for two main reasons. Firstly, the sufficiency of uranium supplies is questionable for nuclear power generation to qualify as a renewable energy. Secondly, the ability to safely and permanently dispose of nuclear waste is a prerequisite for sustainability and again this is disputed (Wang et al., 2009).

4.3 SEP Formation

The evolution of SEP within Europe over the past decade can be seen as both an inhibitor and contributor to the uptake of sustainable energy (Eberlein, 2012). Some researches argue, this is due to the energy industry transitioning from a stable industry to a fast changing and disruptive market place (Kahia et al., 2017). Whilst, further arguments have been centred around defining the role of policy, as researchers and governments have tossed and turned between policies for barriers and policies for promotion or both (Menanteau, Finon & Lamy, 2003; Lund 2009; Valkila & Saari, 2010; Migion & Barek, 2016; Lyytimäki & Lähteenoja, 2016).

This is further demonstrated in the diversity of SEP roles being implemented in multiple ways. this consists of Feed -in-Tarrifs, Bidding systems; Green certificates; and Tax releases. Feed-in-Tariffs, gives a minimum price for renewable energy to be purchased, providing financial incentives for both large organisational investment and general population adoption. This form of policy has been applied successfully in the European Union over the decades as an effective energy policy (Couture & Gagnon, 2010). Feed-in-Tariffs are used in Finland, with specific promotions towards, wind, bio-gas power plants, wood fuelled power plants and timber chip power plants (Energy Authority, 2017). Bidding systems give exclusive provider contracts for energy generation are a common policy to promote large energy providers to produce sustainable energy (Haas et al., 2004). Green certificates, are a tradable quota of energy that is produced sustainably that firms compete for as a specific quota of energy, is required to be produced sustainably (Ringel, 2006). A similar policy has been introduced in Finland, being the Energy Origin Certificate. This states the energy generated has met sustainable energy requirements and proof has been confirmed by the evaluation party Fingrid (2016). Tax releases are another policy form, being subsidies to reduce taxes, such as VAT (Value Added Tax) or a guaranteed reimbursement for investment in sustainable energy production and or energy purchased (Cansino et al., 2010).

These different polices reflect the vast differences that governments can and do use to promote sustainable energy. To understand this diversity, researchers have applied ways to specifically focus on the transitional, promotional and disincentives of SEP. This can be seen in Migion and Barek's (2016) research, analysing the crucial factors to reach a transition to sustainable energy system. Researchers have also sought to understand how renewables policies can be formulated to promote technological development, to create competition with greenhouse gas emitting technologies (Menanteau, Finon & Lamy, 2003). Additionally, other researchers have looked into the perspective layers that influence policy formation in environmental and innovation policies for SEP formation. Critically, the layers perspective argues that SEP should follow three steps: First, policy formation should be adapted to innovations and context for emergence and development; second, policy formation integration must be long-term; and third, policy formation requires responsiveness, pragmatism, patience and flexibility (Depret & Hamdouch 2010).

These elements provide a critical questioning category for firms responses, or lack of, and their comparison.

SEP are applied in a range of different situations across the globe. This literature review focuses on the European Union contexts and implications for SEP formation within the context of Finland. The geographical, societal and cultural diversity of the European Union creates a unique policy mix. This mix is predominantly managed by the European Commission and its capacity and role in establishing overarching policies that are complementary and aligned across all of European Union member states (Sabathil, Joos, Kessler, 2008). As a prerequisite to understanding the 2050ERM, it is important to understand the purpose and goals of the governing body that requested, formulated and supported the 2050ERM policy. The purpose and goal of the European Commission regarding sustainable energy can be defined as "promoting competition in European energy markets to the benefit of consumers and the entire European economy, European energy policy is consciously focused on promoting renewable energies (air, water, sun, and biofuels)" (Sabathil, Joos, Kessler, 2008, p. 155). The European Commission believes that increasing sustainable energy will reduce Europe's dependency on fossil fuels, greenhouse gas emissions, and the dependency on energy suppliers located in unstable regions (Sabathil et al., 2008). This is clearly supported within the stated intentions of the 2050ERM, as it specifically supports and aims for decarbonising energy systems, increasing renewable energy market share, integrating local resources and decentralising energy systems (European Commission, 2011).

Literature on European Commission policy making provides insights into the processes, systems and accountability of policy formation. The European Commission having the exclusive right to formulate policy proposals for the European Union. These proposals are then used to shape European Union policy (Richardson & Mazey, 2015). However, the implementation is the responsibility of member states and the national and regional government bodies. To support this implementation, the European Commission can, when necessary, provide co-authorship towards specific policies. This co-authorship of policies is the limit of implementation for the European Commission. However, it is important to note that the Commission does track progress, limitations and level of compliance of each

member state and firms when necessary (Wallace, Pollack & Young, 2015). This can be seen in bi-annual reports given by each member state towards progress and current state of energy systems for all member states. The level of compliance is upheld with the use of the European Court of Justice, to sanction individual organisations and entire member countries if policies are broken and ignored (Richardson & Mazey, 2015). The tracking of progress and direct compliance for firms is a critical link for this research, as firms have direct obligations to adopt European Commission policy, and if necessary this is enforced by the European Court of Justice.

Furthermore, the relationships of the Nordic Cooperation must also be recognised, as this presents another formal layer of policy formation for Finland. The Nordic Cooperation is the coalition of Nordic countries (Denmark, Finland, Iceland, Norway and Sweden), this consists of a cooperation of Ministers for Business, Energy and Regional Policy. The Nordic Cooperation focuses on business, energy and regional policies to allow combined economic growth, for cross alignment in energy polices to foster aspects such as: Guaranteeing supplies; Harmonising the Nordic electricity market; Promoting the development of sustainable energy sources; and Putting the Nordic Region at the forefront of international developments. (Kiss, Grueso & Vorsatz, 2013). Figure one outlines the relationships between European policy and the Finnish context. Firm feedback between levels does occur, although effects of this are disputed and dependent on the nature of policy proposals and policy maker processes (Gatzert & Kosub, 2017; Eberlein, 2012).

Figure 1: Political Structures within Finland for European Union Policy

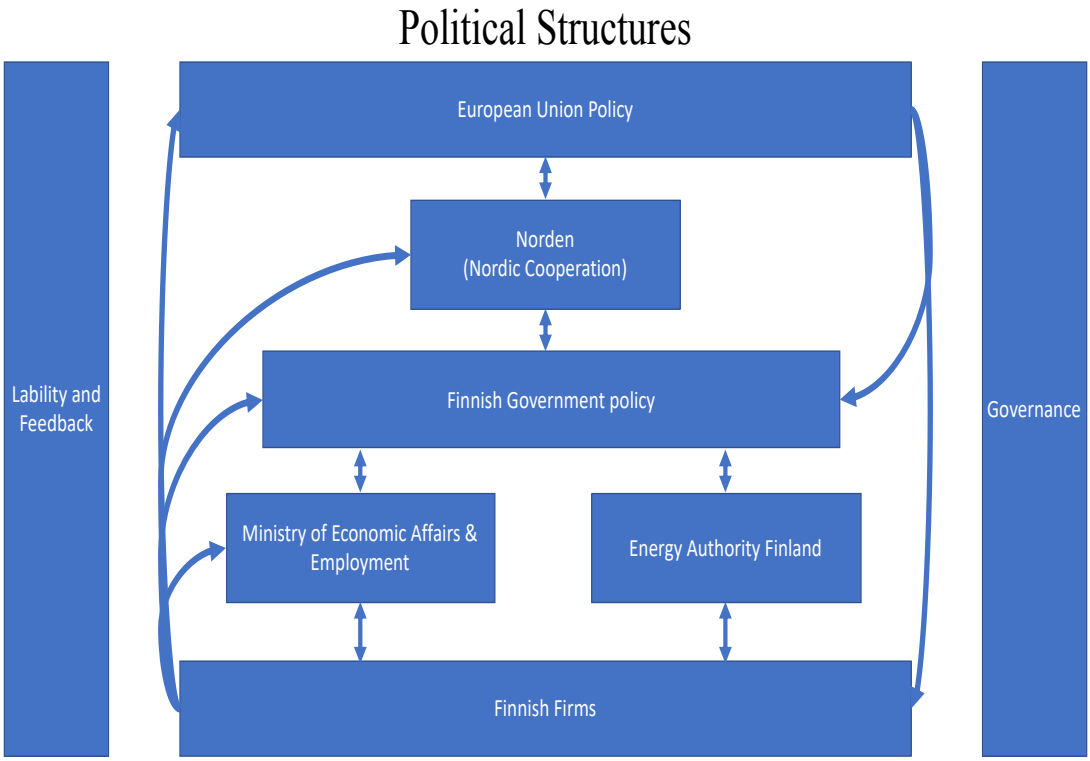


Figure one illustrates the specific Finnish policy formation layers being, the Finnish Ministry of Economic Affairs and Employment and the Energy Authority of Finland. The Ministry plays a significant role in the formulation of polices within Finland to ensure policy alignment with the Nordic Cooperation and the European Union policies. The core role can be defined as the development of energy markets and the security of supply, promoting renewable energy and energy efficiency, and the regulation of nuclear energy. Additionally, the Ministry's responsibilities also include implementing emissions trading and coordinating the national preparation and implementation of climate policy (Finnish Ministry of Economic Affairs and Employment, 2017). The Energy Authority of Finland also plays a role in the regulation and evaluation of energy within Finland, the authority is responsible for the implementation and administration of systems, that promote the production and use of renewable energy (Energy Authority of Finland, 2017). Hence it aims to: promote electricity from renewable sources; manage the implementation and monitoring of legislation for biofuels and bio-liquids; to regulate origin for electricity sales and marketing collected by Fingrid; and calculate the residual mix of electricity within Finland (Energy Authority, 2017).

4.4 SEP Evaluation

By evaluating the literature documenting SEP and their impacts, firms and governments can understand SEP successes, failures, limitations and opportunities. Lund's (2009) research evaluated SEP using five common policy areas: Security of supply; Environmental impacts; Costs; Direct employment; and Exports (Lund 2009). Lund contextualises the use of policy and its contribution to the uptake of sustainable energy. Hamdouch and Depret's (2010) research discusses policy integration as a necessary condition for encouragement and viable development of new environmental technologies and competitive green sectors. Additionally, researchers have sought to understand sustainable energy policies effects on reaching technological capability and 'critical mass', to model renewable energies and the situations for which they could become competitive internationally and domestically (Boyle, 2008). Yet, other researchers present ways to evaluate government subsidies towards enabling market penetration (Lund 2009).

Evaluation frameworks can be further developed by assessing industry development effects of SEP, as studies have shown that support for effective SEP, formation must have connection between industrial impacts and energy policies (Weiss et al., 2003; Lewis & Wiser, 2007; Lund, 2009). This can also be interpreted as the relationships that occur with 'push' and 'pull' factors for industry and SEP. Researchers have done this by recognising the SEP commercialization 'push' elements as R&D that improves innovation. On the other hand, the market 'pull' can be seen as the relationship of measuring deployment support to awareness within local, national and international contexts (Hamdouch & Depret 2010). Therefore, it can be argued that understanding the pull and push factors for SEP assists in the analysis of the effects of consumer awareness and industry development (Huber et al., 2004).

Macro and micro economic effects of SEP also suggest approaches to evaluate SEP. This can be seen in Menanteau, Finon and Lamy (2003) research on investigating the effects of feed-in-tariffs, bidding systems, and green certificate trading within the European Union while other studies discuss regulations and their effectiveness towards promoting sustainable energy (Held, Haas & Ragwitz, 2006; Ragwitz et al., 2007). These elements present ways to evaluate the macro and micro

economic understanding of SEP in relation to economic growth (Kahia et al., 2017). The application micro-economic research has deepened our understanding of detailed financial risk analysis and capability evaluation of specific and in general sustainable energies. Allowing policy makers and firms to make strategic and investment decisions relating to sustainable energy (Starr, Cowing & McFadden, 1986; Kahia et al., 2017). Macro-economic studies have allowed more holistic and inclusive research on how firms and policy makers can invest and make strategic decisions regarding sustainable energy (Chien & Hu 2007; Kahia et al 2017).

Literature on policy effectiveness, equity, and rebound effects also provide SEP evaluation frameworks. Research by Skogstad (2003) found that output and input legitimacy are necessary when understanding policy effectiveness within the European Union. Growing research is now supporting indicator frameworks for sustainability policies, as they are better reflecting the visions and themes set by government agendas (Lyytimäki & Rosenström, 2008). Similarly, equity frameworks provide societal evaluations of policies. Research has found that to understand the equity effects of policy frameworks, it must be multidimensional (Golubchikov & Deda, 2012). Golubchikov and Deda (2012) found that to fully understand the equity relevance and extent within Europe, specific elements must be considered including, governance and finance, technological advancement, access and affordability. Other research also shows the importance of equity relationships to price and policy, as "Excess profits violate the equity criterion and hurt the legitimacy of renewables as well as the competitiveness of EU" (Jacobsson et al., 2009, p. 2145)

Rebound effects must also be considered when understanding policy evaluation. Dimitropoulos's (2007) research on mechanisms and consequences of the rebound effect at the macro-economic level, argues the "possibility that increased energy productivity can lead to higher energy demand and hence carbon emissions… that rebound is always greater than unity or backfire" (Dimitropoulos, 2007, p. 6361). This is based on the reality that there is elasticity in the demand for energy in Europe (Dimitropoulos, 2007). Furthermore, Oikonomou and Jepma (2008) argue that the rebound effect can be seen as energy policies and the causal logic of European trends to increases energy efficiency, and lower the marginal costs of using energy services.

However, there are some gaps within the evaluation literature, these gaps can be seen in a lack of literature on employment effects and informal and formal firm level reactions towards SEP (Migion & Barek, 2016; Kahia et al., 2017). Through understanding the informal and formal aspects of SEP a broader picture of implementation impacts can be drawn. Therefore, this research will focus on the implementation elements of the 2050ERM, as policy implementation research is actor driven and seeks to contextualize decisions for change.

4.6 SEP Implementation

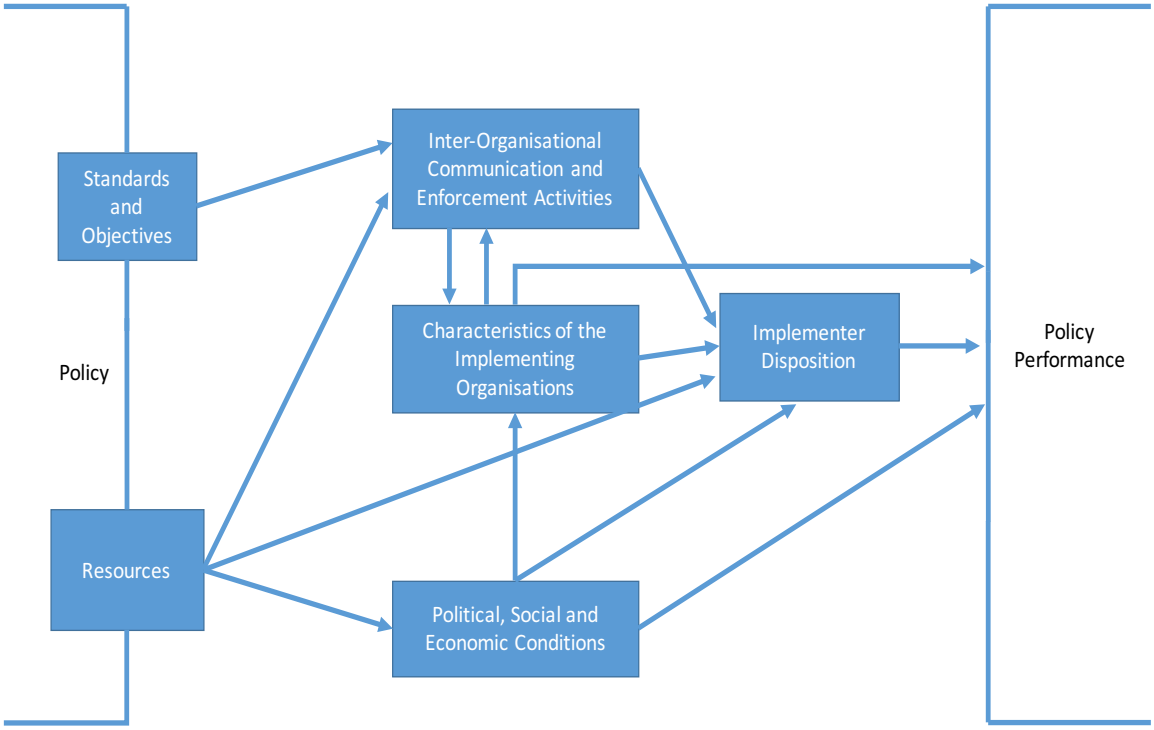
Literature on SEP implementation was the key to forming the methodological framework and foundation of this research. How policy is best implemented is an area that has been under contention for decades, as outlined by Meter and Horn in 1970. The contention is partly due to boundary constraints of implementation research, creating vast issues for empirical and social science when selecting relevant information (Meter & Horn, 1975). Simply put, implementation research asks, "why did it happen this way" (Dolbeare, 1974 p. 135). Policy implementation, can be characterised into two areas defined by Meter and Horn (1975), being the amount of change and the consensus level amongst its effectors. The change is a key factor for this research, as the policy layers of European Commission, Nordic Cooperation and Finland's national policy all indicate intention for change and have direct effects for firms. Hence, this research is focused on the level of change related to each policy level, and the logic of seeking to understand firm perspectives as to how and why action occurred.

The literature showed a common consensus, that successful policies are trending towards incremental change (CECILIA, 2015). Policies must progressively build off existing relationships or form relationships that can be built upon, to achieve long term objectives. Eberlein's (2012) research on the historical implementation of European Commission energy policy has shown that the European Commission has consistently used incremental energy policies, making energy policy one of its greatest strengths. Conversely, Marltand (1995) research discusses how large policy shifts have typically been fraught with issues, having high chances for failure. Therefore, the incremental approach has been adopted by

the European Commission. This corresponds to the 2050ERM, as it is a long-term objective policy that recognises the need for incremental change and development over time.

Figure two was developed by Meter and Horn (1975), as a targeted framework for categorising information and its effects on actors when researching and collecting information on policy implementation. This presented a foundational methodological structure, as it was applied to the contexts of the 2050ERM and subsequent layers of Nordic Cooperation, and Finnish national policy. Meter and Horns 1975 modelling of policy players and policy interactions has been consistently sited throughout literature and is still used in published papers today (Bryson, 2018; Lane, 2000).

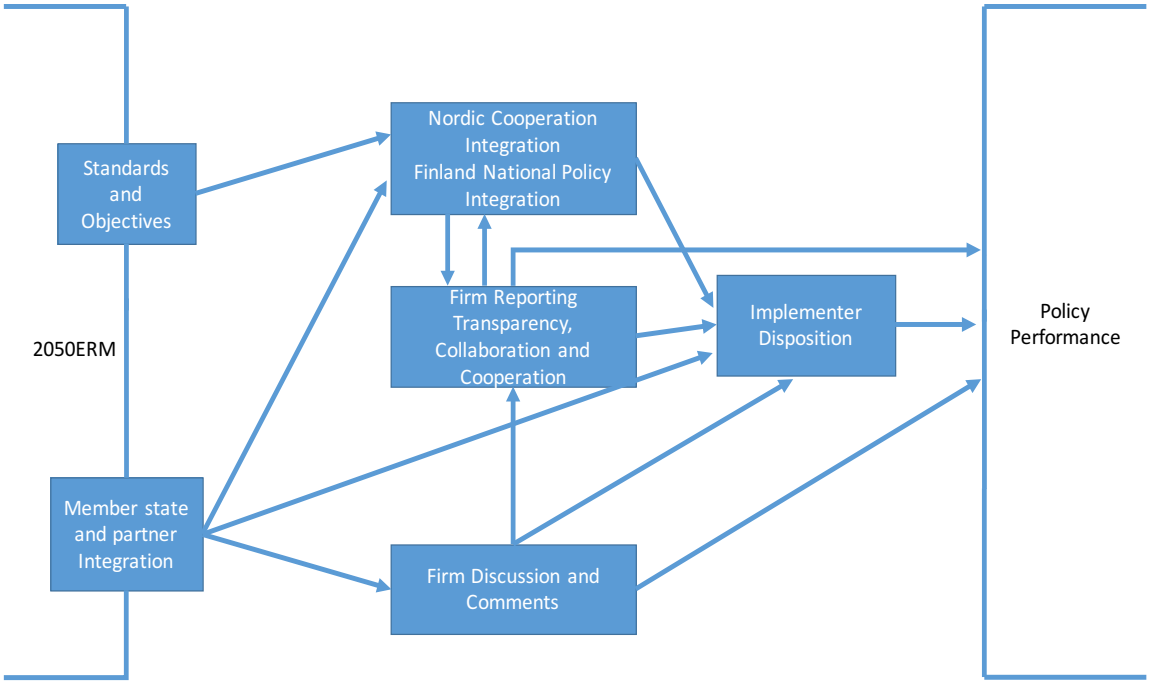
Figure 2: Meter and Horn (1975) policy implementation framework.



Therefore, Figure three presents an adaption to the context of the 2050ERM and Finland. Meter and Horns' (1975) model adapted to focus on the 2050ERM, shows a pathway to understand performance characteristics. This related the extent to which objective and standards are realised and commented on. The inter-organisational communication aspects are related to the policy transformation into Nordic Cooperation and Finnish National Policy as they are significant players when

considering inter-organisational communication and enforcement actors within the Nordics and Finland specifically. The cross-referencing applications of the presented model also allowed policies to be highlighted clearly when firms face ambiguity, conflict and change relative to the policy goals and the broader intentions behind. In doing so, a testable assumption was created within the annual reports to analyse for reporting and transparency towards the 2050 ERM, Nordic Cooperation and Finnish National policy, as "the prospects of effective implementation will be enhanced by the clarity with which standards and objectives are stated and by the accuracy and consistency with which they are communicated" (Meter & Horn, 1975, p. 466).

Figure 3: Policy implementation framework framed with 2050ERM actors.



The characteristics of the implementing agency was shown to be available in specific annual report of companies. Annual reports, provided formal documents showing the degree of open communication and reference formal and informal linkages to policies relative to a firm (Meter & Horn, 1975). Through the analysis of annual reports against policy statements, discussion points were discovered. Each point provided insights into specific policy goals and the significance of ambiguity, change and conflict to emerge and patterns to develop.

The adapted model also showed the social, economic, and political conditions adapted to the context of annual report statements made by firms, as the statements provided justification for actions achieved or planned, creating an insight why firm decisions were made. The recognition of the policy players is a fundamental consideration of this research as policy players showed connections between higher authority and implementation (Meter & Horn, 1975). It is then important to note, that this research clearly takes the stance of top down policy implementation methods (Matland, 1995). The top down perspective, looks at supranational analysis against lower levels of government and industry (Eberlein, 2012). The top down perspective shows specific policy's impacts and outcomes, and contrasts perspective on success, failures and or limitations commented by firms within annual reports.

It is important to recognise conflict and ambiguity in policy implementation theory (Matland, 1995). Conflict can be defined as the relative disagreements in goal congruency to policy intention and stakeholders involved. The more high level conflicts exist, the more bureaucratic politics are applied and the further from rational policy processes all stakeholders become. However, conflict in some circumstances can be an unavoidable, as fundamental values may be under contention (Stewart, 2006). Hence, the 2050ERM will likely have value conflict with potential firms, due to its intention towards industry change for sustainable energy against fossil fuels.

Moreover, the role of ambiguity is another fundamental in policy implementation research, this is defined as "ambiguity of goals and ambiguity of means" (Martland, 1995, p. 157). Goal ambiguity is relative to clarity of policy intention; as high independency of interpretation can reduce policy conflict, however, specified intentions create concrete directives leaving effected stakeholders little room for situational changes causing conflict (Martland, 1995). Goal ambiguity is high as the objective goals outlined in the 2050ERM fosters actors to adapt goals relative to their own contexts and ambitions (European Commission, 2012). Whilst, goal pathways are when necessary technological capability is yet to be reached or even technically possible (Martland, 1995). 2050ERM goal pathways are required

for CCS (Carbon Capture Storage), due to current economic and technological limits (European Commission, 2012).

Therefore, when analysing implementation annual reports, specific elements were considered. Text context is key in framing a firm's specific intentions, relative to: Firm cognition comprehension and their understanding of the policy; The direction of response towards acceptance, neutrality, rejection; and The intensity of that response which has been indicated in reports and confirmed and clarified in discussions (Meter & Horn, 1975, Martland, 1995, Eberlein, 2012).

Furthermore, policy implementation research at the European Union level has specific structures and intentions that must be recognised. This can be understood by outlining principle agents, agency drift and EU policy conflict. Knill (2015) noted for top down European Union policy implementation research, researchers must have comparisons of what has occurred to what was intended. For this to happen, key actors must be defined. Hence, the principle agents involved are the European Commission, Nordic Cooperation and Finnish National policy. The ability to analyse each level's outcome and intention is possible due to bi-annual progress reports given to the European Commission by each member state (European commission, 2014; European Commission, 2016). It can be noted, that the policy alignment occurs, as the bi-annual reports show consistent adoption and target achievement for sustainable energy and policy expected by the European Commission.

In the case of this particular research, agency drift can be defined as the paradigm of acceptance of European Union policy relative to Nordic and Finnish policy levels. This policy drift is affected by the complexity and ambiguity of the 2050ERM (Knill, 2015). Conflict is also expected, as research shows significant implementation problems when European Commission policy is related to the environment and integration of internal markets (Eberlein, 2012; Knill, 2015). Eberlein (2012) also noted that substantial conflict occurs when policy effects pre-existing monopolies.

Research conducted by Mio and Venturelli (2012) on European Union policy changes for Sustainable Development and Environmental Policy reporting provides methodologically similar research on policy implementation. As it applies annual

reports against EU reporting law and its effects on reporting rates and reported offences. The research was based off the accounts modernisation directive from the European Commission, which changed the expectation for private and public companies to report on sustainable development and environmental impacts in non-financial terms. However, participant selection was flawed, as the specific terminology of the directive stated that only majority owned government organisations are legally required to report. The study selected 100 companies listed on the stock exchanges (UK and Italy). Hence, some participant companies had no direct effect. Nevertheless, Mio and Venturelli (2012) does provide a methodology similar to the proposed research relative to annual reports and policy level effects.

Another example of implementation research across policy levels was conducted by Antoaneta, Dimitrova and Bernard (2017) showing relationships between policy levels during implementation. The study analysed the relationship between actor levels at a supranational level and national level relative to EU cultural heritage policy. The model provides critical definitions of policy adoption from supranational to national. Antoaneta et al's (2017) model presents a method to compare policy levels and the relationships between transparency and reporting statements. The categories of transparency were: Incidental domestic compliance, Formal domestic compliance; Domestic adaptation, and incidental and constrained domestic adaptation; and Imposed formal compliance. Hence, this model can be adapted to firm reporting and transparency towards the 2050ERM and subsequent policy levels beneath.

4.5 SEP Firm Impact

By defining the role of policy formation, evaluation and implementation the fundamentals of SEP industry impacts can be described. Firstly, it is important to recognise that firm environments are vastly different to that of government. Migion and Barek (2016) argue that this difference is due to role differences and stakeholder obligations of governments and firms. It can be argued that the role of an energy firm is to offer products and services that meet government regulations, policies and consumer/client consumption needs and obligations of shareholders.

Hence, it is important to develop an understanding of the market place, relative to direct power generation, consumption and transmission for Finland and firms. Firstly, the market has many layers. Internationally, Finland is part of the Nordic Pool Spot, which is an open electricity trade market, consisting of Norway, Denmark, Sweden, Finland, Estonia, Latvia, Lithuania, Germany and the UK (Flatabo et al., 2013). The Nordic pool spot provides an open market place for the sale on energy across multiple countries. Within this marketplace there are 22 Finnish energy generators that sell energy (Haakana, 2017).

However, when looking deeper at the Finnish context, further significant players can be found. Fingrid, a majority state owned enterprise, is the single supplier and owner of the national main grid (Zakeri & Syri, 2014). Additionally, a national review conducted by the Finnish Energy Authority noted there are 72 retail suppliers of energy within Finland and of that, 66 operate nationally, and within the national marketplace, there are approximately 120 energy generating companies (Energy Authority, 2014). There are 333 listed company members in Finnish Energy (FE) a branch organisation for the industrial and labour market policy of the energy sector. It represents companies that produce, procure, distribute and sell electricity, district heat and district cooling and related services. This group of firms was analysed to segment information into potential candidates for this research. Firms were categorised into those that produce annual reports in any language, those that produce annual reports in English, service offering (Electriticity generation, procurement, distribution, selling, heating, cooling and other being consulting and technology services).

Informal and formal firm effects also are another important element to consider. Migion and Barek (2016) discuss how the impacts of SEP effect firms in two formal ways. Firstly, the operational level and secondly, the strategic investment level. Several studies have looked in detail at the extent SEP impact firms on formal levels. These studies consist of understanding goals as previously discussed in the SEP formation section, consisting of mandatory targets, quota obligations, fixed feed-in prices, price premiums, tradable green certificates, investment subsidies, preferential loans, tax rebates and net-metering (Aslani, Wong, 2014; Msimanga, Sebitosi, 2014; Paska, Surma, 2014; Lee, Zhong, 2014; Connor et al., 2015).

Additionally, further research showed that firms have thrived when SEP develop strategies that co-integrate environmental policies and innovation policies (Depret & Hamdouch 2010).

However, SEP can cause informal effects such as relational and emotional outcomes. These effects can be seen in the values, culture and behaviours of employees and public (Byrnes et al., 2013; Migion & Barek, 2016). Within SEP there is limited research on informal influences of SEP on firms (Bergek, Mignon & Sundberg, 2013; Migion & Barek, 2016). However, research conducted consists of understanding informal effects, such as Bollinger and Gillingham's (2012) research on casual peer effects to understand diffusion effects on policy, indicates the effects of peer opinion towards sustainable energy and the positive effect on firm investment and shows a positive relationship between public opinion and firm adoption of sustainable energy. McEachern and Hanson (2008) conducted research on market and adoption perspectives, focusing on socio-geographic contexts for sustainable energy and the connections towards increased adoption. The research found individuals and groups involved with communication channels had higher tendencies to adopt sustainable energy at a personal home basis than those that were uninvolved and social isolated.

Research conducted by Graziano and Gillingham (2015) on mediation effects, showed significant positive relationships between neighbours and the adoption of photovoltaic solar panels. Whilst, Korcaj, Hahnel and Spada (2015) research on peer behaviour influences of SEP indicated that resistance to adoption was significantly tied to consumer awareness in product quality and complexity. This shows the need and importance for SEP to encompass consumer education. Overall, arguably, there are significance effects from informal factors, as argued by Migion and Barek (2016), who surmised that formal and informal factors have an impact on investment decisions and effects the entire investment process.

4.7 SEP Finnish context

It is important to understand the role of SEP within Finland. Firstly, it is important to recognise that Nordic countries in general have been seen as leaders in sustainability for decades (Räikkönen, 2014). Aslani, Naaranoja and Wong's (2013)

research also supports that the Nordic countries represent examples of success for SEP effectiveness and the promotion of renewable energy policies. Furthermore, there are different SEP in Finland. SEP within Finland is inclusive of biomass electricity/heat, hydropower electricity, solar electricity/heat, wind power electricity, and geothermal electricity/heat (Aslani, Helo & Naaranoja 2014). Finland provided comprehensive insights into successful policies and their impacts. Furthermore, as noted earlier Finland has the second highest sustainable energy generation per capita at 38.7%, in the European Union (Lyytimäki & Lähteenoja, 2016). Hence, this research aims to contribute and reduce the literary absence of implementation research of Finnish and EU energy policy and firm implementation (Heiskanen et al., 2017). This lack of research provides a key motivation and reasoning for this research.

Historically, Finland's SEP has had changes and stagnation like many other countries. This is reflected in Finland's energy consumption and population. Aslani, Helo and Naaranoja (2014) found that the Finnish population decreased by 12% from 1981 to 2011, whilst energy consumption increased from approximately 202,000 GWh to 385,000 GWh. Furthermore, counter arguments can be seen in research by Lund arguing that Finland's policy approach is modest, as it lacks stakeholder engagement and a dynamic mix of sustainable energy (2009). However, other researchers discuss Finland growing commitments towards SEP. This can be seen in 2016 by Finland's national commitment to become the world leader in sustainability, and the long-term objective to become a carbon neutral society (A, Finnish Ministry of Economic Affairs and Employment, 2014; Lyytimäki & Lähteenoja, 2016).

The bi-annual reports submitted to the European Commission from the Finnish government gives a specific SEP context. The reports indicate policies and measurement that the Finnish government has undertaken as legally required by the European Commission. This has been done by categorical arrangement of policy types as required by the European Commission in reporting, categories are: Regulatory; Financial; Informative; Guidance; Research; Development; Competence; Economic; Policy programme; and Business development. Each category represents a specific policy purpose and intent developed by the Finnish

government to allow report interpretation. The Commission reports show the past current and future polices of Finland. The reports show a steady increase of sustainable energy market share against the total energy market, as 2013 total market share was 36.7%, 2014 was 38.7% and 2015 was 39.5% (European Commission, 2016).

Table 2 European renewable energy market share member states.

Country	Renewable Share 2013	Renewable Share 2014	Renewable Share 2015
Austria	32.30%	33.1%	33.60%
Belgium	7.50%	8.00%	7.30%
Bulgaria	19.00%	18.00%	18.40%
Cyprus	8.10%	9.00%	9.10%
Czech republic	12.40%	13.40%	13.60%
Germany	12.40%	13.80%	14.50%
Demark	27.30%	29.20%	30.60%
Estonia	25.60%	26.50%	27.90%
Greece	15.00%	15.30%	15.50%
Spain	15.30%	16.20%	15.60%
France	14.00%	14.30%	14.50%
Finland	36.70%	38.70%	39.50%
Croatia	28.10%	27.90%	27.50%
Hungary	9.50%	9.50%	9.40%
Ireland	7.70%	8.60%	9.00%
Italy	16.70%	17.10%	17.10%
Lithuania	23.00%	23.90%	24.30%
Luxembourg	3.60%	4.50%	5.00%
Latvia	37.10%	38.70%	39.20%
Malta	3.70%	4.70%	5.30%
Netherlands	4.80%	5.50%	6.00%
Poland	11.30%	11.40%	11.80%
Portugal	25.70%	27.00%	27.80%
Romania	23.90%	24.90%	24.70%
Sweden	52.00%	52.60%	54.10%
Slovenia	22.50%	21.90%	21.80%
Slovakia	10.10%	11.60%	11.90%
United Kingdom	5.60%	7.00%	8.20%
European Union 28 Member Average	15.00%	16.00%	16.40%

Additionally, further insights into the Finnish context can also be ascertained through understanding international recommendations, influences and obligations for Finnish SEP. As the above sections show, the direct influence of the European Union's policy forms the basis for Finnish direction towards SEP (Valkila & Saari, 2010). Additionally, Finland's energy policy has drawn considerable praise from the International Energy Agency (IEA, 2008). Other researchers also believe that

Finland's progressive SEP is due to their intentions for stakeholder engagement and dynamic policies for sustainable energy (Hamdouch & Depret, 2010). Hamdouch and Depret's (2010) research found that countries with green economies that are currently the most developed are generally those with public authorities that have adopted active and dynamic SEP. Additionally, other studies of Finland SEP have analysed the portfolio approach of Finnish SEP, Showing the relationship between the political, technological, managerial, social, and cultural mix and SEP effectiveness (Aslani, Helo & Naaranoja 2014).

Furthermore, Nordic Cooperation also represents a core policy level for Finland. In 2016, 15% of imported energy consumption came from Sweden and one fifth of total energy consumption was from imported energy (Statistics Finland, 2016). This shows, that Finland has a significant reliance on energy from other Nordic states, hence, the importance of Nordic Cooperation for trade agreements and bilateral development. This cooperation has developed roadmaps for 2010-2013 and 2013-2017 that are aligned with the 2050ERM (Nordic Cooperation 2010; Nordic Cooperation 2014). The road maps provide objective goals and prioritised issues for all Nordic countries. Thus, these roadmaps provided another comparative framework both for the 2050ERM and for Finnish firms.

The technological diversity of Finland is another element. Finland is known for its technological innovations and abilities. It has been argued that Finland has been slow in the adoption and innovation related to solar, wind and energy storage technology (Heiskanen, et al., 2017). However, significant opportunities have been noted, being waste energy and bioenergy, wood energy generation, energy efficient building and ICT energy related innovation (Export Finland, 2017). The latter is specifically noted to be important for export markets (Heiskanen, et al., 2017).

Research has also shown significant outcomes related to decarbonisation for Finnish firms. Frost and Sullivan's (2015) research indicated important sectors to the Finnish economy were: transport, energy, buildings, industry, water and waste, with bio-economy as a cross-cutting category. The decentralisation of energy systems that is currently occurring, and that Finland is transitioning towards, is a "a pro-consumer market, built on the foundations of battery energy storage and residential and

commercial solar PV" (First & Sullivan, 2015, p. 3). Within industrial processes it is predicted that Finland's historical, current and growing capacity in ICT for management, machine learning and big data analytics has the opportunity to be a key economical revenue maker (First & Sullivan, 2015). This is further seen in relation to the Finnish innovation research promoting development and research on energy system integration innovation and machinery and equipment being key areas for Finland (Heiskanen, et al., 2017). The role of bio-economy, clean tech and digitalisation have been outlined as the new economic areas of growth in Finland (Finland Export, 2017). However, it is important to note that both the Finnish and European Commission targets are framed on the assumption that CCS will become a comical viable opportunity and crucial to meeting emission targets (European Commission, 2011; A, Finnish Ministry of Economic Affairs and Employment, 2014).

The geographical context of Finland was also significant when analysing SEP practises and literature. Finland has great geographical diversity and environmental extremes. Finland's biomass covers nearly 86% of total land, the highest in all of Europe (Aslani, Helo & Naaranoja 2014). That 28.5% of sustainable energy generation in Finland comes biomass emphasises this point (Berlina, Mikkola, 2017). Finland has extreme temperatures, snow coverage and limited daylight in winter, limiting the uptake of solar systems. However, this has not stopped Finland producing copper components for solar heating systems (Lund, 2009). The geographical diversity has also impacted the historical development of SEP, as Finland's industries have created a dependency on industrial capacity. This is arguably due to industrial energy consumption coming from the forest and paper industry, as this is estimated to be 60% of industrial energy consumption within Finland (Aslani, Helo & Naaranoja, 2014). Hence, Finland energy consumption is mainly due to raw material production of steel and pulp (Heiskanen, et al., 2017). To manage this demand, Finland has developed a combination of domestic production, imported energy and nuclear power (Valkila & Saari, 2010). It can be argued that this has forced Finland's alternative sustainable technologies to compete with a highly secure market.

Therefore, it can be surmised that there are a range of challenges for sustainable energy within Finland. This is further emphasised by studies that have

researched the past and projected sustainable energy market share and their effects from SEP. In 2009 wind power was less than 1% of total energy production, but is expected to increase to 15% by 2020. The total amount of sustainable energy was also expected to account for 38% of gross final consumption by 2020, which has now been surpassed, in 2016, with 38.7% currently existing in Finland (Aslani, Naaranoja & Wong, 2013; Zakeri, Syri & Rinne, 2015). This shows a positive contradiction to other studies, as it has been argued that sustainable energy will reach 36% of gross final consumption by 2050 (Valkila & Saari, 2010). The European Commission 2050ERM has targeted achieving a 55% gross final energy consumption from sustainable energy for all of European Union member states (European Commission, 2012). These targets have set a high bar for Finland to achieve, indicating market share in Finland is expected to change in favour for sustainable energy.

4.8 Conclusion

Finland can be seen as an exemplary country within Europe when understanding the role of policy and sustainable energy. They have shown the ability to establish SEP that are implemented by both public and private sectors. Furthermore, these policies are inclusive of all relevant sustainable energy technologies of biomass, wind, solar, hydro-electric and geothermal. The Finnish context also provides the context for understanding the influence of cultural, historical and geographical trends with the marriage of sustainable energy policy for innovation, incentives and barriers. Furthermore, the direction and targets that have been set by the European Commission 2050ERM, set an agenda for both public and private organisations. It is, therefore, important to understand how they have progressed and planned, as this can provide key insights into the expected success or failure of the European Commission 2050ERM for Finland.

Through applying the core constructs of implementation research a systematic evaluation of Finnish firms and the 2050ERM implementation was proposed. The core elements of polices were discussed and investigated relative to reporting, transparency and implementation. The use of, annual reports allowed constructs of conflict, change and ambiguity to be investigated at a Finnish firm level (Meter & Horn, 1975; Marltand 1995, Stewart; 2006; Eberlein 2012). Furthermore, this can be commented against the policy layers of the European Commission,

Nordic Cooperation and Finnish national policy.

5. Methodology and Research Methods:

5.1 Methodology

This research used content analysis to examine Finnish firms' reports that operate and report in Finland. The firms selected were those that offer services and products within Finland that are directly related to the European Commission's 2050ERM direction (European Commission, 2012).

Content analysis can be defined as "a research technique for making replicable and valid inferences from texts (or other meaningful matter) to the contexts of their use" (Krippendorff, 2004, p.18). This research uses a qualitative method of content analysis, and investigates the question of "how and to what extent is the European Commission 2050ERM implemented by Finnish firms?". Content analysis provided "a method for putting large numbers of units of verbal matter into analysable categories" (Krippendorff & Salkind 2010, p.4).

The appropriate data for such a question was collected via publicly released information in firm annual reports. This information was coded via lists of definitions for unit analysis relative to the 2050ERM goals listed and other relative policy levels. Furthermore, coding was ex-post content analysis, as the material collected only provided explanations about disclosed information (O'Donovan, 2002). Hence, subsequent findings were limited in discussing emergent themes and associated areas of sustainable energy and policy implementation. Annual reports were coded using Bowman's (1984) line-by-line methods, looking specifically for comments relating to topics from the 2050ERM goals and subsequently the lack of comments. Information was sorted in the published year of the annual report against the policy definition and each policy level. (See Appendix Three for format of policy category and year framework).

The construct of ambiguity, conflict and change evaluated the application and perception of 2050ERM and related polices. These constructs were selected due to the consensus and importance of each area when researching policy implementation (Meter, Horn, 1975). The results were collected by conducting comparative analysis of associated words for each core construct. (See Appendix Two for onomasticon list

of ambiguity, conflict and change words). Associated words highlighted the range policy types such as policy development, business development, and informative policies. (See Appendix One for policy details). Once policy type and ambiguity were compared, both the associated firm type and area of comment were analysed. Common patterns were identified from firm count. If firm count was above half the total number of firms referencing within the construct, the policy area was further investigated for policy implementation and insights concluded. Investigated areas provided consistent examples of firm industry stance, impact understanding and ambivalence. Therefore, presenting insights into the implementation path of the 2050ERM of Finnish firms across a range of energy operators and change over time.

The use of content analysis allowed a systematic evaluation. Information consisted of released statements of Finnish firms to be categorically analysed and referenced against firms, Finnish European Commission progress reports and the European Commissions' goals set out in the 2050ERM and subsequent policy levels. Furthermore, the use of content analysis allows a systematic comparison of multiple firms, against awareness, attitude, knowledge, understanding, capability and action towards the European Commission's 2050ERM.

5.2 Ethics

The research ensured that ethical limitations, ramifications and considerations are evaluated and managed at all times. There were ethical components that were recognised in relation to content analysis. The ethical issues of content analysis were limited due to the impersonal elements of content analysis. However, the research endeavoured to ensure that statements and language were not miss-analysed and communicated during analysis, as this holds the potential to misrepresent companies, particularly if the content is wrongly classified or interpreted. This was achieved by following line by line coding, whereby text was understood for the whole sentence(s) to ensure appropriate classification was awarded.

Furthermore, there was no beneficence with this research as it is purely focusing on the implementation process for sustainable energy development within Finnish Firms. The research aimed to ensure that the selected firms reputations were undamaged, through ensuring no internal evaluation of failure is performed. For

further information on the ethical considerations of this research, see Appendix Five for the University of Canterbury Human Ethics student application form.

5.3 Research Methods

5.3.1 Participant selection

This research utilised several stages in the process of collection information on the impacts of the 2050 ERM. This will be explained in terms of the firm selection processes from the membership list of Finnish Energy (Finnish Energy, 2017).

Firstly, categorising and investigating a range of firms has been conducted on a list of energy businesses on the Finnish Government website (www.energia.fi). This website is from 'Finnish Energy' a government organisation that supports the industrial and labour market for energy policy. The government website lists over 333 member companies that offer energy related services within Finland.

The firm list was categorised in the following way: Annual reports in non-English language(s); Annual reports in English; Website in English; Energy Production; Energy Procurement; Energy Distribution; Energy Seller; Heating and Cooling; Other Services (Consulting; Componentry; Accounting). The reason for these categories was to break down and allow the difference of services offered by energy firms to be found. This was validated through looking at firm services offerings in the website and concluding which service categories were relevant. This categorisation did recognise firms that offer more than one service, as commonly found within energy industries. Hence, each category presents the broad areas that exist in the energy industry. Additionally, all duplicated/same website companies have been removed to leave only a single representative company.

Of the original 333 listed, 238 were separate companies. Of this total, 41 produced annual reports in English, 112 reported in a non-English language and 123 did not have annual reports. Of the 41 firms that produce annual reports in English, annual reports were analysed using content analysis. (See Appendix Four, for complete list of energy firms, excluded and included).

5.3.2 Data collection

Annual reports that ranged from 2012 to 2015 were used to conduct the content analysis. These dates were selected as the 2050ERM was not published until late 2011. Content analysis was based on specific criteria and categories that were framed directly from the 2050ERM, Nordic Cooperation and Finnish national policy.

The content analysis was based of three levels of policy. Firstly, the European Commission 2050 Energy Roadmap, being the overarching policy for all national and supranational bodies for European Union (EU) members and obligated partner countries. Secondly, Nordic Cooperation (NC) being another supranational policy level, as the NC policy is geared towards applying Cross-Nordic polices and EU Policy integration. Thirdly, Finland's National policies, listed by bi-annual reports required by the European Commission for progress reports on energy policy integration. Furthermore, each policy level has been placed into a framework allowing annual reports to be cross referenced to highlight potential patterns in firm recognition, interpretation and comments towards specific policies at each specific policy level. This was done by applying the textual definitions for each of the sections stated above.

Specific policy intention categories can be applied. Categories were developed using the categories found in bi-annual reports given to the European Commission, these categories are: Regulatory; Economic; Informative; Research Financial; policy Development; and Business development. Each category was created by the European Commission to define policy type, the objective measures, goals and timeframe expected to complete or build a capability (European commission, 2014; European Commission, 2016. The list of policy types was established for recording and reporting to the European Commission. The goals of the European Commission and Nordic Cooperation were formatted into these policy types to allow clearer comparative analysis. From this, a scored framework for annual reports was created to create range of data sets apply NVivo software and thematic analysis techniques.

5.3.4 Methods of Analysis

This research applied staged analysis methods, involving statistical and qualitative methods. The analytical methods applied in the research are framed by research practices developed for policy implementation research (Schaffhauser-Linzatti & Ossmann, 2018; Reichardt & Rogge, 2016; Mio & Venturelli, 2012).

Nvivo, a statistical referencing tool, was used to analyse annual reports. This analytical tool used definitions found in each policy level as stated above. Each, definition has been quoted directly from the government documents themselves to remove misinterpretation. Hence, definitions were applied from the 2050ERM, Nordic Roadmap 2010-2013 and 2014-2017 and Finnish Commission reports 2014 and 2016. From this analysis firm transparency and reporting can be documented towards specific policy levels and intentions as reporting is an indicative finding of implementation within a firm (Meter & Horn, 1975).

The entire database was analysed using Nvivo to analyse levels of significance relative to policy levels. The data was framed against core implementation constructs of conflict, change and ambiguity (Meter & Horn, 1975; Marltand 1995; Stewart, 2006; Eberlein 2012). This analysis consisted on word frequency and word queries. The use of word frequency analysis shows the prevalence of common phrases used by firms. The word queries allowed core constructs of change, conflict and ambiguity to be searched. This consisted of the specific word ‘change’ and its synonyms to be queried. The analysis provided a map to compare phrases and core concepts to policy levels between firms, years and policy levels.

The construct of ambiguity, conflict and change evaluated the application and perception of 2050ERM and related polices. The results were collected by conducting comparative analysis of associated words for ambiguity. (See Appendix Two for defined ambiguity, conflict and change words). Associated words highlighted the range policy types such as policy development, business development, and informative policies. (See Appendix One for a list of all policy details). Once policy type and ambiguity were compared, both the associated firm type and area of comment were analysed. Common patterns were identified from firm count. If firm count was above half the total number of firms referencing within

the construct, a policy area was included. This can be seen in Table Three, as policy development, economic and informative polices meet the requirements. By presenting examples, industry stance, impact understanding and ambivalence were described. This allowed contextual insight into the impact of the 2050ERM on firms across a range of energy operators.

5.4 Limitations

This research has sought to understand the implementation process and impact of the 2050ERM by Finnish firms. The primary limitation of this research was the lack of personalised qualitative data, through interviews of firm employees. This additional textual data, would have provided deeper confirmation and situational perspectives regarding implementation of the 2050ERM. Attempts were made to contact firms for interviews, however due to time constraints this was not successful. This lack of interview data, was reduced by the fact that reports were analysed over a period of four years and a large number of reports were used. Therefore, to build upon this research further studies could conduct interview to enrich and further contextualise this research.

6. Findings:

The data that was collected during this research utilised a range of processes to analyse the text collected. The analytical process utilised both methods found in literature and software programme Nvivo. Constructs searched for within the text consisting of conflict, change and ambiguity. The onomasticon of each construct was applied in a Nvivo analysis to produce emergent themes from statements. Comparative insights were then emanant in firm comments, policy level and annual occurrences. The outcomes of the initial process can be seen in Table Three showing the number of references towards each construct, number of firms.

The dataset of 41 companies that offer services and products within the Finnish energy industry have shown a range of initial findings. The constructs of ambiguity, conflict and change can be seen when running analysis. Language consistency is also prevalent within the datasets. This provides a starting point to

conduct further analysis into the relationships of conflict, ambiguity and change in common words.

Table 3 Core Construct Statistics

	Number of relevant firms	Number of references
Conflict All Policy	30	233
Conflict EU	28	141
Conflict NC	7	34
Conflict N	7	26
Ambiguity All Policy	18	138
Ambiguity EU	14	79
Ambiguity NC	4	42
Ambiguity N	0	0
Change All Policy	39	3066
Change EU	39	1628
Change NC	27	527
Change N	23	354

*EU = European Commission *2050ERM*, NC = Nordic Cooperation, N = Finnish National

Word frequency provided another core finding within the dataset. Firstly, the data was structured within categories to allow categorical analysis. This consisted of policy type, annual report year, policy level, policy statement and lastly the firm annual report statement. By doing so, the categorical analysis function of Nvivo was utilised to cross reference against policy level, year and statement. Initial analysis consisted of word frequency queries across all years and firms, followed by categorical word frequency queries across all years and policy levels. This allowed common terms to be highlighted within the data. Secondly, the same process was conducted for the core concepts discussed within literature being change, conflict and ambiguity. This was done to identify both the existence and lack of references in each firm reports, year and policy levels associated.

Table Four presents the results of word frequency and construct significance across time (2012 to 2015) and level. Policy (European Commission, Nordic Cooperation and Finnish national EU reported policy).

Table 4 Emergent Word Pattern Analysis

	1st Most Common word	2nd most common Word	3rd Most Common Word	4th Most Common Word	5th Most Common Word
All 2012-2015	Energy (39F, 5451R)	Power (37F, 2948R)	Electricity (37F, 2350R)	Products (37F, 1985F)	Development (39F, 1837R)
All 2012	Energy (39F, 1532R)	Power (26F, 665R)	Products (23F, 562R)	Electricity (24F, 501R)	Plant (20R, 458F)
All 2013	Energy (36R, 1336R)	Power (27F, 583R)	Products (24F, 492R)	Markets (32F, 475R)	Electricity (23F, 452R)
All 2014	Energy (37F, 1336R)	Power (29F, 667R)	Electricity (25F 596R)	Develop (31F, 548R)	Products (29F, 468R)
All 2015	Energy (37F, 1549)	Electricity (29F, 661)	Power (29F, 650R)	Renewable (30F, 454R)	Products (28F, 434R)
EU 2012-2015	Energy (41F, 3766R)	Power (34F, 1510R)	Electricity (30F, 965R)	Emissions (35F, 811R)	Renewable (30F, 797R)
NC 2012-2015	Energy (32F, 923R)	Developing (27F, 504R)	Research (15F, 470R)	Power (25F, 411R)	Electricity (24F, 407R)
N 2012-2015	Energy (30F, 601F)	Power (20F, 515R)	Products (21F, 318R)	Wind (12F 312R)	Plant (12F, 289R)

* F = number of firms referencing. F = number of textual references of this specific word. EU = European Commission 2050ERM Policy References. NC = Nordic Cooperation Policy References. N = Finnish National Policy references

The analysis of Nvivo and excel cross referencing produced a range of findings that show patterns on the effects, implementation and gaps of the 2050ERM. This can be seen by looking at Table Five presenting word references and key word searching with the Nvivo tool and excel cross referencing. The level, policy goal and firm statement gave insights into context towards ambiguity, conflict and change. The examples listed show industry statements towards the implementation of the 2050ERM. (See Appendix One for full policy goal descriptions, in the order stated in Table Five).

Table 5 Comparative Findings:

Ambiguity Construct				*Conflict Construct*				*Change Construct*			
Policy type	No. Firm	Text Ref	Firm Firm service(s)	Policy type	No. Firm	Text Ref	Firm Firm service(s)	Policy type	No. Firm	Text Ref	Firm service(s)
Policy Development	11	43	(3A),(2B),(3C),(3D) (4E),(11F)	Research	7	50	(3A),(1B), (1C),(2D) (2E),(7F)	Informative	36	414	(12A),(7B),(12C),(13D) (12E),(27F)
Economic	12	19	(3A),(3B),(5C),(4D) (4E),(11F)	Informative	21	38	(9A),(4B),(8C),(7D) (9E),(15F)	Regulatory	35	374	(13A),(7B),(12C),(13D) (12E),(26F)
Informative	9	14	(3A),(2B),(3C),(2D) (4E),(8F)	Policy Development	14	33	(6A),(3B),(6C),(4D) (4E),(12F)	Business Development	36	299	(13A),(7B),(12C),(13D) (12E),(27F)
Financial	8	12	(2A),(1B),(3C),(2D) (3E),(8F)	Regulatory	14	32	(8A),(3B),(7C),(7D) (7E),(14F)	Policy Development	31	231	(11A),(7B),(10C),(12D) (11E),(25F)
Guidance	4	10	(1A),(2B),(2C),(1D) (1E),(4F)	Business Development	18	28	(7A),(3B),(8C),(5D) (6E),(15F)	Research	36	222	(13A),(7B),(12C),(13D) (13E),(27F)
Business Development	5	7	(2A),(2B),(2C),(2D) (2E),(4F)	Economic	10	15	(4A),(2B),(4C),(3D) (5E),(8F)	Financial	29	161	(12A),(7B),(11C),(13D) (12E),(22F)
Regulatory	2	5	(2A),(2B),(2C),(2D) (2E),(4G)	Financial	12	15	(5A),(3B),(6C),(4D) (4E),(11G)	Economic	30	148	(11A),(6B) (9C),(11D) (9E),(24G)
				Guidance	11	12	(5A),(4B),(5C),(4D) (5E),(8G)	Guidance	31	144	(11A),(6B),(10C),(11D) (11E),(23G)

*A= Production. B = procurement. C = Distribution. D = Seller. E = Heating & Cooling F = Other (Consulting, Research and Development)

6.1 Ambiguity Construct

Ambiguity in policy development emerged as a significant area of comment from firms. Of the 17 firms referencing ambiguity, 11 commented on policy development within the dataset. The policy development comments in dataset discussed specific policy goals such as: Decarbonisation; Public support schemes; Price efficiency; National effects to other countries; and Policy scope being targeted limited and predictable when developing policies. See Appendix One for policy details. Consulting firms provide a clear example of policy ambiguity relating to the whole energy industry and that of energy consulting services.

> The legislative risk is highly relevant. Announcements of legislative reforms and amendments to the legislation governing feed-in tariffs or incentives for renewable energies may precipitate investment uncertainty and a decline in demand in the short or medium term. A planned legislative amendment is currently attracting heightened debate in the member states of the EU. The EU Commission is stepping up the implementation of market-based systems such as auction-based bidding. (Nordex Group, 2015, p.71-72).

The Nordex Group 2015 statement, highlights concern for clients and the uncertainty of policy application. The ambivalence can be interpreted as negative towards financial effects caused both within the Nordex Group but also their clients. However, ambiguity provides the Nordex Group with opportunities to increase services in strategic and risk management relating to policies. Specific work could focus on the effects of decarbonisation, price subsidy and market internationalisation which require significant strategic and risk management.

The time spread of comments showed an increase from 2012-2013 from six to ten comments from four firms. The comments and firm number drop in 2014 to three comments from three firms but increased again in 2015 to ten comments from four firms. The quantity of firms and textual themes emphasize a cycle in ambiguity. When policy is being developed clear intention of technological and capability goals must be stated from the beginning, allowing firms to have increased clarity of market conditions. Firms must also seek to understand the technological or capability goals

outlined by governments or face harsh legislative realities and firm disruption.

Production firms provide additional perspective of effects from policy development policies. Three out of the 11 energy production firms commented on policy ambiguity in relation to energy efficiency and public support. The existence of ambiguity can be found in 2012 with Fortum's services and other firms commented on direct affects from the introduction of the 2050ERM.

> While consumers and society demand higher reliability and more flexibility from electricity distribution, regulatory models should provide incentives for the investments. The unstable economic situation in Europe and globally – and the uncertainty regarding its duration – affected Fortum's business operations in 2012 (Fortum Energy, 2012, p.15).

Fortum's example highlights energy production views on investment risk from uncertainty in policies. The uncertainty is due to the risk of disproportional return on investments. This in turn effects the goals for decarbonisation as firms are unwilling to change practices. Furthermore, the time spread of comments from energy production firms showed increases in ambiguity for energy production firms. The spread of comments and firms from 2012-2014, two comments from two firms, with one less in 2014, at one comment from one firm. Whilst, in 2015 firms and comments increased to six respectively from three firms.

The existence of ambiguity was prevalent in all years as shown by Fortum's and others in annual report. Increasing comment and textual themes indicates that policy issues have resolved, but have grown over time. Hence, firms may benefit from reduction of economic uncertainty, by reducing ambiguity in the policy. Allowing a clearer strategic path for investment and leading to the decarbonisation of power systems.

Economic policy was also found to be another highly referenced area for energy firms and ambiguity. This can be seen in Table Three as economics are referenced by 12 firms out of 17. The specific areas in economic policy that were commented on consisted of price effects and investment risk. (See Appendix One for

policy details). Of the 12 firms to comment on economic policy, five were energy distribution firms. Carbon emissions policies highlighted issues around clarity and lead to effects on price stability for energy distribution. The effects of economic ambiguity on energy distribution highlight the need for clarity of different roles in energy distribution.

> Crucial factors having an impact on the price of electricity include the prolonged economic instability in Europe, and the uncertainty of future decisions on the reduction of carbon dioxide emissions, as well as the development of the water resource situation in the Nordic countries (EPV, 2012, p.24).

Of the 12 firms, five distribution firms made comment on ambiguity for economic price effects and investment. The spread of comments over time was proportional, with three firms and three comments being made about economic ambiguity. Overall, uncertainty is expected. However, effort to minimise this by firms and policy makers is desirable for all, as both would benefit when associated with economic policies, as they hinder capability and reduction targets of the 2050ERM.

Energy procurement also presents additional insights into policy impacts. Of the 12 firms that commented on economic policies, three were energy procurement firms. Textual themes consisted of impacts to price and investment. This is prevalent in the potential volatility and uncertainty of renewable energy price, resulting in firm decisions focusing on profitability uncertainty. The same can be said with competition effects, as competitors can gain advantage from fixed or subsidised renewable prices. This has effected the willingness of firms to invest in new energy purchase agreements both within Finland with other member states. This can be seen in Vattenfall's 2012 comment.

> The European energy markets are becoming increasingly affected by the rising share of renewable energy. In 2012, uncertainty surrounding global economic growth also had an impact on electricity and commodity prices. There is some overcapacity in the Nordic electricity market, mainly due to higher production of renewable energy. In summary, it can be said that the

> market conditions for Vattenfall and the energy sector continue to be challenging (Vattenfall, 2012, p.12).

Similarities were found in the time spread in energy procurement firms energy as distribution firms. Comments from the total number of firms were equal, with three firms and three comments being made in relation to economic ambiguity. There was a decline in the number of comments over years and as well as the number of firms from 2012-2014, but slight re-emergence in 2015 with one comment from one firm. This textual consistency and themes over the time period suggest that economic ambiguity may have reduced over time, with only a slight emergence in 2015. Policy must aim to reduce the uncertainty of price as the effect will hinder firm willingness to transition to alternative technologies or capabilities.

Informative policies were found to be prevalent in the dataset. This can be seen in Table Three, as informative policies are commented on by nine firms out of 17. The specific areas in informative policy consisted of oil reduction and modernising energy systems. (See Appendix One for policy details). To demonstrate policy impact, heating and cooling and energy selling firms are portrayed. Of the nine firms to comment on informative policy, four were heating and cooling firms. Danfoss 2013 comments shows themes of subsidy and market conditions and their effects on investment return for modernising energy systems. In general the modernisation of energy systems with sustainable energy system is believed and practised by heating and cooling companies. However, certain technologies have been adversely affected by political support making them undesirable for application, as they offer reduced returns in comparison to other renewable and fossil fuel alternatives.

> The solid level of demand for Danfoss' technologies which meet the growing need for a stable food supply, modern infrastructure, efficient energy utilization and climate-friendly solutions continued in 2013. One notable exception was the European market for solar panels, which virtually collapsed due to uncertainty and changes to the framework conditions (Danfoss, 2013, p.6).

Time spread also showed a little variation in the number of firms and comments. The firm and comment count showed one comment in 2012, two in 2013, zero in 2014 and two in 2015. Comment patterns and textual themes indicate consistent and emerging ambiguity for heating and cooling firms. Hence, policy must aim to reduce the uncertainty of price as the effect will hinder firm willingness to transition to alternative technologies or capabilities (Danfoss, 2013, p.6).

Further examples of impact are found in informative policy relating to energy selling firms. Of the nine firms to comment on informative two were energy sellers. Kemijoki 2012 comment shows energy sellers are uncertain when considering hydroelectric energy sales at a commercial, domestic and export level. This has created an undertow effect in selling hydropower, as return on investment and risks are potentially higher then selling other sustainable, nuclear and fossil fuel energies.

> The most important risks for hydroelectric power companies involve increasingly stringent and ambiguous environmental legislation and potential changes in taxation and tax-like fees. When legislative provisions allow for several interpretations, this breeds insecurity in the investment environment and undermines the predictability of permit processes. prolonged permit processes also have economic impacts (Kemijoki, 2012, p.30).

Only two comments from two firms were found in 2012. Textual themes made little comment on potential implementation requirements for oil reduction and modernising energy systems. This presents a potential gap within the selling market, as policy plays a crucial role in incentivising and hindering the uptake of technology.

6.2 Conflict Construct

The area of informative policy measures was found in the dataset relating to conflict. This can be seen in Table Three presenting conflict comments from 21 firms out of 30. The specific goals relating to informative policy measures consisted of: Decentralisation of power; Modernising energy systems; Smart grid systems; Increased renewable energy consumption; Substitution of coal and oil with gas; and, Future role of oil. (See Appendix One for policy details). To demonstrate policy impact, energy production and distribution firms statements were examined.

Of the 21 firms, nine energy production firms made comment on conflict relating to informative policy measures. The themes focused on conflict related to decentralisation of power, modernising energy systems, smart grids, increasing renewable energy, substitution of coal and oil with gas and future implications for oil. This can be seen in Fingrid's textual themes on decentralisation of power and modernising energy system in 2012. Specifically, conflict is related to forecasted future trends on price and consumer dissatisfaction. Hence, conflicts have and are expected to persist for energy production companies when modernising their energy systems and decentralising power due to price issues.

> We gave as much transmission capacity to the market as was possible, but in that situation it was not of much comfort. There were more transmission congestions between Finland and Sweden than ever before. The area price differences were great, and our customers were not satisfied at this… Fingrid's biggest ever alternating current line project, will facilitate the efforts to keep Finland as a single price area. The latter project will be completed in 2016 (Fingrid, 2012, p.9).

The comments made by firms over time showed that 2012 had the highest number of comments with five comments from four firms, the number of comments declined over time with only a slight increase in 2015 at three comments from three firms. Firm comments and themes showed a dissipation of conflict over time as technological capability, management and strategic conflicts were resolved. From a policy perspective, policy makers must expect significant conflict during the inception of policies. However, reduction should be a main priority and policy makers must plan for initial reactions and conflicts. From a firm perspective, firms must also seek to understand the immediate conflict polices may cause, but evaluate if these conflicts are short term or long term and the associated resources required.

Energy distribution firms provide another example of conflict from informative policy measures. Of the 21 energy firms, comments about conflict were made by eight energy distribution firms. The types of policies commented on by firms were: Decentralisation of power; Modernising energy systems; Smart grids;

Increasing renewable energy; Substitution of coal and oil with gas; and Future implications for oil. (See Appendix One or policy details). EPV 2014 comment showed that there is a clear gap in capabilities from energy production which energy distribution firms must cover.

> The domestic electricity generation in Finland is insufficient to cover consumption during extremely cold winters. The difference between consumption and generation peaks even during a normal winter is up to 2,800 MW. In order to cover consumption peaks, Finland is forced to import electricity from abroad. Not even the future commissioning of Olkiluoto 3 will be enough to cover the generation shortfall. In order to keep the unprofitable power plants operational, they would have to be included in the peak load capacity system (EPV, 2014, p.9).

The time spread of comments were consistent 2012-2014 with 2014 being the highest at four comments from four firms, with a sudden decrease in 2015 with one comment from one firm. Textual themes and time spread suggests that conflict from informative policies has resolved with time. However, firms must recognise that informative policies will require time to transition and overnight clarity and alignment will not occur.

Business development policies also met the dataset requirements to indicate significant industry impact from policy. This can be seen in specific policy areas of ICT development, role of electric vehicles; renewable heating, intermittent energy management, new power system investment. (See Appendix One for detail policy descriptions). Of the 30 firms to comment on conflict, 18 commented on business development policies. A range of business development policy conflicts were noted in production and energy consulting services.

Of the 18 firms to comment on business development, seven were energy production firms. The Nordex group example shows the risks that production firms must consider when investing in wind technology, as government subsidy can be both a benefit and a negative to production firms.

> Wind power has left its infancy. After once making negligible contributions to electricity supplies, it is today assuming "system responsibility" in more and more countries, providing an essential pillar for energy supply. For this reason, wind power systems must now meet entirely different requirements. They need to stabilise the system and support the electricity grid. For this purpose, it must be possible to adjust their effective and idle output to stabilise frequency and voltage (Nordex, Group, 2014, p.31).

The time spread for energy production firms showed a steady increase from 2012-2014 on conflict for business development policies. This was seen with 2014 having six comments from six firms, in 2015 the comments dropped with one firm and comment. This indicates that potential resolution or removal of conflict occurred towards business development policies for energy production firms. This further supports the themes and comment patterns that conflict will resolve with time, but also adequate resource application and understanding are crucial to resolving conflict quickly.

Of the 18 firms to comment on business development 15 offer consulting services. Policies commented on were: ICT development; Role of electric vehicles; Renewable heating; Intermittent energy management; and Power system investment. (See Appendix One for policy details). Vapo's 2014 comments about investments conflict, emphasises sustainability investment and energy management when standards have changed in the EU. This has created a need for consulting firms to understand how to help clients apply new standards management whilst maximising stakeholder return.

> New international emission standards are increasing investment costs and affecting the use of fuels. Flue gas scrubbers improve efficiency in heat production, which has the effect of reducing the use of fuel. The most significant investments in the financial year were allocated to growing the heating business in Finland and Sweden, energy efficiency investments, the reduction of emissions to waterways from peat production, and the preparation and acquisition of new production areas (Vapo, 2014, p.10).

Time spread of comments showed conflict comments for the 2050ERM increased over time. This was shown with minimal comments in 2012-2013 with two firms making three comments. In 2014 an increase in comments occurred with eight firms and eight comments found. In 2015 the conflict reduced with only four firms and four comments. Overall, the pattern of comments and the textual themes imply that time allows firms to adapt to the new market requirements, by being able to understand the impact and areas of change needed. Hence, firms will need to spend time understanding indirect and direct effects of business development polices to ensure comprehensive planning and resource application. Change is an inevitable function in the market place, either through competitors or governmental influences. However, the application of resources and time spent understanding changes and conflicts are crucial to successful adaption and opportunity execution.

6.3 Change construct

Firm comments relating to informative policies measures consisted of themes relating to change. Firm comments on Informative policies consisted of: Power decentralisation; Decarbonisation; Smart grids; Modernising energy systems; Increased renewable consumption; Oils future role; and Substitution of coal and oil for gas. (See Appendix One for policy details). Of the 36 firms 12 energy production firms commented on change relating to informative policies. Helen Energy's 2014 comment provides an example of these changes, as the application of smart grids provides opportunities to increase efficiency, profits and consumer satisfaction and perception. Smart grids and modernising energy systems have created new opportunities for firms to differentiate and improve their business models.

> The dense urban structure provides new opportunities for increased use of renewable energy, recycling of energy flows, and emissions reduction. The research project SunZEB – "PlusEnergy" in the City, which was launched in spring 2014, aims to create an optimal energy solution for areas connected to district heating and cooling. In addition to a building's own energy use, the project takes into account innovative recirculation and reuse of energy in new and renovated buildings (Helen Energy, 2014, p.2).

The time spread of comments for energy production firms showed small variation in comments between 2012-2014 with a low of 30 (2013) comments and high of 33(2014), while the number of firms commenting grew by one from 2012-2014 with a high of 11. In 2015 there was a drop in both comment and firms at 26 comments from 10 firms. Themes and comment patterns imply that planned and new changes were no longer as prevalent in previous years. Hence, to increase uptake and adoption policy makers and firms would benefit if informative policies had greater details regarding direct and indirect changes.

Furthermore, energy procurement firms provide examples of change regarding informative policies. Of the 36 firms, seven procurement firms commented on change from informative policies. Procurement firms have commented on business models and market effects. For example, policy for decarbonisation has encountered resistance from procurement firms, specifically the investment in renewables. EPV 2014 statement shows, that procurement firms see emission tax and regulation as necessary but the financial disincentives currently in place have created a resistance to invest in renewables due to losses in capital from emission trading.

> The European Commission's proposal to restructure the emissions trading starting in 2020 would make the markets sound and encourage future investments. The European Union has several important development projects in progress. Currently, the Market Stability Reserve (MSR) is being outlined, the implementation of which is expected to take time. Capacity mechanisms and the implementation of these are also under discussion. The technologies or mechanisms related to this must be weighed so that they include both existing and new capacity. The climate change is a significant factor concerning the development of the energy market, and the EU continues to discuss the matter (EPV, 2014, pp.5-11).

The time spread of comments on change for procurement firms also showed increases over time with 2012 at 15 comments from four firms to an increase in 2014 of 27 comments from six firms, 2015 had 18 comments from six firms. As found with production firms, so too are procurement firms adapting to market and policy change over time. This further demonstrates informative policies would benefit if

detail included direct and indirect areas of desired change, to hasten the rate of change and firm adoption.

Significant firm comments on regulatory policies consisted of: Carbon capture and storage; Interconnection capacity; Decreasing energy demand; Carbon pricing; Increasing renewable consumption; Reducing import dependency; Reducing greenhouse gas emissions. (See Appendix One or policy details). When selecting examples, energy distribution and selling firms were chosen. Of the 35 firms to comment on regulatory policies, 12 were distribution firms. Fingrid's comments on regulatory policies effects on distribution firms show emissions trading has affected the desire and need to improve energy efficiency and renewable energy markets. The consistency in global policy is also seen as a weighing factor in ensuring continuity and stability for firms to make investment decisions

> Greenhouse gas emissions must be rigorously limited through global measures. The EU's energy and climate policy, which is effective until 2030, is based on significant reduction targets for emissions, an increase in the share of renewable energy, and an improvement in energy efficiency. The climate agreement concluded in Paris in December 2015 is seen as a breakthrough in abating climate change… Emissions trading had minor financial significance for Fingrid (Fingrid, 2015, p.6).

The time spread of energy distribution forms showed that there was an increase in comments across all years from 2012-2015 with a low of 26 comments from eight firms in 2012 and a high of 33 comments from 11 firms in 2015. First, regulatory policy requires firms to understand what frozen processes and capabilities require change. Second, to unfreeze adapt and introduce capabilities and processes and lastly, to re-freeze capabilities and processes. Additionally, the unfreeze stage can utilize moment of change in consumer, technological and political direction to create market advantages and competitor differentiation.

Comments from energy sellers also show impact from informative policies. Of the 35 firms that commented on informative policies, 13 were energy sellers. Fortum's example shows changes occur when considering selling energy within a highly interconnected energy market as changes for renewable policies effect more

than one country, creating a complex competition and marketplace conditions. The harmonisation of policies is seen as crucial for Fortum when ensure cost efficiency and return on investment for their stakeholders.

> For cost and efficiency reasons, electricity supply and generation must be viewed from a Europe-wide perspective. When electricity is generated with a method that is most efficient for each area, a reasonable electricity price for consumers and a competitive supply for industry can be ensured. Instead of massive production subsidies from the public sector, it would be important to ensure market functionality by investing in, e.g., electricity interconnections that would improve the security of electricity supply throughout Europe. Nordic/EU Policy harmonisation, infrastructure development and integration of the Nordic electricity market towards continental Europe depend to large extent on the actions of authorities. The current trend of national policies could even endanger market-driven development of the energy sector and the uncertainty with regard to future policy targets and framework is currently considerable (Fortum, 2014, p.5).

The time spread of firm comments for energy sellers for regulatory policies showed increases between 2012-2014 from eight firms to 12, and increases in comments from 30 in 2012 to 38 in 2014. In 2015 there was a drop in comments to 34 whilst the number of firms stayed the same. change has been constant element in informative policies. Textual themes have shown that business model change is effected by regulatory policies. Hence, it is important that clear informative policies are created, to provide accurate pathways for firms to meet goals of the 2050ERM.

Business development policy measures were also found to be prevalent in comments reflecting change from firms. Policies relating to business development policy measures included: Increased ICT; Renewable heating a cooling solutions; Air and health benefits; Intermittent energy management; Renewable energy investment; and Alternative fuels. (See Appendix One for policy details). When portraying impacts of business development policies, consulting and heating and cooling firms can be used. Of the 36 firms to comment on business development policies, 12 were heating and cooling firms. Gassum shows that in 2014 changes in

energy requirements have created a new demand for heating and cooling products that can be sustainable allowing Gassum and other heating and cooling firms to expand services and increase revenue, This has been done through renewable heating and cooling solutions and alternative fuel coupled with investment and energy management of these fuels.

> Hybrid solutions can also be utilized in heating, including the combination of geothermal heat and gas. We are determined to develop products and service solutions that our customers need and appreciate. Energy efficiency, supply security, scalability and low emissions are what natural energy gas solutions are about. At the same time renewable and resource-wise Finnish biogas adds to our energy palette. Building on gas is sustainable – today and tomorrow. The role of Energy Services has been transformed in recent years into a developer and provider of energy-efficient and resource-wise solutions. Our business activities no longer need to be limited to the area covered by the gas pipeline net- work either: new opportunities are opened up by LNG in the Western- Finnish energy sector once our LNG import terminal becomes operational in Pori in 2016. The switchover to gas, appliance installation, maintenance and servicing as well the construction of new distribution networks are the strengths of Energy Services in the new market area (Gassum, 2014, pp.24-25).

The time spread of comments show a range of patterns. Comments from 2012-2015 were 16 in 2012 and 31 in 2015, the number of firms also increased over 2012-2015 with 6 in 2012 and 12 in 2015. Textual themes highlighted that business development policies play a crucial role in fostering positive incentives for businesses to change and improve business models. This further shows, policies can and do benefit if clear arguments and reason for change are given, particularly if they show businesses can still meet stakeholder expectation and policy goals.

Consulting firms provide another area of comment on change from business development policies. Of the 36 firms 27 consulting firms were found to comment on change relating to business development policies. Alfa Laval shows that economic growth has favoured sustainable energy consulting and increased the demand for services to evaluate potential investment opportunities. The growth in

sustainable energy has also created opportunities for consulting firms to increase client efficiencies and provide operational expertise in improving distribution chains and energy efficiency opportunities.

> The world's energy needs are growing, particularly in emerging economies. The International Energy Agency (IEA) predicts that demand will grow by approximately 30 percent by 2040, compared with the current level. Such a sharp increase will present a challenge for the supply chain since it will require greater oil and gas exploration, as well as an expansion of energy production to include alternative sources, particularly renewable ones. Distribution chains also need to be developed. At the same time, greater focus will need to be devoted to energy recovery – in other words, to the development and use of technologies that enable the energy already being produced to be used more efficiently (Alfa Laval, 2015, p.10).

The time spread from comments showed firm counts were lower in 2012 at 34 comments from 16 firms, whilst 2013-2015 comments grew from 39 to 42 per year from 19- 22 firms per year. Consulting firms play crucial roles in translating and evaluating policy impacts, hence clearer roles for consulting firms can potentially to increase policy effectiveness.

Change relating to policy development policies were also found to be prevalent in comments. The policies relating to policy development included: Decarbonisation; Member state effects; Applying targeted, integrated and predictable energy polices; and Tools to respond to price increase. (See Appendix One for policy details). When portraying impacts of business development policies, production and procurement firms can be chosen. Of the 31 firms to comment on policy development, 11 were energy production firms. Pohjolan Voima 2015 comments highlight the intention production firms have to support renewable energy with subsidy and to create barriers for carbon emitting energy in 2015. Hence, energy production firms want a clear plan for investment and the role of subsidy to ensure market stability and assurances for their stakeholders in investments.

> The Government Programme and the supplementary action plan include two projects that are especially important for Pohjolan Voima. The Government has started the updating of the national energy and climate strategy in the project "Towards coal-free, clean and renewable energy in a cost-efficient way". It will submit the project to the Parliament for information at the end of 2016. The Ministry of Employment and the Economy has launched a reform of production subsidy for renewable electricity. A Government bill regarding the reform will probably be given in early 2017 (Pohjolan Voima, 2015, p.23).

The time spread of comments were consistent with eight firms commenting from 2012-2014 and nine in 2015 and the number of comments ranged from a low of 17 in 2014, 21 in 2012 and 2015 to a high 23 in 2013. Overall, textual themes present the argument that engagement with business regarding policy development is critical. As business opportunities can emerge from active engagement and firm clarity is increased.

Of the 31 firms to comment on policy development policies seven were procurement firms. EPV 2015 comments show that the current and past culture for renewable has been one of subsidy dependence as the return on investment, without any subsidy, is still one that is unfavourable for renewables against fossil fuels. EPV shows the critical role subsidies play in providing incentives for energy firms to invest in renewables.

> The current input tariff system is working according to the set targets, and is enabling the construction of new wind power in the current situation, where the price level of electricity on the Nordic electricity market has sunk lower than ever before. Without the tariff, investing in energy generation would be unprofitable regardless of generation method (EPV, 2015, p.26).

The time spread of comments also shows an increase over time from 2012-2014 with a low of 13 comments from four firms in 2012 and a high of 16 comments from six firms in 2014. In 2015 this trend stopped with ten comments from four firms. The demand for changes and effects of policies grew over time, as

procurement firms adapted to the changes in policies. This took several years to implement, but was achieved over the year 2014 as the following year changes comments decreased. Further supporting the practical stance that continual engagement is critical and should never stop as engagement leads to reduced confusion and dialogue about issues with firms and policy makers.

Research policy related comments from production and procurement firms contained themes of change. The policies relating to research included collaborative research as well as industrial and scalable research. (See Appendix One for policy details). When portraying impacts of business development policies, production and procurement firms were used. Of the 36 firms, 12 energy distribution firms commented on change relating to research policies. Valmet 2013 example shows that energy research has been primarily focused on improving energy efficiency and investment opportunities.

> The focus of our research and technology development work is on modularized and standardized solutions, and biomass conversion technologies. We also continuously develop new ways to serve our customers with technical solutions to improve the performance and competitiveness of their existing production facilities throughout their lifecycle. In research and technology development we cooperate with our customers and a network of research institutes and universities (Valmet, 2013, p.14).

The time spread of comments found that 2013 was the highest year for comments on research with 13 comments from seven firms. Whilst 2015 was the lowest at five comments from four firms. The declining comments and textual themes indicate that evaluating new systems and investigating opportunities are not as prominent. As firms have applied findings of research, the range of opportunities has shrunk. Research policy can provide a direction of focus for firms, leading to innovation and growth. Hence, ensuring research aligns with other policy subsidies and stability is crucial in ensuring active research in desired areas.

The theme of change regarding research policies was found in comments of energy selling firms. Of the 31 firms, 13 selling firms commented on change relating

to research policies. Helen Ltd comments show, that research into effective investment for renewables has been critical for energy selling firms to reduce energy prices for consumers and ensuring profit margins.

> Investments in emissions reduction and renewable energy Environmental investments increased considerably from the previous year's EUR 2 million to EUR 10.5 million in 2014. The biggest environmental investments during the year were related to the modernisation of the turbine at Vuosaari B power plant (EUR 3.6 million), the reduction of nitrogen oxide emissions especially in Salmisaari (EUR 3.1 million) and the start of pellet combustion (EUR 2.7 million). Environmental income fell to EUR 0.6 million. The income mainly consisted of grants received for research and development activities and from the sales of scrap (Helen, 2015, pp.4-9).

The time spread comments from energy sellers and research policies showed a range of aspects. 2012-2013 little change occurred with 9 comments from 6 firms, with the highest comment rates found in 2014 with 11 comments from 8 firms. In 2015 the lowest number of firms were found with 9 comments from 5 firms. Textual themes and consistency imply that two key motivators for firms are analyse new opportunities and evaluate risks. This highlights the importance of research policy requiring alignment with other policy areas, particularly financial and economic policies.

Financial policies were found to be prevalent in comments reflecting change from firms. The policies relating to financial included decarbonisation and private investment risk management. (See Appendix One for policy details). When portraying consistent themes from financial policies, consulting and heating and cooling firms were examined. Of the 29 firms commenting, 12 heating and cooling firms commented on change relating to financial policies. Turku Energia's 2014 comment highlights the significant market changes that have occurred from financial investment and support for sustainable energy. This has allowed firms to focus on customer needs in supply and in consumer responsibility.

> We also launched the development a completely new kind of district heat solution in the Skanssi area during the year. Once the project has been implemented it will also increase the use of renewable energy sources and create an operating model which has not been seen elsewhere in Finland. Turku Energia has five strategic objectives for the period 2015-2020. Ensuring a customer-centred operation and customer specific profitability. Increase the generation and procurement of renewable and low-carbon energy. Staff development and improved resource management. Increased reliability and intelligence of energy systems. Development of business and organisational structures (Turku Energia, 2014, p.2).

The time spread of comments showed a insights into textual themes. In 2012-2014 there were ten comments from six firms, rising to 16 comments from ten firms. However, in 2015 there was a drop back to 2012 levels. This supports the textual theme of heating and cooling firms developing understanding of financial policies relating to the 2050ERM. Understanding has become general practice over time and leading to a decrease in discussion as found in 2015. Overall, financial policies play a crucial role in providing consistent and stable incentives for firms to apply resources and execute business opportunities.

Consulting firms also showed different elements of change relating to financial policies. Of the 29 firms to comment, 22 were consulting firms. Gassum 2014 comment presents an example of common themes relating to market opportunities realised. As the demand for gas has grown with the support of the government and business implementation.

> We see biogas as a future opportunity for all responsible enterprises and households. Therefore we will invest in our biogas and transport solutions and ensure increases in biogas capacity as well as developing ways to make environmentally friendly gas-fuelled vehicles a more common sight on the roads. The Finnish Ministry of Employment and the Economy makes a positive investment support decision on the Pori LNG import terminal. At the moment there are 24 gas filling stations in Finland, with 18 of these owned by Gasum (Gassum, 2014, p.7).

Time spread and textual themes showed indicating a range of findings. Comments increased over 2012-2014 with 11 comments from seven firms to 24 comments from 15 firms. In 2015 there was a slight decrease to 20 comments from 13 firms. The time spread and textual themes implied that consulting firms have provided increasing services related to investment risks and decarbonisation opportunities. As the 2050ERM requires significant financial requirements, the need for such services will grow as sustainable energy advances. Hence, consulting firms would benefit in greater awareness and participation in financial policy changes, especially when related to energy production, transmission and research.

Economic policies were found to be prevalent in comments reflecting change from firms. The policies relating to economic included policy impacts on price and investment risks. (See Appendix One for policy details). When portraying impacts of economic policies production and energy selling firms were examined. Of the 30 firms 11 production firms commented on change relating to economic policies. Vattenfall 2012 comment presents a consistent theme in firms seeing changes in the economic viability of sustainable energy. This economic viability has created investment risks in existing energy fossil fuel production and hastened the transition to sustainable energy solutions.

> Vantenfall Goal's - Growth in renewable electricity generation. We can also see that the traditional business model, based on large-scale electricity generation in conventional power plants, is being challenged. Much more subsidised renewable power than expected – mainly wind and solar power – has been added and is putting pressure on conventional gas- and hard coal–based electricity. Due to the elevated business risks for the industry, the estimated value of some of our assets in coal- and gas- red plants has been impaired. As a result, in 2013 we – like many other European utilities – recognised substantial impairment losses. Because of these impairment losses, which for Vattenfall amounted to approximately SEK 30 billion, we fell short of our profitability and dividend goals (Vattenfall, 2012, pp.6-10).

The time spread of comments and textual themes show a range of findings. Comments from production firms were highest in 2013 with 10 comments from 10 firms, and lowest in 2012 at six comments from six firms. By 2015 comments reduced to eight comments from seven firms. Textual themes and time spread implies that economic changes were higher a year after the 2050ERM was introduced. However, this declined over time as business models changed and investments were implemented. Therefore, economic changes towards positive incentives has allowed the 2050ERM goals to be progressively met. Policy makers will benefit if ensuring positivity remains, as it is crucial motivator for firms.

Energy selling firms show that change was prevalent when commenting on economic policies. Of 30 firms 11 were energy sellers, comments related to change from economic policies. Comments from Helen energy show that policy impacts for price have affected margins for energy selling firms, creating higher risks for energy selling firms to ensure that they will not be undercut by subsidies for sustainable energy.

> The market-distorting subsidies for new energies have various, drastic consequences: conventional power plants are being pushed out as it is now practically impossible to operate them profitably. The climate has to cope with more CO2 emissions and the consumer is required to pay more for electricity (Helen energy, 2013, p. 3).

Findings relating to textual themes and time spread were similar to production firms. Energy firms comments were highest in 2013 at 8 comments from 8 and lowest in 2012 with 5 comments from 5 firms. In 2015 comments had reduced to 7 comments from 7 firms. The time spread and textual themes imply that economic changes were consistent in all years but extensively noticed in 2013. However, by providing clearer and consistent incentives for firms, improvements in risk reduction and implementation of economic policy can be fostered.

Guidance policy was found to be prevalent in comments reflecting change from firms. The policies relating to guidance included: Job transition; New energy systems; and Transmission development.(See Appendix One for policy details)

When portraying impacts of guidance policies distribution and heating and cooling firms were examined. Of the 31 firms ten distribution firms commented on change relating to guidance policies. Fortum's 2014 example presents common textual themes that emphasis the role of sustainable energy, in its current and future role and the implications for transmissions grids. Transmission girds are vital to the demand and distribution when overcoming challenges that sustainable energy currently faces. Hence, energy firms see subsidies for sustainable energy playing a significant role in the future.

> We believe that the future energy system will be based on emissions-free and inexhaustible energy sources and on overall efficiency of the energy system. Transitioning to a solar economy changes the way electricity and heat is produced and consumed. A solar economy provides solutions to the challenges of climate change and resource scarcity. Transitioning to a solar economy will take decades. During this time traditional production forms will be further developed and used alongside the production forms of a solar economy. We want to promote both short and long term development of the energy system simultaneously. However, emission-free energy sources that are currently in use or under development are not yet able to fulfil the energy demand of a modern and developing society. The flat electricity price level does not encourage investments in new production capacity. In fact, the majority of new investments in many countries are based on subsidies (Fortum, 2014, pp.23-27).

The time spread also showed in 2014 seven firms discussing guidance policies, whilst in 2013 there was only three firms. The number of comments was highest however in 2012 at ten and lowest in 2013 at five comments. Comment patterns and textual themes imply that over time guidance policies have shown to be effective in promoting new energy systems and energy transmission development. By creating positive guidance policies, policy can portray images of future scenarios and firms can gain understanding and transition to meet this.

Heating and cooling firms also show different aspects relating to change from guidance policies. Of the 31 firms, 11 heating and cooling firms commented on

change relating to guidance policies. Gassum's 2014 comment, presents the consistent theme of gas transmission and the changes that have occurred over time. As push from polices to increase natural gas consumption has provided a boom in demand and opportunities for Gassum and other natural gas heating firms.

> We already master the technology, but the biogas market is still in its infancy. An important role during the transition into carbon neutral society is also played by natural gas – a fuel that burns cleanly and efficiently. Utilizing the gas infrastructure is a major opportunity in the structural change towards renewable, intelligent energy solutions. Gasum owns the Finnish transmission pipeline network and is responsible for gas transmission to customers. In addition to pipelines, the network consists of valve and compressor stations as well as pressure reduction stations located at delivery points via which gas is delivered to customers' networks. Natural gas has already been imported to Finland for 40 years (Gassum, 2014, pp 32-33).

Time spread and textual themes also show a range of findings. Comments increased over 2012-2014 at eight comments from six firms to ten comments from eight firms. Whilst, in 2015 comments reduced to eight and number of firms to seven. The time spread and textual themes implied that increasing consumer demand and subsidy created opportunities have caused firms to increase sustainable heating and cooling options. This supports the importance of positive, clear, constant and constructive guidance polices to promote firm adoption and alignment with other policy areas.

7. Discussion:

The research conducted has presented a range of insights and improvements that can be drawn to existing literature and practices. The common elements present overlapping themes in specific policy effects and impacts for firms. The consistent themes and constructs across policy types provides context for positive and negative effects from a firm perspective and policy sustainability whilst policy level interactions present further implications and commonalities in literature. Additionally, each perspective gives indications of policy strengths, weaknesses,

sustainability and gaps. This chapter will present a discussion of functions, perspectives and effects whilst linking literature and practice on energy policy.

7.1 Overlapping comments in policy type

The results were found to have overlapping links to a range of policies in multiple constructs. The overlapping constructs provide context whilst highlighting the important practical and literary challenges, opportunities and developments occurring in the energy landscape of Finland and the European Union. The specific overlapping policy areas consisted of policy development, economic, informative and business development policies. The overlapping policy areas have had a range of policy impacts for Finnish energy firms. The overlap in constructs can be discussed against literature to present consistency and the relevance of findings. Therefore, the overlap of policy areas provides insights into Finnish firm ambivalence, perspective, conflict and progress towards the 2050ERM gaols.

7.1.1. Policy Development

Policy development was highly referenced by firms in the construct of change and ambiguity. The overlapping policies were found in constructs of change and conflict, specially: Decarbonisation; Public support schemes; Price efficiency; Member state effects; Policy scope being targeted limited and predictable; and Tools to respond to price increases. (See Appendix One for policy details). Within the comments made by firms, themes of risk awareness remained consistent in language.

The extent of awareness of policies are commented as being both negative and positive as the awareness and understanding of impacts is critical to reducing risk and creating positive change in firms. This aligns with Gatzer and Kosbu's (2017) research on risk and investment, as firm understanding of the underlying drivers of policy risks is vital. Specifically, external and internal consideration are economic, technological progress, ideological change and stakeholder involvement. Economically, subsidy sustainability is found to be a consistent indicator of policy duration and industry certainty. Technological progress is closely tied to capital costs, determining continual or upfront subsidy support. Ideological changes relating to equity of living standards and individual costs to increase adoption and

infrastructure development. Stakeholder involvement when understanding public, government and private actors, as high stakeholder involvement creates awareness, opportunity realisation and feedback (Gatzert & Kosub, 2017). As firms understand these areas, positive outcomes are achieved and realized due to effective resource and time management.

Furthermore, through active policy engagement business opportunities can emerge as participation allows learning, adaptation to needs, service improvement, satisfaction, and information for firms (Yetano, Rovo & Acerete, 2010). Such an engagement theme emerged in the consistent willingness of firms to support sustainable energy infrastructure investment when combined with subsidy. This aligns with McEachern and Hanson (2008) finding individuals and groups involved with communication channels had higher tendencies to adopt sustainable energy than those who were uninvolved and isolated. However, this is countered by uncertainty of subsidy and investment return. This can be seen in firm comments discussing sustainable energy support which indicate that the current and past culture for sustainable energy has been one of subsidy dependence for achieving a return on investment. Without any subsidy, the current situation is still unfavourable for sustainable energy against fossil fuels as the full life cycle costs of renewable energy still does not match the costs and return on investment that fossil fuels provide (Pacesila, Burcea & Colesca 2016). Hence, Finland still requires subsidy policies to stimulate grow sustainable energy (Pipola, Lund, 2018).

The very nature of sustainability development requires engagement from stakeholders (Barr & Stewart, 2016). Specifically, all stakeholders must be involved, participate, and support policy. Engagement literature focusing on policy development consistently finds Nordic firms are amongst the highest in the EU for policy engagement practices and processes (Sataøen, et al., 2015). Consensus in literature finds that the time given to facilitate and discuss the impacts and implications of energy policy is a core process in sustainable policy development (Sataøen, et al., 2015; Kangas, Lazarevic & Kivimaa, 2018). However, Kangas, Laxarvic and Kivimaa (2018) Finnish research finds there still exists ineffective relationships in the energy industry as ineffective relationships and communication must be constantly managed between policy creation, intention and standards. This is

specifically seen in Finnish studies showing the existence of restrictive technological options and abridged requirements on infrastructure.

Engagement is also fundamentally affected by firm willingness to conduct research and increase interconnections between countries. The market push of firms is primarily focused on two areas, profit creation and efficiency improvement (Hills & Michalena, 2017). Should firms be unengaged and uncertain on continuity of subsidy, efforts to be involved will be constricted. This then acts as a catalyst for the development of investment policy and economics. This was consistent with themes of uncertainty in disproportional return on investment. Specific policy areas affected by this are decarbonisation and generation as firms hesitate to change practices. Firms may therefore benefit if uncertainty in policy development is reduced, as this allows firms to pursue a strategic path for investment with more confidence that will lead to decarbonisation of power systems.

7.1.2. Economic (ambiguity, change)

Overlapping economic measurements were found relating to a range of polices. Economic policy measurements related to the constructs of ambiguity and change. Homogeneous themes of price, consistency and investment were found in comments relating to a range of economic measurement and 2050ERM subtype polices. These policies consisted of price effects and investment risk. (See Appendix One for policy details). Furthermore, themes aligned and built upon a range of literature regarding carbon emissions management, investment dynamics and technological stimulation.

Emission trading policy effects were found to be both negative and positive in a range of comments as there is restricted trading of emissions on the spot markets and futures, per European Union Law (Directive 2009/29/EC). Limits on carbon emissions within the European Union have created an opportunity for large energy producers to sell carbon emissions and create the world's largest carbon pricing scheme with 31 countries trading emissions, based on current and future emissions awarded and owned by firms within the countries. This system is commonly referred to as the European Emissions Trading Scheme (EU ETS) (EUROPA, 2018). There are a range of price and investment effects associated with this policy. To manage

this risk, firms place costs on consumers to varying extent. As Daskalakis (2018) highlights, the futures market to a degree hedges opportunity costs, and if costs are disproportional consumers are at risk of wearing costs. Whilst the emission trading effects carbon and energy prices, emissions trading is also greatly affected by other policy areas relating to investment and subsidy.

Energy security is tied to the emission trading scheme of the EU and therefore the economy. This creates concerns from firms, public and governments in policy relating to carbon dioxide and energy demands (Aslani, Helo, Naaranoja, 2014). There are a range of economic implications from emissions trading and carbon emission restriction and reduction policies. Emissions reduction and technology development are at the core of the European Commission's emissions trading scheme. Calel and Dechezleprêtre (2016) finds that there are differences between firms who are involved in the EU ETS compared to those who are not. Only large energy producers are required to enter the EU ETS whilst other smaller operators can operate outside the EU ETS framework. Additionally, significant differences occurred in patent and innovation records, showing correlation that the EU ETS motivates large energy producers to increase innovation.

Research has also found that intertwined polices support and restrict the intent of the EU ETS. Specifically relating to feed in tariffs, bidding systems and green certificates (Ragwitz et al., 2007). Firm comments highlighted this effect in a range of energy types. Firms are focused on potential price undercutting from policy mix. EU ETS research findings show synergies and interactions, particular EU ETS and renewable and efficiency policies (Marcantonini, Teixido-Figueras & Labandeira, 2017). Marcontonini et al. (2017) found research and development subsidies are the most effective and that policies tend to create higher implicit prices than the EU ETS (2017). Hence these aspects effect firm decisions to invest in specific renewables.

Firm investment decisions based on EU ETS and other regulatory dynamics can be further explained by homogeneous patterns found in literature. As firms by default aim to serve their stakeholders, policy uncertainty effects these decisions. Recent research, finds policy uncertainty has no significant effect in increasing

investment related to a firm's decision to invest (Lopez, Sakhel & Cusch, 2017). Hence, firms' comments on economic viability of sustainable energy, specifically solar panels and wind power support such literature. This has created a 'chicken and egg' scenario for alternative sustainable energy investments. In summary, investments have been constricted and hindered by regulatory uncertainty and poor political processes found in policy development areas.

7.1.3. Informative (ambiguity, conflict and change)

Informative policies were also found relating to constructs of change, conflict and ambiguity. Within informative policies there were a range of policy subtypes referenced, such as: Oil reduction; Modernising energy systems; Decentralisation; increasing renewable energy; Decarbonisation; Smart grids; Oils future role; Substitution of coal and oil with gas; Increased ICT; Renewable heating a cooling solutions; Air and health benefits; Intermittent energy management; and Alternative fuels. (See Appendix One for policy details). The themes of technological subsidy, price, and investment context emerged from firms comments.

Technological subsidy plays a critical role in promoting sustainable energy adoption. Comments showed issues relating to both subsidy and financial return for firms. As previously mentioned, technological development can been adversely affected by political uncertainty, countering the desired policy outcomes. Nordic market maturity is the highest in the EU, as demonstrated by high adoption of sustainable energy technology. Consistently, there is uncertainty in energy efficiency policies, as significant market opportunities have been exploited previously (Thollander, Rohdin & Moshfegh, 2012). Furthermore, strategic intent relates to successful technological efficiency implementation (Thollander et al., 2013). Successful, informative policy measurers consistently focus on financial early market adoption incentives (Grod, Stucki & Woerter, 2017). Specific energy areas emerged in comments on investment and price effects relating to technological innovation and efficiency in the context of informative policy measures.

Prevalent examples of price effects were mentioned by firms relating to Nordic hydroelectric energy sales at a commercial, domestic and export level. As, biomass, hydro power, wind power, and transportation fuel are key pillars in current

and future emissions reduction (Pipola, Lund, 2018). Combine this with interconnection increases between Nordic countries, so too will neighbour policy effects increase (Unger et al., 2017). Firms commented that hydropower prices affected investment, as increases in Nordic spot prices of hydropower capacity significantly reduces the prices in neighbouring countries (Gaabak et al., 2017). Subsidy uncertainty and hydro energy diversity and price have affected modernising energy systems, creating potentially higher risks compared to a diversified sustainable energy mix.

Decentralisation of power and modernising energy system have also effected price security within Finland. Firm comments highlighted themes relating to price issues for expected and forecasted future energy trends. Finland's current power system is already based on co-generation, giving it a head start in decentralisation of energy systems (Rämä & Wahlroos, 2018). However, significant development is needed still to reach 2050ERM goals (2050ERM, 2012). The core issues faced by firms is the need for consistent capital investment and policy certainty to modernise energy systems. As previously discussed, uncertainty creates a range of issues around investment progress and speed. The issues relating to capital is simply related to the capital needed to build, research and integrate capabilities for a modern energy system. Policies can both slow and speed this progress, as financial incentives and investment support will speed the energy modernisation process up (Haapaniemi et al., 2017). Policy plays an important role in reducing the cost bearing on consumers and allow the price of electricity to stay competitive to fossil fuels (Ropenus et al, 2016).

Consistent comments on smart grids (SG) demonstrates both efficiency and modernisation practices and perspectives. Smart grids are seen as a core competency of the 2050ERM, providing increased profits, efficiency, modernisation, decarbonisation and business development opportunities (2050ERM, 2011). Whilst for policy makers, SG provide detailed information for precise and accurate incremental policy to be developed and executed (Eid, Hakvoot & Jong, 2017). SG are expected to increase in Finland and provide a critical foundation for policy makers and firms today and increasingly in the future (Colak, et al., 2015).

7.1.4. Business development (change, conflict)

Business development was the last policy area to have overlapping constructs. Business development policy measurements were consistent in constructs of change and conflict. Policy subtypes relating to these constructs consisted of: ICT development; Role of electric vehicles; Renewable heating; Intermittent energy management; New power system investment; Air and health benefits; and Alternative fuels. (See Appendix One for policy details.) Consistent themes in business development policy measures were subsidy consequences, strategic context, product and service development.

Subsidies are noted as important policies in the literature and by firms for business development. The range of effects, barriers and limitations of subsidies can be seen in different technologies. As solar, wind hydro and bio-fuels are the core technologies, literature on subsides within Finland and Nordics for business development provide points of discussion. Solar subsidies have been applied in the Nordics but are lacking in Finland. Misconceptions of solar ?efficiency at high latitudes has slowly decreased over the decades. However, Finland has not subsidied solar systems (Child, Haukkala & Breyer, 2017). This has caused conventional sustainable energies such as bio-fuels, hydro and wind to be supported in Finland. As a result, payback periods are decades long. Hence, financial incentives, if introduced, will need to provide a payback period of three-five years, before large domestic and commercial adoption ?of solar will occur (Hirvonen, et al., 2015).

Finland has provided a range of subsidies that support business development. Preferential loans and capital gains grants have been used to promote the business development of wind. This has been applied with both feed in tariff and portfolio standards to promote business development of wind energy generation in Finland and the Nordics (Li, et al., 2017). Specifically, these subsides have only applied to large scale and industrial operations, limiting domestic adoption (Ratinen, Lund, 2015). Furthermore, hydropower subsidies have also only been for commercial focus. Hydropower has been traditionally part of the energy mix due to Finland's natural geography (Helynen, 2004). Hydropower has been supported by feed-in-tariffs, but processes to improve and expand operations have been fraught with complications (Puheloinen & Ekroos, 2011)

Lastly, bio-fuels have been a core past and current business development area with a long history of subsidy in Finland and the Nordics. This has consisted of research funding, taxation and subsidies for forest chip energy. Subsidies for investment and taxation exemption have been applied over the decades in Finland. However, forest chip energy has had growing regulation on practice and environmental impacts to ensure sustainability of the industry and are expected to become industry standards by 2020 (Karhunen et al., 2014). The subsidy focus has been on harvesting fuels, this has been aimed at promoting both small and large-scale wood harvesting operations. Finnish subsidy goals and intention have been to promote industry growth to a point that no longer needs subsidisation due to scale and efficiency practices (Ranta, Karhunen & Laihanen, 2017).

Business development policy have also been applied and affected consulting services within the energy industry in Finland and EU. Comments highlighted the role consulting firms play in translating and evaluating policy impact and implementation for their client's context. Within the EU, consulting firms have been used as accredited policy informers, causing issues with information asymmetries and low willingness to pay (Feser, Runst, 2016). Furthermore, consultants have been under market pull rather than push particularly in heat management practices (Heiskanen et al., 2017). However, firms also commented on positive economic growth favouring renewable energy consulting, resulting in increased demand for services to evaluate potential investment opportunities. Also, energy auditing has also provided opportunities for consulting firms to recommend new technologies and efficiency, improving information asymmetries for policy measures in the EU and in industry (Feser et al., 2016).

Research and development (R&D) was also a common theme of discussion in relation to the need to adapt to expected and new market requirements emerging from the 2050ERM. Firms will need to spend time understanding indirect and direct effects of business development polices to ensure comprehensive planning and resource application. Subsidies have played an important role in Finland, providing positive and guiding support for R&D (Czarnitzki, Ebersberger & Fier, 2007). However, deregulation effects on R&D have caused firms to focus on shorter term

developments rather than larger commercial and innovation opportunities (Dooley, 1998). This in turn risks goal attainment of the 2050ERM. Europe has particularly struggled with R&D, due to market liberalisation causing conflicting demands. Research finds, liberalisation has caused public distrust, confusion and cynicism both within firms and from towards R&D policy (Apajalahti, et al., 2015).

7.2 Core positive themes

Positive comment and outlook were found consistent with the results across a range of constructs and policy categories indicating 2050ERM sustainability. As, the sustainability of a policy requires economic development whilst protecting the long-term value of the environment (Emas, 2015) The positive comments related to resolving conflict and ambiguity and positive change. To evaluate the sustainability of the 2050ERM as a policy, constructs of change, conflict and ambiguity provide thematic areas for discussion. As a result the existence of positive actions, intention and perspectives from firms provide insights and support for specific policies and their sustainability.

Fundamentally, sustainability requires and manages change, but the implementation of change is fundamental success. At implementation's core, change can be referred to as the amount and the consensus of change achieved, expected or needed (Metre & Horn, 1975). Natural gas and alternative fuels provide a clear example of such change. Finland has a significantly large natural supply of bio-fuels and natural gas, which are core energy fuels outlined in the 2050ERM (Finland Export, 2017). Policy for natural gas and alternative fuels has been supported by progressive SEP that is co-integrated. Research has been focused on finding dynamic and integrated policy's to provide positive development for economies and a sustainable energy transition (Hamdouch & Deprets, 2010). Taxation production subsidy have been highlighted by researches for the success of natural gas and alternative fuels within Finland (Karhunen et al., 2014; Ranta, Karhunen & Laihanen, 2017).

Technological developments provide opportunities to shed unsustainable practices and increase efficiency. For example, both government and firms are benefiting from increased efficiencies and measurement capabilities from SG. Smart

girds are playing an increasingly important role in shaping and reporting for informative polices in the EU and in Finland (Eid, Hakvoot & Jong, 2017; Colak et al., 2015). This has also assisted the sustainability of polices relating to price and investment, reducing ambiguity and conflict. As resistance to investment price impacts have been a constant challenge and uncertainty for firms, there has however been a range of positive outcomes from investments and price impacts. As informative polices and technology have improved, so too has information asymmetries on price and investment risk and opportunities. Research has also noted that the incremental stance of the European Commission on energy polices has, in general, assisted firms in positive improvement and goal attainment of European Commission policies (Eberlein, 2012). Therefore, research has played a significant role in reducing information asymmetry by evaluating technological opportunities that are supportive to firms and improve feedback for policy sustainability.

Findings showed consistent discussion around implementation of investments in sustainable energy generation. Textual themes focused on ideation and efficiency opportunities for firms, such as product lifetime and infrastructure adaptation. This has been seen by investments having specific positive opportunities causing the growth of wind generation, bio-energy and hydro power generation. Arguably, this is due to the sustainability of Finnish policy frameworks and proactive and active investment portfolios by firms. Therefore, the literature and findings present arguments for the sustainability of the 2050ERM policy goals. However, there are a range of ambiguity change and conflicts that are counter to the sustainability of the 2050ERM policy goals.

7.3 Core Negative themes

There were a range of negative themes that emerged from firm comments across policy areas. Specifically, these were price effects and investment uncertainty. Negative themes provide insight into the policy sustainability that the 2050ERM faces currently and will face along the road to reach the EU goals for climate change and energy capabilities. By understanding, evaluating and recognising the negative themes, policy makers and firms have the opportunity to learn and prevent issues whilst minimizing the resources needed to implement the goals of the 2050ERM.

Furthermore, the core negative themes provide insights into the flaws and issues relating to the implementation of the 2050ERM in Finland.

Price effects are a main objective and outcome expected in the 2050ERM. There are a range of consequences and conflicts from change that have emerged from comments, which in turn potentially affect the implementation and success of the 2050ERM. Price effects are directly related to the subsidies. In practice, this is beneficial to firms in creating certainty in the marketplace. But, negative effects were noted when subsidy parity is removed by other EU member states. This is noted with energy price effects from hydro and wind energy generation (Lopez, Sakhel & Cusch, 2017; Unger et al., 2017; Gaabak et al., 2017). This is a critical issue faced within the EU for policy sustainability. The tension and risk for conflict has also increase over time, as interconnections and energy trading has increased in the Nordics and within the spot market (Unger et al., 2017). Specifically, significant concern in firm comments focused on price. As support for technology shifts and neighbor policies have decreased profit margins and increased market risks. Though conflict is expected, mitigation and reduction should be encouraged by polices and firm investment mix (Eberlien 2012). Therefore, greater cohesion and informative processes will be needed to mitigate conflict and negative effects that currently effect Finnish firms and policy sustainability (Flatabo et al., 2013).

Flow on effects from price uncertainty and policy conflicts have negatively impacted investments. Investment sustainability is critical to the sustainability of policies to reach the 2050ERM goals. As with price effects from subsidy, so too does subsidy effect investments. Themes consistently highlighted uncertainty in sustainable energy options, which counter EU and Finnish policies that aim to incentivise firms to invest in sustainable energy as subsidy is noted to be prevalent for hydropower and wind (Lopez, Sakhel & Cusch, 2017; Unger et al., 2017; Gaabak et al., 2017).

Whilst solar investment policies are noted as severely lacking and non-existent within Finland (Child, Haukkala & Breyer, 2017) causing solar investments to only be applied in domestic settings by individual actors (Ferrantelli et al, 2017). Additionally, member state effects also relate to investment policy outcomes and market conditions in Finland. This is specifically seen in wind from German subsidy

and Norwegian Hydro (Gaabak et al., 2017; Unger et al., 2018. Therefore, the assurance of subsidy support and a clear intention of a subsidies future are core ingredients that Finnish and EU policy makers must aim to improve and address to ensure policy sustainability and goal attainment of the 2050ERM.

7.4 Policy levels and firm interaction

The very nature of the European Commission and its structure requires significant effort and resources to ensure policy level interaction. The firm interaction between these levels is not intrinsically complimentary. Hence, textual themes highlighted in the findings provide insights into firm perspectives of policy maker and the extent of their direct and indirect engagement between policy levels. Specifically, communication, consistency and clarity were found to be core themes relating to policy level firm interactions at a direct and indirect level. The importance of level interaction is noted as one of the greatest challenges faced, due to the requirements initiatives of the 2050ERM and other significant future policy goals around the world (Fragkos et al., 2017).

To begin understanding the gaps, challenges and strengths of firm implementation of the 2050ERM a definition of direct and indirect interactions between policy levels can be presented. The relevant policies layers within Finland and the context of the 2050ERM can be defined as: The Finnish Finnish Ministry of Economic Affairs and Employment; The Energy Authority of Finland; The Nordic Cooperation; and the European Commission (Kiss, Grueso, & Vorsatz, 2013; Richard & Mazey 2015). Indirect and direct interactions between institutions can be defined as processes associated with policy intent and that have impacts on the context, strategy, intent and actions of institutions involved (Evans, 2009). This justifies the importance and significance of communication, consistency, clarity of polices for firm implementation.

Communication between firms and policy levels is critical for positive, effective and lasting implementation of policy. Textual themes from findings and insights from literature show that communication should be passed on to associated levels, allowing learning and issues to be resolved pre-emptively and efficiently as communication can reinforce the development and trajectory of policies (Stephenson

et al., 2010). Strengths do exist within the Finnish context particularly in communication between firms and policy levels relative to other EU members (Sataøen, et al., 2015). Researchers believe this is partially due to energy citizenship, as smart meters, electric vehicles and consumer awareness have created a wave of positive and constructive opportunities for firms and induvial to participate and thereby communicate with institutions (Ryghaug, Skjølsvold & Heidenreich, 2018). Therefore, communication between policy levels and firms have found positive pathways for firms to communicate about the 2050ERM goals in indirect and direct ways.

There was no direct mention of consistency between policy levels by firms within the data. It can be noted that consistency is directly related to policy levels. From the firm perspective consistency provides assurances of direction and continuity of polices. At a policy maker level, consistency ensures reduced conflict between firms and institution and smother implementation of policies. Again the Nordics have been notably effective in developing consistent polices between cross border, national and supranational levels (Kangas, Lazarevic & Kivimaa, 2018). However, as previously noted within price effects and investments issues do still exist (Lopez, Sakhel & Cusch, 2017; Unger et al., 2017; Gaabak et al., 2017; Ferrantelli et al, 2017; Unger et al., 2018).

Clarity is also core to effective implementation and construct and positive engagement with firms. Textual themes consisting of clarity were consistently referenced within a range of polices. Clarity is shown in literature as a core component of the European Commission's intent, purpose and goal regarding energy policies (Hogl, Kleinschmit & Rayner 2016; Dupont, 2015). Furthermore, research has shown that clarity and intention of outcomes have played a major role in policy outcomes within the EU and in Finland (Boasson, Wettestad, 2016). Hence, clarity provides a clear motivation for firms to act, as it is relevant for all levels of the EU and associated institutions to insure the implementation of the 2050ERM within Finland.

7.5 Gaps in policy and practice

Textual themes on a range of policies relating to the 2050ERM found gaps in capabilities and expectations of firms and policies. This emerged through both the lack of and existence of themes relating to firms and policies strengths and weaknesses in implementation. Specifically, gaps were found to relate two specific areas. Firstly, member state policy cohesion and, secondly, technological capabilities. Gaps present expected pitfalls and future issues that firms and policy makers will face along the way to achieve the 2050ERM.

Firstly, member state cohesion is commented on as having vast inconsistencies. Policy cohesion has already been recognised as a current issue. However, the evaluation of cohesion gaps presents a greater picture of implementation challenges firms and policy makers will face. The extent of sustainable energy capabilities is heavily influenced by policy cohesion amongst member states (2050ERM, 2017). Studies conducted by the European Commission CECILIA 2050 state that "In a fragmented world, without comparable policies in the rest of the world, the effect of ambitious EU climate policy on the competitiveness of energy-intensive and trade-exposed sectors may be negative in the long run" (CECILIA, 2015 para.1-3).

European Commission policy gave been focused on climate change adaptation and technological developments, though there are still issues with barriers in technological integration and highly regulated frameworks (Pereira, Patrícia Pereira da Silva & Soule, 2018). This is arguably due to policy issues relating to the European commission goal to create a single market for energy in the EU, causing both member state and firm resistant and conflict (Bouzarovski, 2017). Overall, there have been fundamental internal challenges the European Union and Commission have faced recent years at a policy level. However, there are also gaps that can be highlighted in existing policy levels at a Finnish and Nordic level. Hence, improved communication and admission of market restriction needs action from policy makers and firms to ensure the success and implementation of the 2050ERM.

The policy level dynamics can also be seen when looking at the Nordic Cooperation and Finnish National policy. Greater policy cohesion is needed in

informative policies and subsidies, as they are key for Finnish firms to stay profitable and competitive, whilst allowing the government to promote positive growth and cooperation (Parks, 2017). At the Finnish national level, broader subsidy and informative policies for underdeveloped technologies are prevalent in Finland (Child, Haukkala & Breyer, 2017). Overall, all policy level dynamics must be constantly refined as technologies emerge and market conditions change (Meter & Horn, 1975).

Secondly, themes relating to technological gaps emerged from comments. Technological capability is fundamentally needed and expected to achieve the 2050ERM. Textual themes showed a range of gaps in implementation and capabilities that firms have, to meet the goals of the 2050ERM. This was seen in specific technological areas of carbon capture and storage and energy storage capabilities. Furthermore, there is a significant amount of literature on the issues relating to technological gaps (Šćepanović, Warnier & Nurminen, 2017). However, the emerged themes provide further reinforcement of specific issues for how policy expectations are not being met by industry.

The role of carbon capture and storage (CCS) is noted as a critical area in meeting the goals of the 2050ERM in emission reductions (2050ERM, 2011). However, of the firms used in this study, there were limited references to CCS. Of those that referenced CCS, comments highlighted commercial issues around economic availability and technological capabilities. At a policy level recent study have noted that CCS needs radical cost and regulatory innovation to impact on climate mitigation targets (Stuart, et al., 2018). However, industry research on a range of CCS technological options consistently state that technological capability and understanding is still at its infancy and significant development is still needed (Fridahl & Lehtveer, 2018; Akbilgic, et al., 2015).

Though CCS has a range of capability and policy gaps other technological areas were noted by firms. Battery capacity and energy storage is another core theme emerged in technological gaps from firms. This is mentioned with abundance in energy capabilities from renewable energy, but a limited capability in storage the energy produced (Gelazanskas & Gamage, 2014). This comes from the fact that

wind, solar and hydro to an extent are intermittent energy production, as only geothermal and natural gas can consistently produce energy (Chel & Kaushik, 2017). Requiring energy inconsistency requires different energy management and transmission practices.

Smart grids will, and are, playing an increasingly important role in modern energy systems (Eid, Hakvoot & Jong, 2017). Batteries allow a such energy to be stored and then used when wind, solar and hydro are not producing. However, the sheer amount of storage and cost associated is currently not sufficient (Baumann, 2015). Other storage options, such as super capacitors, energy to heat and fuel creation also present further technological opportunities. However, these too lack mass scale and affordability (MacFarlane et al, 2016; Dincer & Acar, 2015; Pardo et al, 2014) .

In Summary, the gaps in Finland must be addressed for the successful implementation of the 2050ERM. To address these issues, both firms and policy makers must work together to develop plans and solutions. This can be achieved through increased awareness, engagement and support. Firstly, member state cohesions requires a significant increase in involvement from not just Finland but the Nordics and other EU member states. As increased involvement allows, policy makers to promote a diverse sustainable energy mix, improved taxation management and collective subsidy incentives. Secondly, this has the potential to improve the gaps found regarding technological capability. As coherent justification, incentives and increased dialog with policy makers and firms can bring forward viability and capability issues. These issues are significant barriers towards meeting goals of the 2050ERM regarding energy transmission, renewable energy share and carbon emission reductions.

8. Conclusion:

This research has aimed at developing a firm perspective of policy implementation relating to the 2050ERM. The contextual approach of content analysis with the data collected provides insights into firm implementation relative to awareness, attitudes and actions in relation to the 2050ERM. In so doing, examples of implementation impacts were found. These impacts were related to investments, strategic pathways, policy sustainability, national and supranational synergies and firm capability gaps.

Investment decisions and strategic pathways can be considered two of the most fundamental aspects that firms must consider and execute in meeting the 2050ERM goals. As the strategic pathway creates understanding for firms, policy makers and consumers as too what current and future energy industry will look like. With this strategic element investment decisions can be made and executed by firms and supported by governments. However, importance must also be placed on continual feedback between stakeholders on subsidy, technological capabilities and limitations as the issues of conflicting polices, market place disparities and realistic policy formation can be assisted and reduced.

This research has found the sustainability of the 2050ERM in Finland still requires significant support from synergistic development to ensure goal attainment. Greater support should be given to developing Finland's abundance of bioenergy and support for technological research and development. However, issues of price, investments would benefit if addressed. As price issues and narrow subsidy support have limited the diversity of energy systems.

The level interaction between policy levels was found effecting firms. As by default supranational policy levels must engage in interactions with other policy makers. However, the extent of interaction was found to be crucial towards the clarity and intention of the 2050ERM. Clarity fundamentally affects investment decisions of firms and therefore effecting emission targets, distribution and generation targets of the 2050ERM.

The policy gaps showed insights into stakeholder interaction, technological capabilities. Policy cohesions between member states, showed effects on investment decisions and price disparities between technology development. Gaps in technological capabilities emerged in CCS commercial viability, and energy storage limitations for energy management and infrastructure modernisation.

Therefore, the research conducted has shown a range of implementation aspects of the 2050ERM for specifically Finland and commercial operators. The study utilised methodical approach of content analysis which has revealed Finnish firms awareness, attitudes and actions relating to the 2050ERM. It is the hope that this research will contribute to the understanding of firm implementation challenges and succusses, whilst helping policy makers gain a deeper understand of how actors can and will implement disruptive and industrial changes.

8.1 Directions for future research

The research conducted, sought to contribute to the body of policy implementation research and sustainable energy. The research found positive and negative impacts related to investments, strategic pathways, policy sustainability, national and supranational synergies and firm capability. These findings provide a basis for further research to be conducted on the broad area of the 2050ERM and specific elements presented in the findings.

The implementation areas noted in this research have potential for additional research. Such research can occur both at a Finnish and European Union level. To expand this research, further focus on understanding the motivations and justifications in specific areas found in the findings, such as: Investment decisions; Strategic pathways; Policy sustainability; and Supranational synergies. This research has not provided representative evidence for justification or reasoning of decisions by firms. To achieve a representative study that expands on the findings of this research interviews could used. This study was also limited by the language and depth of discussion of annual reports rather than specific firm discussion on implementation from an internal perspective. Such evidence and research can build upon academic and industry understanding of why success and gaps have occurred.

Additionally, the replication of this research has potential for further contributions. Specifically, the replication across different time periods and member states provides an opportunity to expand and compile comprehensive understanding of sustainable energy policy implementation, whereby, researchers, policy makers and firms can compare, contrast and validate issues and opportunities relating to the implementation of the 2050ERM. Specifically for Finland, the replication of this research would allow validation of persistent issues and gaps that have been highlighted in implementation.

9. Appendices:

9.1 Appendix 1; Full policy goal statements

European Commission 2050 Energy road Map Goals	
Policy Type	Policy Statement
Regulatory	The EU is committed to reducing greenhouse gas emissions to 80–95% below 1990 levels by 2050
Regulatory	Decrease in energy demand of 41 % by 2050 as compared to the peaks in 2005–06
Regulatory	Renewable Energy Share in gross final energy consumption 75 % in 2050.
Regulatory	Carbon capture and storage (CCS), if commercialised, will have to contribute significantly in most scenarios with a particularly strong role of up to 32% in power generation
Regulatory	An overall increase of interconnection capacity by 40% up to 2020 will be needed, with further integration after this point
Regulatory	the 2050ERM helps in reducing the import dependency and exposure to the volatility of fossil fuel prices.
Regulatory	Carbon pricing can provide an incentive for deployment of efficient, low-carbon technologies across Europe.
Economic	The second is the impact on wholesale market prices of RES generation and concerns about price volatility for investors, and the ability to recover capital and fixed operating costs
Informative	Decentralisation of the power system and heat generation increases due to more renewable generation.
Informative	In 2030, all the decarbonisation scenarios suggest growing shares of renewables of around 30% in gross final energy consumption.
Informative	To accommodate renewable production locally, the distribution grid needs to become smarter to deal with variable generation from many distributed sources such as, in particular, solar photovoltaic, but also increased demand response.
Informative	Substitution of coal (and oil) with gas in the short to medium term could help to reduce emissions with existing technologies until at least 2030 or 2035
Informative	Scenarios indicate that modernizing the energy system will bring high levels of investment into the European economy.
Informative	Oil is likely to remain in the energy mix even in 2050 and will mainly fuel parts of long-distance passenger and freight transport.

Research	Support should be given to research and demonstration at industrial scale.
Research	On the European level, the EU should contribute directly to scientific projects and research and demonstration programmes, building on the strategic energy technology plan (SET-Plan) and the next multiannual financial framework, and in particular Horizon 2020, to invest in partnerships with industry and Member States to demonstrate and deploy new, highly efficient energy technologies on a large scale
Financial	Decarbonisation can be an advantage for Europe as an early mover in the growing global market for energy-related goods and services.
Financial	Investment risks need to be borne by private investors, unless there are clear reasons for not doing so. Some investments in the energy system have a public good character. Thus, some support for early movers may be warranted (e.g. electric cars, clean technologies)
Policy Development	Public support schemes in Member States should be clearly targeted, predictable, limited in scope, proportionate and include phase-out provisions
Policy Development	The tools to respond to price increases by improving energy efficiency and reducing consumption have to be in place.
Policy Development	Decarbonisation can be an advantage for Europe as an early mover in the growing global market for energy-related goods and services.
Policy Development	Energy policy developments need to take full account of how each national electricity system is affected by decisions in neighbouring countries. Working together will keep costs down and ensure security of supply.
Guidance	The extension of current planning methods to a fully integrated network planning for transmission (onshore and off shore), distribution, storage and electricity highways for a potentially longer timeframe will be needed.
Guidance	Mechanisms that help workers confronted with job transitions to develop their employability are needed
Guidance	new energy system, a new conguration of decentralised and centralised large-scale systems needs to emerge and will depend on each other, for example, if local resources are not sufficient or are varying in time
Business Development	Renewable heating and cooling are vital to decarbonisation. A shifting energy consumption towards low carbon and locally

	produced energy sources (including heat pumps and storage heaters) and renewable energy (e.g. solar heating, geothermal, biogas, biomass), including through district heating systems, is needed.
Business Development	An increasingly important feature of the required technology shifts is the use of information and communication technologies (ICT) in energy and transport and for smart urban applications
Business Development	Another area of special importance is the shift towards alternative fuels, including electric vehicles
Business Development	The need for accessible resources in the power system (e.g. accessible generation, storage, demand management) as the contribution of intermittent renewable generation increases
Business Development	To exploit renewable electricity from the North Sea and the Mediterranean, significant additional infrastructure, notably subsea, will be needed.
Business Development	the 2050 ERM brings significant air pollution and health co-benefits.
Business Development	There is a need to invest in new renewable technologies, such as ocean energy and concentrated solar power and second and third generation biofuels. There is also a need to improve existing ones, such as by increasing the size of off shore wind turbines and blades to capture more wind and to improve photovoltaic panels to harvest more solar power.

Nordic Cooperation Strategy 2050		
Year	Policy type	Disclose statement
2010-2013	Economic	Sparsely populated areas: The aim of the Nordic energy co-operation in sparsely populated areas is to ensure environmentally sound and efficient energy systems in parts of the Region that are not linked to a continuous distribution grid, or that only have weak and vulnerable access to a wider transmission network.
2010-2013	Economic	Intenal Cooperation: International marketing of the Region's energy solutions and creative potential shall enhance export opportunities and economic growth, and will profitable the Nordic Region as sustainable and technologically advanced.
2010-2013	Guidance	Renewable Energy: The Nordic countries shall co-operate to ensure the smooth integration of renewable energies into the energy systems. This shall be achieved through better coordination of decisions, planning and tools related to the development of renewable energy and the electricity market.

2010-2013	Informative	Renewable energy: The Nordic countries shall work to promote renewable energy via joint efforts to improve the preconditions and competitive situation for renewable energy. The countries must strive to co-ordinate initiatives and tools to the extent to which it is beneficial. Nordic exchanges of experience about tools, support systems, planning, implementation and integration are key to the co-operation. The Nordic countries shall work to create favourable conditions for technological development and innovation in this area. Continuing investments in grid upgrades and the integration of renewable energy sources fuelled an 18 percent (12 per- cent in local currencies) orders increase in the Power Systems division...Europe declined 11 percent (6 percent in local currencies) despite increases in Finland and the U.K., as a $1 billion offshore wind order in Germany received in 2011 was not repeated in 2012, as well as on lower orders in Sweden, Norway and Italy.
2010-2013	Research	Research and technology development: The Nordic Region shall strengthen its position by developing internationally competitive skills and knowledge environments for effecient, sustainable and clean energy technologies and systems.
2010-2013	Research	Research and technology development: Nordic co-operation shall build on national initiatives in technology development and contribute to the effective overall use of resources. The research shall focus on areas where Nordic synergies can be created, and where they can contribute to critical mass, increased impact and greater visibility in knowledge development and dissemination.
2010-2013	Research	Research and technology development: The primary focus in this work will be on the Nordic Region in a European context. The secondary focus will be on cooperation with relevant countries with whom the Nordic Region shares a common interest in developing efficient, sustainable and clean energy technologies.
	Research	Research and technology development: Co-operation on research and development shall underpin national and Nordic energy policy and provide decision-makers with access to significant and topical research results. This cooperation shall make it possible for the Nordic countries to adopt coordinated or joint positions, both in international forums and in dialogue with key international partners.

2010-2013	Research	Research and technology development: The co-operation must, through continuous dialogue between research, the energy sector and society as a whole, act as a catalyst for creating conditions that ensure that Nordic energy research and technology development are capable of attracting and retaining the necessary competences and investment.
2010-2013	Policy Development	From a joint electricity market to an open one: The goal of the Nordic work in this area is to build a border- less Nordic market that trades with the outside world in a efficient manner. The Nordic electricity market shall be further developed into an effective and efficient borderless Nordic market with harmonised rules for all stakeholders, including both businesses and consumers. This shall ensure good and fair competition for the benefit of customers, as well as secure supplies and the efficient utilisation of energy and resources.
2010-2013	Policy Development	Internal Cooperation: The Nordic Region shall be at the forefront of key energy policy issues and, to a greater degree than at present, use its positions of strength and its network to exert influence on the work being done in this area in international organisations. The Nordic energy ministers shall be particularly strong and active players in shaping energy policy frameworks in the EU/EEA.
2010-2013	Business Development	Energy efficiency: The aim of the Nordic co-operation is to improve cost-effective energy savings and efficiency in all areas. This must be done without any negative impact upon individuals and businesses. The development and organisation of cost-effective, market-based savings and energy-efficient technologies shall direct focus to achieving cost benefits for citizens, busi- nesses and Nordic society as a whole.
2010-2013	Business Development	Renewable Energy: Opportunities for joint, multi-sectoral initiatives will be evaluated with a view to promoting sustainable transport. Co-operation between authorities, research and innovation environments and businesses shall be established, devel- oped and strengthened.
2014-2017	Economic	The Electricity Market: A stronger Nordic energy balance, increased trade with balance regulating power, and greater requirements for security of supply necessitates the construction of more connections to the continent. This increases transmissions in the main grids and increases the need for internal grid reinforcements. The Nordic electricity

		market vouches for efficient utilisation of the production resources, so bottlenecks in the Nordic electricity grid that create long-term and large variations in the price of electricity should be removed.
2014-2017	Financial	The Electricity Market: In 2010, the Nordic energy ministers decided on implementation of grid investments that are socio-economically profitable in a Nordic perspective. If benefits and costs are unevenly distributed between the countries, the system managers are to negotiate on sharing. At a suitable level, the Nordic region needs to agree on methods for assessing the socio-economic benefit of cross-border transmission capacity. It is important that the main Nordic grid operators continue to collaborate more on grid planning and prepare Nordic grid development plans.
2014-2017	Informative	Energy Efficiency: It is important to exchange experiences on the implementation and joint Nordic analysis of consequences of the various EU directives, ordinances and action plans relating to energy ef ciency. An example of such an analysis, which has already begun, is one examining the consequences of the EU energy efficiency directive for a Nordic end-customer market. In 2014, the EU Commission will present a new analysis of the route towards attaining the 2020 goal for energy efficiency, so various EU directives may be revised. The Ecodesign Directive will also be reviewed. In the areas where there is scope, common standpoints may be developed before the EU decision.
2014-2017	Informative	Renewable Energy: An informal exchange of experiences on the implementation has been taking place, and will continue through the concerted action, in which all EU member countries and Norway and Iceland participate. In the period up to 2017, the directive on renewable energy may result in new initiatives from the EU Commission, including guidelines on support systems for renewable energy and co-operation mechanisms.
2014-2017	Guidance	Renewable Energy: Even if most parts of the directive on renewable energy have already been implemented in national legislation, progress towards goal attainment must still be monitored to ensure that measures introduced are appropriate.
	Policy Development	Renewable Energy: At Nordic level, there is a value in exchanging views on implementation of the directive on

		renewable energy and analysing issues of common Nordic interest.
2014-2017	Research	Energy Research: The current main programme under NER, Sustainable Energy Systems 2050, is focusing on renewable energy, markets and grids, and transports with low emissions. The aim of the programme is to develop knowledge and solutions that can promote the development of a sustainable energy system by 2050.
2014-2017	Research	Energy Research: The Nordic co-operation on research and development in the energy field will be based on initiatives in the national programmes, and will promote co-operation with clear Nordic value.
2014-2017	Business Development	Horizontal Areas: Electric vehicles; Collaboration between relevant players should continue in a way that is appropriate and clearly adds value to the Nordic region. The aim should be to bridge the gap between long-term political objectives and current national policies with focus on the transport sector in the Nordic region. Issues of joint interest include standardisation, infrastructure, information, instruments, business models, and impact on the common Nordic electricity market.
2014-2017	Business Development	Horizontal Areas: Objectives for renewable energy in the transport sector; If biofuels are to be included in the national fulfulment of the ten-percent goal, they must be sustainable in accordance with the sustainability criteria in the renewable energy is important in relation to the attainment of the ten-percent goal and any changes in the directive. Where there is scope, it may be possible to develop common standpoints before EU decisions. directive. The sustainability criteria are based on requirements for greenhouse gas reductions in relation to fossil fuel, and requirements for the type of land that the raw material for the fuel is grown on. Exchange of information, experiences and views between the Nordic countries

Finnish National Policy Reports to the European Commission		
Policy Type	Policy Disclosure	Policy inception/amendment/implementation
Regulatory	Biofuel distribution obligation (Act on Promoting Use of Biofuels in Transport 446/2007)	Amendment 1420/2010 to the Act entered into force on 1 January 2011; Amendment 394/2013 entered into force on 1 July 2013
Regulatory	Sustainability criteria for biofuels and bioliquids (Government Bill for an Act on Sustainability Criteria for Biofuels and Bioliquids, 393/2013)	Act into force on 1 July 2013
Financial	Wind power production support (Act on Production Support to Electricity from Renewable Energy Sources, 1396/2010)	The scheme entered into force on 25 March 2011
Financial	Biogas production support (Act on Production Support to Electricity from Renewable Energy Sources, 1396/2010)	The scheme entered into force on 25 March 2011
Financial	Production support to small-scale CHP (Act on Production Support to Electricity from Renewable Energy Sources, 1396/2010)	The scheme entered into force on 25 March 2011
Financial	Production support to woodchips (Act on Production Support to Electricity from Renewable Energy Sources, 1396/2010)	The scheme entered into force on 25 March 2011
Regulatory	Energy support (Government Decree on General Terms and Conditions for Granting Energy Support 1063/2012)	The scheme was revised as of 1/01/2013
Regulatory	Wind power compensation areas (Act on Wind Power Compensation Areas, 490/2013)	Act into force on 1 July 2013
Informative	Guarantee of origin for electricity (Act on Verification	Amendment 445/2013 to the Act entered into force on 14 June 2013

	and Notification of Origin of Electricity 1129/2003)	
Informative	Communication by Motiva	Continuous operations
Informative	Consumers' energy advice projects	Continuous operations
Financial	Farms' investment subsidies	
Financial	Investment assistance for biogas plants (Government Decree on Assisting Bioenergy Production, 607/2008)	2008–2013
Financial	Farms' energy programme (sub-item 30.01.40, Government Decree on Support to Farms' Energy Plans,1000/2009)	2009–2016
Financial	Energy wood harvesting and chipping subsidies under the Act on the Financing of Sustainable Forestry	1992–
Informative	Regional wood energy consultants	
Regulatory	Amending the Land Use and Building Act to determine a minimum level for renewable energy	Regulatory decree process launched on 1 May 2013
Guidance	Installer certification scheme	Scheme launched in 2013
Financial	Energy and repair assistance for detached houses (Act on Repair, Energy and Health Hazard Assistance for Housing, 1184/2005)	The assistance amounts are decided on annually in the state budget
Financial	Discretionary state aid for wind farm planning (Act on	2011–

	Discretionary Government Transfers, 688/2001)	
Guidance	Information and communication	Continuous operations
Guidance	Synergy Building	2009–2013
Financial	Act on the Excise Tax on Liquid Fuels (1472/1994), taking life-cycle greenhouse gas emissions into consideration in the CO2 based taxation of fossil motor petrol and diesel oil	As of 1 July 2012
Financial	Act on the Excise Tax on Liquid Fuels (1472/1994), raising the CO2 tax on heating and machinery fuels from 30 to 35 euros per tonne of CO2	As of 1 January 2013
Research	Groove – Renewable Energy, Growth through Internationalisation 2010–2014 (Tekes programme)	2010–2014
Research	Future bioenergy solutions – BEST (programme by Cleen Ltd and FIBIC Ltd)	2013–2016
Research	ForestEnergy 2020 (Research and innovation programme by VTT Technical Research Centre of Finland and Finnish Forest Research Institute)	2012–2016
Research	Improvement of renewable energy research infra by VTT Technical Research Centre of Finland (RES-infra)	2012–2015
Business Development	Cleantech strategy programme	2012–2015
Regulatory	Must-carry status for biofuel (Act on Promoting the Use of Biofuels in Transport; 446/2007)	Legislative amendment 1420/2010 entered into force on 1 January 2011; legislative amendment 394/2013 entered into force on 1/07/2013

Regulatory	Sustainability criteria for biofuels and bioliquids (Act on Biofuels and Bioliquids; 393/2013)	Act entered into force on 1/07/2013
Economic	Production aid for wind power (Act on Production Aid for Electricity Produced from Renewable Energy Sources; 1396/2010)	System entered into force on 25 March 2011
Economic	Production aid for biogas (Act on Production Aid for Electricity Produced from Renewable Energy Sources; 1396/2010)	System entered into force on 25 March 2011
Economic	Production aid for small CHP plants (Act on Production Aid for Electricity Produced from Renewable Energy Sources; 1396/2010)	System entered into force on 25 March 2011
Economic	Production aid for wood chips from forestry (Act on Production Aid for Electricity Produced from Renewable Energy Sources; 1396/2010)	System entered into force on 25 March 2011
Economic	Energy aid (Council of State Decree on the General Conditions for Granting Energy Aid; 1063/2012)	System reformed as of 1/01/2013

Economic	Wind-power compensation regions (Act on Wind-Power Compensation Regions; 490/2013)	Act entered into force on 1/07/2013
Informative	Electricity origin guarantee (Act on Ensuring and Reporting Electricity Origin; 1129/2003)	Legislative amendment 445/2013 entered into force on 1/07/2013
Informative	Motiva Oy's report	Ongoing activity
Informative	Consumer energy advice projects	Ongoing activity
Economic	Farm energy programme (item 30.01.40, Council of State Decree on Aid for Farm Energy Plans; 1000/2009)	2009–2016
Economic	Rural Development Programme for Mainland Finland 2014–2020	2014–2020
Economic	Rural investment aid (related to the preceding entry)	2014-2020
Informative	Energy solutions in rural areas, Southern and Northern Savo	2012-2014
Economic	Aid under the Act on Fixed-Term Financing for Sustainable Forestry (34/2015)	2015-2020
Informative	Regional wood- energy advisers	Rural Development Programme for Mainland Finland 2014–2020
Regulatory	Amending the Act on Land Use and Building (132/1999)	Legislative amendment 989/2013 entered into force on
Regulatory	Amending the Act on Land Use and Building so as to define the minimum level of renewable energy	Regulatory project launched on 1 May 2013. On the basis of the report by the working group that was set up, the Ministry of the Environment has decided that the preparatory work on the legislation will continue as part of the development of legislation relating to nearly zero-energy

Regulatory	Fitters' certification scheme	The scheme was launched in 2013. The Act on the Approval of Trainers for Fitters under Certain Energy Schemes Using Renewable Energy (38/2015) has been issued.
Economic	Energy and repair aid for detached houses (Act on Aid for Residential Repair, Energy and Health Problems; 1184/2005)	The amounts of aid are decided upon each year in the State budget
Economic	Discretionary State subsidy for wind-power planning (State Subsidies Act; 688/2001)	2011–2014
Information	Provision of information and advice	Ongoing activity
Economic	Act on Excise Duty on Liquid Fuels (1472/1994), and taking account of greenhouse-gas emissions during the life cycle for the purposes of carbon-dioxide- based taxation of petrol and diesel oil	From 1 July 2012
Economic	Act on Excise Duty on Liquid Fuels; increasing carbon-dioxide tax on petrol and diesel oil by 10 %	Implemented in two stages, starting on 1 January 2012 and 1/01/2014
Economic	Act on Excise Duty on Liquid Fuels; increasing carbon-dioxide tax on heating and machinery fuels from EUR 30 to EUR 35 per tonne of carbon dioxide	From 1/01/2013
Economic	Sustainable growth and work – Finland's Structural Fund Programme 2014–2020	2014-2022
Research	Groove – Renewable energy and growth from internationalisation 2010–2014 (Tekes programme)	2010–2014
Research	Sustainable bioenergy solutions for the future – BEST (a programme by Cleen Oy and FIBIC Oy)	2013–2016
Research	Intelligent Towns (Tekes programme)	2013-2017

Research	Green Growth – The Road Towards a Sustainable Economy (Tekes programme)	2011-2015
Research	New energy academy programme (Finnish Academy programme)	2015-2018
Research	ForestEnergy2020 (research and innovation by VTT and Metla)	2012–2016
Research	Refurbishment of VTT's renewable energy research infrastructure ("RES-infra")	2012–2015
Policy Development	Cleantech strategic programme	2012–2015
Informative	Sitra's Resource- Wise area	2012-2015

9.2 Appendix 2; Onomasticon list

Conflict	Ambiguity	Change
fight	uncertainty	Modification
war	haziness	Variation
struggle	doubt	transformation
skirmish	indistinctness	revolution
clash	obscurity	Conversion
encounter	abstruseness	Adjustment
engagement	Opacity	Amendment
peace	Equivocality	Difference
disagreement	Clarity	Coins
divergent	Certainty	Loose
difference		New Circumstance
argument		Swap
variance		replace
quarrel		substitute
inconsistency		trade
discord		switch
contradiction		convert
dispute		transformation
tension		transform
controversy		transmute
fracas		change over
opposition		modify
concord		vary
convergence		revolutionize
oppose		revolutionize
differ		adjustment
diverge		amendment
be at odds		shift
be incompatible		
be at variance		
concur		
argue		
scrap		
agree		

9.3 Appendix 3; Policy framework for content analysis and year breakdown

Table Key:

EU	European Commission
NC	Nordic Cooperation
N	Finland National Policy

Framework table for content analysis categorisation:

Firm Annual Report Year				
Policy	POLICY YEAR	Policy (EU, NC, N)	Disclosure/Statement	Description
Regulatory	2012	EU		
Regulatory	2012	EU		
Regulatory	2012	EU		
Regulatory	2012	EU		
Regulatory	2012	EU		
Regulatory	2012	EU		
Regulatory	2012	EU		
Economic	2012	EU		
Informative	2012	EU		

Informative	2012	EU		
Informative	2012	EU		
Informative	2012	EU		
Informative	2012	EU		
Informative	2012	EU		
Research	2012	EU		
Research	2012	EU		
Financial	2012	EU		
Financial	2012	EU		
Policy Development	2012	EU		
Policy Development	2012	EU		
Policy Development	2012	EU		
Policy Development	2012	EU		
Guidance	2012	EU		
Guidance	2012	EU		
Guidance	2012	EU		
Business Development	2012	EU		
Business Development	2012	EU		
Business Development	2012	EU		

Business Development	2012	EU		
Business Development	2012	EU		
Business Development	2012	EU		
Business Development	2012	EU		
Economic	2010-2013	NC		
Economic	2010-2013	NC		
Guidance	2010-2013	NC		
Informative	2010-2013	NC		
Research	2010-2013	NC		
Research	2010-2013	NC		
Research	2010-2013	NC		
Research	2010-2013	NC		
Research	2010-2013	NC		
Policy Development	2010-2013	NC		
Policy Development	2010-2013	NC		
Business Development	2010-2013	NC		
Business Development	2010-2013	NC		
Regulatory		N		
Regulatory		N		

Regulatory		N		
Regulatory		N		
Regulatory		N		
Financial		N		
Financial		N		
Financial		N		
Financial		N		
Financial		N		
Financial		N		
Financial		N		
Financial		N		
Financial		N		
Financial		N		
Financial		N		
Financial		N		
Financial		N		
Guidance		N		
Guidance		N		
Guidance		N		
Research		N		

Research		N		
Research		N		
Research		N		
Business Development		N		
Informative		N		
Informative		N		
Informative		N		
Informative		N		

9.4 Appendix 4; Firm list, outlining excluded and included firms with service offering break down

* This list was taken from the listed membership firms off www.energia.fi, firms removed from this list were those who are owned by an already listed firm.

Firm Name	Annual Reports In Non- English Language	Annual Reports In English	English Website	Energy Production	Energy Procurement	Energy Distribution	Energy Seller	Heating & Cooling	Other (Consulting, R&D and Other)
ABB Oy, Energiayhtiöiden järjestelmät	No	Yes	Yes	No	No	No	No	No	Yes
Adven Oy	Yes	No	No	No	No	Yes	No	Yes	Yes
Affecto Finland Oy	No	No	No	No	No	No	No	No	Yes
Aidon Oy	No	No	Yes	No	Yes	Yes	Yes	No	No
Alajärven Lämpö Oy	No	No	No	Yes	No	No	No	No	No
Alajärven Sähkö Oy	No	No	No	No	Yes	Yes	Yes	Yes	No
Alfa Laval Nordic Oy	Yes	Yes	Yes	No	No	No	No	No	Yes
Alholmens Kraft Oy Ab	No	No	Yes	Yes	No	No	Yes	No	No
Alkkulan Aluelämpö Oy	No	No	No	Yes	No	No	Yes	Yes	No
Arvo-Putki Oy	No	No	Yes	No	No	No	No	No	Yes
Auris Kaasunjakelu Oy	No	No	Yes	Yes	No	Yes	Yes	Yes	No

Aurora Kilpilahti Oy	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes
Axpo Finland Oy	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Belimo Finland Oy	Yes	No	No	No	No	No	No	No	Yes
Brugg-Pema Oy	No	No	Yes	No	No	No	No	No	Yes
Calefa Oy	No	No	Yes	No	No	No	No	Yes	Yes
Canplast Oy	Yes	No	No	No	No	No	No	No	Yes
CGI Suomi Oy	Yes	Yes	Yes	No	No	No	No	No	Yes
Chemitec Consulting Oy (Ezra Holdings)	Yes	Yes	Yes	No	No	No	No	Yes	Yes
Cybersoft Oy Ab	Yes	No	No	No	Yes	Yes	Yes	No	Yes
Danfoss Oy Ab	Yes	Yes	Yes	No	No	No	No	Yes	Yes
Ekenäs Energi Ab	Yes	No	No	Yes	No	No	Yes	Yes	Yes
Ellappi Oy	No	No	No	No	No	Yes	No	No	Yes
Elomatic Oy	Yes	No	Yes	No	No	No	No	No	Yes
Elvera Oy	No	No	No	Yes	No	No	No	No	Yes
Empower IM Oy	Yes	Yes	Yes	No	No	No	No	No	Yes
Energiameklarit Oy	No	No	No	No	No	No	Yes	No	Yes
Enerke Oy	No	No	No	No	No	Yes	No	No	Yes
Enfo Partner Oy	Yes	Yes	Yes	No	No	No	No	No	Yes
Enontekiön Sähkö Oy	No	No	No	No	No	No	No	No	Yes
Enoro Oy	No	No	Yes	No	No	No	No	No	Yes

Ensto Finland Oy	Yes	Yes	Yes	No	No	No	No	No	Yes
Enstroga AG Oy	No	No	No	No	No	No	Yes	No	Yes
EPV Energia Oy	Yes	Yes	No	No	Yes	Yes	No	No	Yes
ESE-Verkko Oy	Yes	No	No	Yes	No	Yes	Yes	No	Yes
eSett Oy (Part of Fingrid)	Yes	No	Yes	No	No	No	No	No	Yes
Esse Elektro-Kraft Ab	Yes	No	No	No	No	Yes	Yes	No	Yes
Etelä-Savon Energia Oy	Yes	No	No	Yes	No	No	Yes	No	No
Exsane Oy	No	No	Yes	No	No	Yes	No	No	Yes
Fingrid Oyj	Yes	Yes	Yes	No	No	Yes	No	No	Yes
Forssan Verkkopalvelut Oy (Part SALLILA Companies)	Yes	No	No	No	Yes	Yes	Yes	No	Yes
Fortum Power and Heat Oy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gasum Oy	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No
GE Power Finland Oy	Yes	Yes	Yes	No	No	No	No	No	Yes
Gebwell Oy	No	No	Yes	No	No	No	No	Yes	Yes
Haminan Energia Oy	Yes	No	No	Yes	No	Yes	Yes	No	Yes
Haukiputaan Sähköosuuskunta	Yes	No	No	No	Yes	No	Yes	No	Yes

HeadPower Oy	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Helen Oy	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes
Hiilitieto ry	No	No	Yes	Yes	No	No	Yes	No	Yes
Hyvinkään Lämpövoima Oy	No	No	No	No	No	No	No	Yes	Yes
Högfors Oy	No	No	No	No	No	No	No	No	Yes
HögforsGST Oy	No	No	No	No	No	No	No	No	Yes
Höyrytys Oy	No	No	No	Yes	No	No	Yes	Yes	Yes
Imatran Lämpö Oy	No	No	No	No	No	No	No	Yes	Yes
Imatran Seudun Sähkö Oy	Yes	No	No	No	No	Yes	Yes	No	Yes
Imatran Seudun Sähkönsiirto Oy	Yes	No	No	No	No	Yes	Yes	No	Yes
Inergia Lämpö Oy	Yes	No	No	No	No	No	Yes	Yes	Yes
Infratek Finland Oy	Yes	Yes	Yes	No	No	No	No	No	Yes
inPulse Works Oy	No	No	Yes	No	No	No	No	No	Yes
Intrum Justitia Oy	Yes	Yes	Yes	No	No	No	No	No	Yes
IntStream Oy	No	No	Yes	No	No	No	No	No	No
JE-Siirto Oy	No	No	Yes	No	No	No	Yes	Yes	Yes
Jylhän Sähköosuuskunta	No	No	No	No	Yes	No	Yes	Yes	Yes
JyNet Oy	No	No	No	No	No	No	No	No	Yes
Jyväskylän Energia Oy	Yes	No	Yes	No	No	No	Yes	Yes	No

Jämsän Aluelämpö Oy	No	No	No	Yes	No	No	No	No	Yes
Järvi-Suomen Energia Oy	Yes	No	No	No	No	No	No	No	Yes
KNaakon Energia Oy	No	No	No	Yes	No	No	Yes	No	Yes
Kainuun Voima Oy	Yes	No	No	Yes	No	No	Yes	No	Yes
Kalajoen Lämpö Oy	No	No	No	No	No	No	No	Yes	Yes
Kampek Invest Oy	No	No	No	No	No	No	No	No	Yes
Kamstrup A/S	Yes	Yes	Yes	No	No	No	No	No	Yes
Kangasalan Lämpö Oy	No	No	No	No	No	No	No	Yes	Yes
Kannuksen Kaukolämpö Oy	Yes	No	No	No	No	No	Yes	Yes	Yes
Kanteleen Voima Oy	Yes	No	No	Yes	No	No	No	Yes	Yes
Karhu Voima Oy	No	No	No	No	No	No	No	Yes	Yes
Karvian Lämpö Oy	No	No	No	No	No	No	No	Yes	No
Kauhajoen Lämpöhuolto Oy	No	No	No	Yes	No	No	No	Yes	No
Kauhavan Kaukolämpö Oy	No	No	No	No	No	No	No	Yes	No
Kaukora Oy	No	No	No	No	No	No	No	Yes	No
Kausalan Lämpö Oy	No	No	No	No	No	No	No	Yes	No

Kemijoki Oy	Yes	Yes	Yes	Yes	No	No	Yes	No	Yes
Kemin Energia Oy	Yes	No	No	No	No	No	No	Yes	Yes
Keminmaan Energia Oy	No	No	No	No	No	No	No	Yes	Yes
Kenet Oy	No	No	No	Yes	No	No	No	No	Yes
Keravan Energia Oy	Yes	No	No	Yes	No	No	No	No	No
Keskusosuuskunta Oulun Seudun Sähkö	Yes	No	No	Yes	No	No	No	No	No
Keuruun Lämpövoima Oy	No	No	No	No	No	No	Yes	Yes	Yes
Kiteen Lämpö Oy	No	No	No	Yes	No	No	Yes	Yes	Yes
Kittilän Aluelämpö Oy	No	No	No	Yes	No	No	No	Yes	No
Koillis-Lapin Sähkö Oy	No	No	No	No	No	Yes	Yes	No	No
Koillis-Satakunnan Sähkö Oy	Yes	No	No	No	No	No	No	Yes	No
Kokemäen Lämpö Oy	No	No	No	No	No	No	No	Yes	No
Kokemäen Sähkö Oy	No	No	No	Yes	No	No	Yes	Yes	No
Kokkolan Energia Oy	No	No	No	No	No	No	No	Yes	No
Korpelan Voima Kuntayhtymä	No	No	No	No	No	No	Yes	Yes	No

Koskienergia Oy	Yes	No	No	Yes	No	No	No	No	No
Kotimaan Energia Oy	No	No	No	Yes	No	No	Yes	No	No
Kotkan Energia Oy	Yes	No	No	Yes	No	No	No	Yes	Yes
Kraftnät Åland Ab	Yes	No	No	Yes	No	No	No	Yes	Yes
Kronoby Elverk Ab	Yes	No	No	No	No	Yes	No	Yes	Yes
KSS Lämpö Oy	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No
Kuopion Energia Oy	Yes	No	Yes	No	Yes	No	Yes	Yes	No
Kuoreveden Sähkö Oy	No	No	No	No	No	No	No	No	Yes
Kuortaneen energiaosuuskunta	No	No	No	No	No	No	No	Yes	Yes
Kurikan Kaukolämpö Oy	No	No	No	No	No	No	No	Yes	Yes
Kymenlaakson Sähkö Oy	Yes	No	Yes	No	No	Yes	Yes	No	No
Kymppivoima Hankinta Oy	Yes	No	No	Yes	Yes	No	No	No	No
Köyliön-Säkylän Sähkö Oy	Yes	No	No	Yes	No	No	Yes	No	No
Lahti Energia Oy	No	No	No	No	Yes	Yes	Yes	No	No
Laihian Nuuka Lämpö Oy	Yes	No	No	No	No	No	No	Yes	No
Laitilan Lämpö Oy	No	No	Yes	No	No	No	No	No	No

Lammaisten Energia Oy	No	No	No	No	No	No	No	Yes	No
Landis+Gyr Oy	No	No	No	No	No	No	No	No	Yes
Lankosken Sähkö Oy	Yes	No	No	Yes	No	No	No	No	No
Lappeenrannan Energia Oy	Yes	No	No	No	Yes	No	Yes	No	No
Lapuan Energia Oy	No	No	No	No	No	Yes	Yes	Yes	Yes
LE-Sähköverkko Oy	No	No	No	Yes	No	Yes	No	Yes	No
Lempäälän Lämpö Oy	No	No	No	No	No	No	No	Yes	No
Leppäkosken Energia Oy	Yes	No	Yes	Yes	Yes	No	Yes	No	No
Liedon Lämpö Oy	No	No	No	No	No	Yes	Yes	No	No
Liikennevirta Oy	No	No	No	Yes	No	No	Yes	No	No
LOGSTOR Finland Oy	Yes	No	Yes	Yes	No	No	Yes	No	No
Lohjan Energiahuolto Oy LOHER	Yes	No	No	No	No	No	Yes	No	No
Loimaan Kaukolämpö Oy	Yes	No	No	No	No	No	No	Yes	No
Loiste Energia Oy	No	No	No	Yes	Yes	No	Yes	No	No
Lähituuli Oy	No	No	No	Yes	No	No	Yes	No	No
Lämpö Korpela Oy	No	No	No	No	Yes	No	Yes	No	Yes

Lännen Omavoima Oy	No	No	No	No	No	Yes	Yes	No	No
Länsirannikon Koulutus Oy WinNova	Yes	No	Yes	No	Yes	No	Yes	Yes	No
Manga LNG Oy	No	No	No	No	No	No	No	No	No
Metsa Group Mankala Oy Ab	Yes	Yes	Yes	No	Yes	No	Yes	No	No
Mariehamns Elnät Ab	No	No	No	No	No	No	No	No	Yes
Muonion Sähköosuuskunta	No	No	No	No	No	No	No	Yes	No
Mäntsälän Sähkö Oy	Yes	No	No	No	No	No	No	Yes	Yes
Mäntän Kaukolämpö ja Vesihuolto Oy	No	No	Yes	Yes	No	No	No	Yes	No
Mäntäsälän Vesi Oy	No	No	No	No	No	No	No	Yes	Yes
Naantalin Energia Oy	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes
Napapiirin Energia ja Vesi Oy	Yes	No	No	No	No	No	No	Yes	No
NDC Networks Oy	No	No	Yes	No	No	No	No	No	Yes
Netcontrol Oy	No	No	Yes	No	No	No	No	No	Yes
Nivos Oy	No	No	No	No	No	No	Yes	Yes	Yes

Nordex Energy GmbH, Finnish Branch	Yes	Yes	Yes	Yes	No	No	No	No	Yes
Nurmeksen Lämpö Oy	No	No	No	Yes	No	No	Yes	Yes	Yes
Nurmijärven Sähkö Oy	Yes	No	No	Yes	No	No	Yes	No	No
Nykarleby Kraftverk Ab	No	No	No	Yes	No	Yes	Yes	No	Yes
Onninen Oy	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes
Orimattilan Lämpö Oy	No	No	No	Yes	No	No	No	Yes	Yes
Oulun Energia Oy	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes
Oulun Seudun Sähkö Verkkopalvelut Oy	Yes	No	Yes	No	Yes	No	Yes	Yes	Yes
Outokummun Energia Oy	No	No	No	No	Yes	No	Yes	No	Yes
Paimion Lämpökeskus Oy	No	No	No	No	No	No	No	Yes	Yes
Paneliankosken Voima Oy	Yes	No	No	Yes	No	No	Yes	No	No
Paraisten Kaukolämpö Oy	Yes	No	No	Yes	No	No	Yes	Yes	No
Parikkalan Valo Oy	Yes	No	No	No	Yes	No	Yes	No	No
Pav Oy Ab	No	No	No	Yes	No	No	Yes	No	Yes

PKS Sähkönsiirto Oy	Yes	No	No	No	Yes	Yes	Yes	No	Yes
Planora Oy	No	No	Yes	No	No	No	No	No	Yes
Pohjois-Karjalan Sähkö Oy	Yes	No	No	No	Yes	Yes	Yes	No	Yes
Pohjolan Voima Oy	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Pori Energia Oy	Yes	No	No	No	No	No	Yes	Yes	Yes
Porvoon Energia Oy - Borgå Energi Ab	Yes	No	No	Yes	No	No	Yes	Yes	No
Power-Deriva Oy	No	No	Yes	No	No	No	No	No	Yes
Puhuri Oy	No	No	No	Yes	No	No	No	No	No
Puolustushallinnon Rakennuslaitos	No	No	Yes	Yes	Yes	No	No	Yes	Yes
Pöyry Finland Oy	Yes	Yes	Yes	No	No	No	No	No	Yes
Raahen Energia Oy	Yes	No	No	Yes	No	No	Yes	Yes	Yes
Radiki Oy	No	No	No	No	No	No	No	No	Yes
Ramboll Finland Oy	Yes	Yes	Yes	No	No	No	No	No	No
Rantakairan Sähkö Oy	No	No	No	No	No	Yes	No	No	Yes
Rauman Energia Oy	No	No	No	No	No	No	Yes	No	No
Ravera Ab Oy	No	No	No	No	No	No	No	No	Yes
Rejlers Oy	Yes	Yes	Yes	No	No	No	No	No	Yes

Reka Kaapeli Oy	No	No	Yes	No	No	No	No	No	Yes
Renewa Oy	No	No	Yes	Yes	No	No	No	No	No
RIG Oy	No	No	Yes	No	No	Yes	No	No	No
Riihimäen Kaukolämpö Oy	No	No	No	No	No	No	No	Yes	No
Ropo Capital Oyj	No	No	No	No	No	No	No	No	Yes
Rovakaira Oy	Yes	No	No	Yes	No	No	Yes	Yes	No
S2B Energia Oy	No	No	No	No	No	No	No	No	No
Saarijärven Kaukolämpö Oy	Yes	No	No	Yes	No	No	Yes	Yes	Yes
Sallila Energia Oy	Yes	No	No	Yes	No	No	Yes	No	No
Salon Kaukolämpö Oy	No	No	No	No	No	No	No	Yes	No
Sastamalan Lämpö Oy	No	No	No	No	No	No	No	Yes	No
Satapirkan Sähkö Oy	No	No	No	No	No	No	No	No	Yes
Savon Voima Oyj	Yes	No	No	No	Yes	No	Yes	No	Yes
Schneider Electric Finland Oy	Yes	Yes	Yes	No	No	No	No	No	Yes
Seinäjoen Energia Oy	Yes	No	No	No	No	No	No	No	Yes
Seiverkot Oy	No	No	No	No	No	No	No	No	Yes
Suomen Energia-Urakointi Oy (part of Olon Energy)	Yes	No	No	No	No	No	No	No	Yes

Suur-Savon Sähkö Oy	Yes	No	No	No	No	Yes	Yes	No	No
Switch Nordic Green AB Filial Finland	Yes	No	No	Yes	No	No	Yes	Yes	Yes
Tampereen Sähkölaitos Oy	Yes	No	Yes	No	Yes	Yes	Yes	No	Yes
VTT, Teknologian tutkimuskeskus, Energia ja Metsäteollisuus	Yes	Yes	Yes	Yes	No	No	No	No	Yes
Tenergia Oy	No	No	No	Yes	No	No	Yes	No	No
There Corporation Oy	No	No	Yes	No	No	Yes	Yes	No	Yes
Tieto Finland Oy	Yes	Yes	Yes	No	No	No	No	No	Yes
Tietokoura Oy	No	No	Yes	No	No	No	No	No	Yes
Toholammin Energia Oy	No	No	No	No	No	No	No	No	Yes
Tornion Energia Oy	Yes	No	No	Yes	No	No	Yes	No	No
Tornionlaakson Sähkö Oy	Yes	No	No	No	No	Yes	No	No	No
Trimble Solutions Oy	Yes	Yes	Yes	No	No	No	No	No	Yes
Tunturiverkko Oy	No	No	No	No	Yes	Yes	Yes	Yes	No
Turku Energia Oy	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No
Turun Asennus ja Luokkahitsarit Oy	No	No	No	No	No	No	No	No	Yes

TuuliSaimaa Oy	No	No	Yes	Yes	No	No	Yes	No	No
TE Tyco Electronics Finland Oy	Yes	Yes	Yes	No	No	Yes	No	No	No
Uponor Infra Oy	No	No	No	No	No	Yes	No	Yes	Yes
Vaasan Sähkö Oy	Yes	No	Yes	No	Yes	Yes	Yes	Yes	No
Vakka-Suomen Voima Oy	Yes	No	No	No	No	No	No	No	Yes
Valkeakosken Energia Oy	No	No	No	No	No	No	Yes	Yes	Yes
Valmet Technologies Oy	Yes	Yes	Yes	No	No	Yes	No	No	Yes
Vantaan Energia Sähköverkot Oy	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes
Vapo Oy Lämpö ja sähkö	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Varissuon Lämpö Oy	No	No	No	Yes	No	No	Yes	Yes	No
Varkauden Aluelämpö Oy	Yes	No	No	Yes	No	No	Yes	Yes	No
Vatajankosken Sähkö Oy	Yes	No	No	No	Yes	No	Yes	No	Yes
Vattenfall Oy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
VEO Oy	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Veolia Services Suomi Oy	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Verkko Korpela Oy	No	No	No	No	Yes	No	Yes	No	Yes

Vertek Oy	No	No	No	No	No	Yes	No	No	Yes
Vetelin Energia Oy	No	No	No	No	No	Yes	No	No	Yes
Vexve Oy	No	No	Yes	Yes	No	No	No	No	Yes
Vierumäen Infra Oy	No	No	No	No	No	No	No	No	Yes
Vimpelin Voima Oy	No	No	No	Yes	No	Yes	Yes	Yes	Yes
Voimatel Oy	No	No	No	No	No	No	No	No	Yes
VSV- Energia Oy	No	No	No	No	No	Yes	No	No	No
W1TT Group Oy	No	No	Yes	No	No	No	No	Yes	Yes
Wiitaseudun Energia Oy	Yes	No	No	Yes	No	No	No	Yes	No
Wilo Finland Oy	Yes	Yes	Yes	Yes	No	No	No	Yes	No
ÅF-Consult Oy	Yes	Yes	Yes	No	No	No	No	No	Yes
Ålands Elandelslag	No	No	No	Yes	No	No	Yes	No	Yes
Ähtärin Energia ja Vesi	No	No	No	No	No	No	No	Yes	No
Äänekosken Energia Oy	Yes	No	No	No	Yes	No	Yes	No	No
HiQ	No	Yes	No	No	No	No	No	No	No

9.5 Appendix 5; Ethics application copy

Human Ethics Application Coversheet – Student

r Office Use Only –	**HEC Reference:**
te Received: 25th October, 2017	**Reviewers: R. Robinson**
te Approved: 1st November, 2017	**Approved: 1st November, 2017 (HEC Chair)**

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by the

Will another ethics committee review this application?

- If a New Zealand Health and Disability Ethics Committee (HDEC) is reviewing your project, please send your HDEC application to us with this coversheet, and then the approval. You do not need to fill out the full University of Canterbury application form.
- If you have ethics approval from another institutional ethics committee (eg another New Zealand or Overseas University ethics committee) and you will conduct your research in the country of that ethics committee, please send this coversheet only with that application and the later approval letter, and an explanatory email. You do not, initially, need to fill out the full University of Canterbury application form.

Please ***Bold*** your answers

Project Title: "The European Commission 2050 Energy Road Map - implementation impacts for Finnish energy firms towards sustainable energy"

Status of Research: Masters

Applicant

Name: **Christopher Butlin**

University Programme/ Department: **Commerce, management**

Applicant's Email: **clb119@uclive.ac.nz**

Primary Telephone No: No: **+358 0465295980**

Primary Supervisor Title, given name and family name

Name: **Michael Hall**

University Programme/ Department: **Commerce; Management**

Supervisor's Email: **michael.hall@canterbury.ac.nz**

Primary Telephone No: **+64 3 364 2606**

Researcher's Signature

I *Christopher Butlin* have considered, the various ethical issues involved in this research and have personally completed the application form; I have discussed this proposal with my supervisor(s), and I will conduct this research within the bounds of any approval given by the Human Ethics Committee of the University of Canterbury.

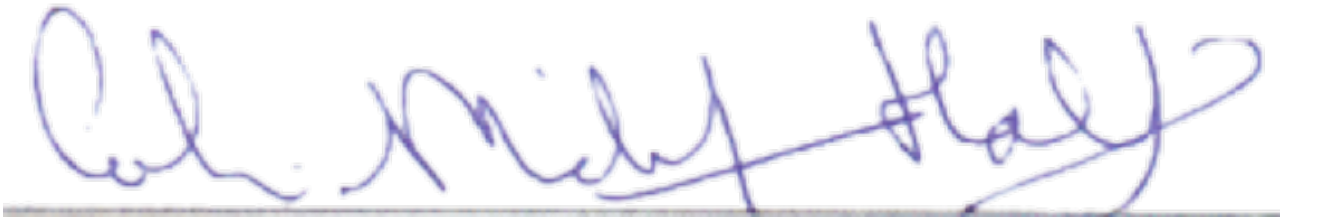
Signed: __  Dated: 25/10/2017

Is the approval of this application a necessary pre-requisite for the Dean of Postgraduate Studies to formally accept your PhD proposal? [YES/NO]

Senior Supervisor's Signature

As the primary supervisor of *Christopher Butlin* research project I, *Michael Hall* consider that the design and documentation are of a standard appropriate for a research project carried out in the name of the University of Canterbury.

Signed: __



Dated: 16 October 2017

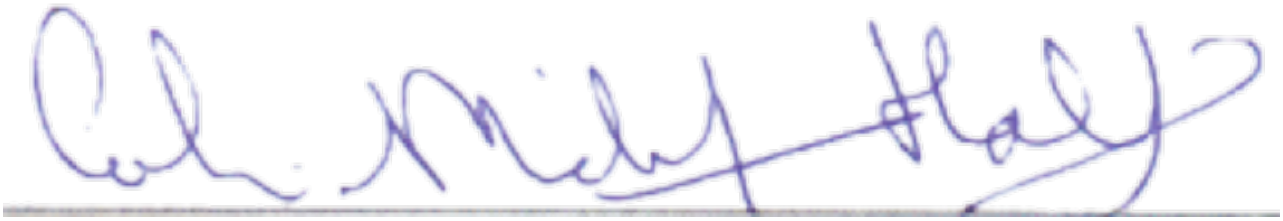
Low Risk processes (to be completed by the primary supervisor)

The low risk process for students differs from a full application only in that it is examined solely by the Chair of the Human Ethics Committee. As a result it may be possible to reply to the applicant in 7 days. It is to be signed only by supervisor(s).

Please explain why the research is low risk research low risk, noting the information overleaf
If no explanation is provided, the application will be considered a full application.

Finland ethical clearance would not be necessary for this research. In New Zealand, any research that includes interviewing people would require ethics approval to ensure that safeguards are in place to protect the privacy and dignity of participants, as well as documenting measures for researcher safety. In addition, ethics assessment of applications takes into consideration possible risks to employees.

Signed (Senior/Primary Supervisor only) _

 Dated:

16 October 2017

Submission instructions.

Please submit ONE electronic file containing all the necessary documents in a PDF format and ONE fully signed hard copy. Exceptions may be made, but must be discussed first with the HEC Secretary. Processing

of HEC applications is unable to begin until a hard copy of the application has been received by the Ethics Office.
Electronic copies should be emailed to human-ethics@canterbury.ac.nz. Hard copies should be sent to the Secretary, Human Ethics Committee (Level 5, Matariki South).

Low Risk application information:

Research may be considered low risk when it arises from

a Masters or PhD theses where the projects do not raise any issue of deception, threat, invasion of privacy, mental, physical or cultural risk or stress, and do not involve gathering personal information of a sensitive nature about or from individuals.

b Masters or PhD level supervised projects undertaken as part of specific course requirements where the projects do not raise any issue of deception, threat, invasion of privacy, mental, physical or cultural risk or stress, and do not involve gathering personal information of sensitive nature about or from individuals.

c Undergraduate and Honours class research projects which do not raise any issue of deception, threat, invasion of privacy, mental, physical or cultural risk or stress, and do not involve gathering personal information of sensitive nature about or from individuals, but do not have blanket approval as specified in Section 4 of the Principles and Guidelines.

3. No research can be counted as low risk if it involves:

(i) invasive physical procedures or potential for physical harm
(ii) procedures which might cause mental/emotional stress or distress, moral or cultural offence
(iii) personal or sensitive issues
(iv) vulnerable groups
(v) Tangata Whenua (if in doubt please see the comments under question 12 on the application form)
(vi) cross cultural research
(vii) investigation of illegal behaviour(s)
(viii) invasion of privacy
(ix) collection of information that might be disadvantageous to the participant
(x) use of information already collected that is not in the public arena which might be disadvantageous to the participant
(xi) use of information already collected which was collected under agreement of confidentiality
(xii) participants who are unable to give informed consent
(xiii) conflict of interest e.g. the researcher is also the lecturer, teacher, treatment-provider, colleague or employer of the research participants, or there is any other power relationship between the researcher and the research participants.
(xiv) deception
(xv) audio or visual recording without consent
(xvi) withholding benefits from “control” groups
(xvii) inducements (over a nominal amount of $20, for example to recompense travel costs)
(xviii) risks to the researcher

This list is not definitive but is intended to sensitise the researcher to the types of issues to be considered. Low risk research would involve the same risk as might be encountered in normal daily life.

Description of the Project

1. What does the project seek to do?

   This research examines the successes and issues encountered by Finnish firms in implementing the 2050ERM.

2. What is the research question or hypothesis of this project?

***Question*: What is the manner in which the European Commission *2050 Energy Road Map* impacts Finnish sustainable energy firms and their growth within the sustainable energy sector?**

3. Describe how this project arose ie, please explain the academic area or issue etc which generated the question(s) to be examined – this is to allow lay members of the committee some context for the research.

In 2011 the European Commission established the *2050 Energy Road Map (2050ERM)* outlining directions for all European Union countries. The *2050ERM* specifically outlines energy goals for decarbonising energy systems, increasing sustainable energy market share, integrating local resources and centralising energy systems (European Commission, 2011). By conducting interviews and analysing annual reports this research seeks to develop an understanding of conflict, acceptance, neutrality, rejection, ambiguity and clarity relative to Finnish energy firms and the *2050ERM*. The constructs of conflict, acceptance, neutrality, rejection, ambiguity, innovation and clarity are fundamental elements in policy implementation research for both governmental and firm level research. These elements provide, critical insights into firm justifications, reactions and limitations. these elements outline the broader understanding and firm dispositions towards the 2050ERM. By a collecting multiple firm dispositions, a wider general disposition towards the 2050ERM is developed, allowing an industry perspective to be presented.

The economic and ecological sustainability assessments of energy policy are common. However, there is little social research carried out on sustainable energy policy. Governments such as Finland provide comprehensive insights into successful policies and their impacts. Finland has the second highest sustainable energy generation per capita in the European Union. Finland also has a reputable and positive tendency towards European Commission policy in relation to compliance and implementation. The timeframe selected of 2012 to 2015 is due to multiple reasons. Firstly, the European Commission has published bi-annual reports from member's countries, these have been released for 2012 and 2015. Secondly, the latest report for 2017 has not been fully published by the European Commission. Hence, to have consistency in comparisons of annual reports, this research has selected 2012, 2013, 2014 and 2015 for firm annual reports, as they align with the 2012 and 2015 European Commission reports.

This research examines the successes and issues encountered by Finnish firms in implementing the 2050ERM between 2012 to 2015. The proposed methodology, utilises contextual approaches including content analysis and interviews. The data collected will provide insights into firm implementation by understanding awareness, attitude and action of the 2050ERM. In so doing, examples of firms that have successfully implemented sustainable energy policy can be identified, allowing policy makers and firms to understand policy success.

4. How will you go about answering the research question?

This research will primarily use quantitative data methods of report content analysis. The content analysis will be based of three levels of policy. Firstly, the European Commission 2050 Energy Roadmap, being the overarching policy for all national and supranational bodies for European Union (EU) members and obligated partner countries. Secondly, Nordic Cooperation (NC) being another supranational policy level, as the NC policy is geared towards applying cross-Nordic polices and EU Policy integration. Thirdly, Finland's National policies, listed by bi-annual reports required by the European Commission for progress reports on energy policy integration. Furthermore, each policy level has been placed in to a framework allowing annual reports to be cross referenced and scored against recognition, interpretation and comments towards specific policies at each specific policy level. Specific policy intention categories have also been applied (these have been developed by using the categories found in bi-annual reports given to the European Commission), these categories are: Regulatory; Economic; Informative; Research Financial; policy Development; and Business development. From this, a scored framework for annual reports will create a range of data sets to run statistical significance in WordStat software.

Secondly, qualitative semi-structured interviews will be used to provide further Finnish contexts. Semi-structured interviews will be conducted with Finnish firms and policy makers at different policy levels (European Commission, Nordic Cooperation, National Policy). For Finnish firms, questions have been developed for each policy level outlining relevant policy goals, objectives, priority issues and areas (Regulatory; Economic; Informative; Research Financial; policy Development; and Business development).

Semi-structured interview questions have been developed for different policy makers and their respective and relevant policy level (European Commission, Nordic Cooperation, national Policy), targeted towards firm implementation, lack of and or issues. Similarly, with firms these questions have been written in relation to policy goals, objectives, priority issues and areas (Regulatory; Economic; Informative; Research Financial; policy Development; and Business development)

In summary, this research will use two types of methods with the primary method being quantitative content analysis of publicly available reports being supplemented by a semi-structured interview process.

Information about the Participants

5. Who are the participants and why have they been chosen to be asked to participate?

This research will utilize several stages in evaluating and selecting candidate firms.
Firstly, categorising and investigating a range of firms has been conducted, based off a list found from the Finnish Government website (https://energia.fi/en/finnish_energy_as_an_organisation/membership/list_of_members).

This website is from 'Finnish Energy' a government organisation that supports the industrial and labour market for energy policy. The government website lists over 333 member companies that offer energy related services within Finland.

The firm list was researched and categorised in the following way: Annual reports in non English language; Annual reports in English; Website in English; Energy Production; Energy Procurement; Energy Distribution; Energy Seller; Heating; Cooling; Other Services (Consulting; Componentry; Accounting). Additionally, all duplicated/same website companies have been removed to leave only a single representative company. Therefore, of the original 333, the total number of companies is 264, of that 58 produce annual reports in English, 73 report in Non-English and 133 do not have annual

reports in any language. The 68 firms that produce annual reports in English will have the framework discussed in question 4 applied.

Of the 58 firms, it is expected that up to 30 will be contacted for interviews to ensure saturation. This number is approximate as it reflects a likely point at which saturation may be achieved. Of the 30 approximately half will be members of the Nordic Pool Spot. The Nordic Pool Spot is the Nordic energy marketplace for business to sell and trade services such as: Energy Production; Energy Procurement; Energy Distribution; Energy Seller; Heating; Cooling; Other Services (Consulting; Componentry; Accounting).

Within each firm staff member(s) will be interviewed to improve confirmation of information. The interviewee(s) must meet specific requirements, as their work portfolio must consist of firm policy creation, planning and evaluation. By doing so, firm interviewee(s) are expected to know relevant firm information on supranational and national polices in the context to their firm. However, it is still up-to the firm to decide who and if they will conduct an interview.

The research aims to interview up to 3 policy makers in total. The interviewee(s) must also meet specific requirements, regarding their work portfolio consisting of policy formation, planning and reviewing within their respective policy level (Finnish Government, Nordic Cooperation, European Commission). The selection of 3 policy makers provides specific view points and discussions from a policy maker perspective on Finnish firm implementation successes and issues.

In conclusion, this research aims to interview approximately 33 individuals.

6. How many participants will be involved (of each category where relevant)? Please include statistical justification where necessary.

The total number of interviewed firms outlined for this research is approximately 33, to follow research saturation practices for grounded theory research (Mason, 2015).

In summary there will be policy maker interviews at the European Commission, Nordic Cooperation, Finnish National policy levels. Whilst, there will be firms interviewed with firms being members of the Nordic Pool Spot and those who are not.

7. What selection criteria and/or exclusion criteria will you use? ie, randomly, by age, gender, ethnic origin, other – please give details. What plans do you have if the recruitment phase is too successful, or does not recruit enough participants?

Firms will be selected based off the policy alignment from statements found within annual reports. If no statements are found for a specific firm, then they will not be contacted for an interview. Of the firms selected the specific interviewed individual will be selected by the firm, when approaching the firm the intention of the interview will be made clear. To do this, a participant information sheet will be attached in an email to the relevant firm. This is aimed to ensure that companies will select a relevant individuals to be interviewed.

8. Describe how potential participants will be identified and recruited?

(Firms) Through formal company website pages and contact email addresses listed.

(Policy Makers) Through formal government policy maker website pages and contact email addresses listed.

9. Does the project involve recruitment through advertising? YES/NO (delete inapplicable) If yes, please attach a copy of all variations of this advertising (including e-advertising, eg, Facebook) and discuss any permissions that you have or might need to seek (eg, from organisers of social media/blog/comments pages).

No

10. How much time are participants asked to contribute to the research?

2 hours is the approximate total time asked of participants, this is inclusive of an approximately 60 minute interview and time for participants to read through interview notes and comment at their discretion.

11. Is any form of inducement to be offered? YES/NO (delete inapplicable) If yes, please justify, and include the funding source for the inducements.

No

12. How will the participants be treated? Describe in practical terms how the participants will be treated, what tasks they will be asked to perform, etc. Indicate how much time is likely to be involved in carrying out the various tasks.

Participants are encouraged to answer truthfully and honestly to the semi-structured interview questions. Participants are not required to answer any of semi-structured interview questions and can request to move to another question. Participants will be given opportunities to end the interview at any time at their own discretion. Participants will decide the location of the interview, ether at their own workplace, phone interview or at Aalto university, to accommodate participant time commitments and needs.

13. Will forms for participants need to be translated? YES/NO If yes, what language?

Participants will be asked if they require forms to be translated into Finnish, if this is the case, then this will be done.

14. Will the project require engagement and consultation with iwi Māori?YES/NO (delete inapplicable) *If the answer is yes to any of the questions below, please contact the research consultant Maori. The consultant will be able to help you assess whether you need to seek consultation and engagement with iwi Māori through the Ngāi Tahu Consultation and Engagement Group. The consultant will facilitate the engagement process, and provide cultural advice and support. Contact details for the research consultant and other important information and advice regarding engaging with Māori are available at* *http://www.research.canterbury.ac.nz/maoriresearch/*
    - Will the design, implementation or outcomes of the project have implications for iwi Māori?
    - Will there be significant Māori content, use of culturally sensitive material or knowledge?
    - Will the research require access to Māori sites, or sampling of flora/fauna?
    - Will there be Māori participants or subjects?
    - Will the ethnicity of participants be recorded and likely to result in different treatment for Māori participants during the study or result in statements specifically about Māori in the results?

No

Other parties with an interest in the research

15. Does the project require permission of an organisation, other people, to access participants or information? YES/NO (delete inapplicable) eg, parents, guardians, school principals, teachers, boards, responsible authorities including employers, etc. If yes, please explain how this approval has been or will be obtained, enclosing copies of relevant correspondence. *Please ensure forms make the employers/organisations aware that even once they have given permission in principle to give you access to participant information, they will not be able to provide this until you have obtained agreement from the participants themselves.*

No

16. Will the project require Community consultation? YES/NO (delete inapplicable) ie, will it involve largely one community or that community's resources, or is it likely to result in different treatment for a community or result in statements specifically about a community in the results (eg, a geographically bounded community, a community of like-minded individuals, a community of hobbyists, employees)? A useful, though not exhaustive test of whether a community ought to be consulted, is whether that community has a leadership group that can be consulted. Once approvals are obtained please forward copies to HEC. *Please note: the HEC understands that in many cases consultation is informal, and does not produce official approval documents. In such cases, simply note with whom consultation has taken place, why it is those particular bodies, and include their contact details of those with whom you have consulted.*

No

17. Is the project funded externally? YES/NO (delete inapplicable) If yes, please provide details and discuss any conflict of interest issues that may arise.

No

18. Is the project commissioned by or carried out on behalf of an external organisation(s)? YES/NO (delete inapplicable) If yes, please identify the organisation(s) and any Intellectual Property agreements. This includes ownership of data, results and publications.

No

19. Is the project to be part of the CEISMIC digital archive? If so, please ensure all participants are made aware of this, and have filled in the UC CEISMIC Quake Studies consent form. See www.ceismic.org.nz.

No

Data collection

20. Does the project involve a questionnaire? YES/NO (delete inapplicable) If yes, please include a copy. The HEC does not normally approve a project which involves a questionnaire without seeing the

questionnaire, although it may preview applications in some cases where the production of the questionnaire is delayed for good reason. If there is a questionnaire please answer the following questions:

No

(a) Explain how and why the questionnaire(s) will be anonymous or confidential (Anonymous: you could ***not*** conceivably know who completed it; Confidential: not anonymous, but you will not reveal the identity of the participants to anybody outside the research team)

(b) Explain how the questionnaire will be distributed and collected.

21. Does the project involve a structured or semi-structured interview? YES/NO (delete inapplicable) If yes, please list the topics or the specific questions to be covered.

Interview Questions relative to policy level and statement: (indicative to findings found in WordStat towards specific policies).

- **Why did you act on this policy?**
- **Did you see stakeholder value in acting and or recognising the policy?**
- **Has this policy been in conflict with your firm?**
- **Do you have room to adapt the policy intention to your own situation?**
- **Do you feel there is clarity towards policy outcome and expectation?**
- **Do you feel there are barriers towards the integration of the policy within your firm?**
- **Does your firm have any comment or interest in the technological aims of the *2050ERM* being CCS (Carbon Capture and Storage technology), energy generation or other technological developments and innovations?**
- **Has innovation played a role in integrating this policy?**
- **Is there anything ells you would like to add?**

22. Does the project involve an unstructured interview? YES/NO (delete inapplicable) If yes, please list the topics to be covered.

No

23. Does the project involve focus groups? YES/NO (delete inapplicable) If yes, please include a copy of the confidentiality agreement all participants will sign or explain the way that you will protect the confidentiality of participants.

No

24. Does the project involve recording of Audio, Video or Images? YES/NO (delete inapplicable) If yes, please explain the purpose and describe the recording. Please ensure information sheets fully inform participants of the extent and nature of the recording, and explain the legal and ethical issues of ownership of these recordings and how you have resolved them.

Yes, to allow detailed note taking to occur. The recoding will only be used for note taking and statement referencing, audio files will be destroyed after 5 years of the thesis submission.

25. Will participants will be given the opportunity to check the transcript and/or notes of their interview/focus group? YES/NO (delete inapplicable) It is normal practice to give participants the opportunity to review their transcription. If this is not to be the case, please explain why you believe it is not necessary. Participants must be informed of interview recording both in the information sheet and at the time of the recording, and the process by which they can review the related transcription. *Please note that transcripts of focus groups may raise privacy issues (particularly if the participants are children, since other parents will see comments by children who are not their own).*

Yes, this will be given as a word document, that states all notes taken within the interview. Participants will have five working days to provide feedback on the document.

Informed and Voluntary Consent

Please note: The HEC recommends that participants receive an information sheet, which they must be able to retain, unless there are good reasons for not adopting such a procedure.
The information sheet(s) and the consent form(s) should be separate. Projects which **only** involve an anonymous questionnaire may not necessarily require a separate information sheet, provided that the questionnaire includes your name and contact number as well as the other points contained in the information and consent templates available on the HEC website. *Please note: so that participants can retain a copy of the information sheets, the information sheet(s) and the consent form(s) should be separate.*

26. By whom and how will information be given to potential participants? Please attach a copy of the information sheet and consent form (if email/internet, please provide a screen shot), or the oral briefing script. Also, please set out in precise detail the processes used to obtain consent, and ensure that those processes allow the participant the opportunity to say no or withdraw without stress, embarrassment or difficulty. Where you do not intend to gain written consent, (ie, where you will rely on oral consent etc) please justify and explain how you will gain consent.

    Please see attached participant information and participant consent sheet.

27. Are all participants competent to give consent on their own behalf? YES/NO (delete inapplicable) As a rule, children and young adults under the age of 16 years (or 18 years if still at school) will require parental consent to participate in your research, as do adults who have impairments that limit their capacity to represent themselves. All such participants unable to give consent should still receive a suitable information sheet and assent form where practicable. It is possible in some cases that respect for the autonomy will override concerns over ethical and legal competency, but these are rare and require much justification, and usually only arise in the context of a general community approval to waive competency requirements.

Yes

If no, please explain,

(a) why they are not competent to give informed consent on their behalf?

(b) how consent will be obtained in the absence of that competency?

(c) if applicable, how will assent to participate be gained?

Privacy and Confidentiality

28. Will information pertaining to or about the participants be obtained from any source other than the participant? YES/NO (delete inapplicable) If yes please state:

No

(a) the identity of the third party or parties.

(b) why such information is needed.

(c) how will you obtain consent from the participant and the third party(ies) to gather that data. Please ensure the information sheet is very clear about any data gathered about participants from third party participants, and how you intend to gain permission to see the data.

(d) the processes you will use to obtain that data. If you are using recruitment strategies that access potential participants via a third party please discuss your specific methods here. In general, it is not legal for your participants to give private contact details of other people to you. Usually, should you wish to snowball recruit, you should give your participants an information sheet or advertisement that they can give to others, in the hope that those third parties will then contact you.

It may happen that by virtue of your job, you have right of access to information concerning the participants. Where information has been collected from individuals for a purpose other than your research, it is probable that potential participants will need to be informed that their agreement to participate may involve such use. Guidance on privacy can be found in the polices of the University, and on the website of the Privacy Commissioner.

29. Is information that identifies participants to be given to any person outside the research team, or if identification of or attribution of comments by participants is sought, please explain how and why. YES/NO (delete inapplicable) If yes, please explain how and why and include this in the information and consent forms.

No

30. Please explain how confidentiality of the participants' identities will be maintained in the treatment and use of the data. eg, the HEC expects that researchers will attempt to ensure that stored data is separated into identifying data (eg, consent forms, coding forms), and de-identified (eg, coded data, de-identified transcripts): typically this is done by assigning participants a code on the consent form, and using that code on any data, transcripts, etc. Where this is too difficult, please explain why.

The ethical issues of content analysis are limited due to the impersonal elements of content analysis. The researcher will endeavour to ensure that statements and language are not miss-analysed and communicated during analysis, as this holds the potential to misrepresent companies, particularly if the content is wrongly classified or interoperated. To mitigate these issues, interviews provide opportunities for potential misinterpretation to be questioned and queried by participants.

With regards to the interview component of the research there are a range of ethical considerations that must be recognised. The interviewing process has the potential to cause discomfort and embarrassment. This is due to, the identity ramifications and personal implications towards sustainable energy development within an organisation. To mitigate this participants will be anonymised. This will be done by anonymising the companies themselves when writing the results and discussion of the research. However, Ministries will not remain anonymous, but interviewed participants will be given the generic anonymous title of ministry representative. To ensure information collected does not compromise the participants, transcripts will be shown to the participant, with the option to omit and remove any statements at their own discretion.

31. Is an institution (eg, school, business, etc) to which participants belong to be named or be able to be identified in the publication or presentation of this project? YES/NO (delete inapplicable) If yes, please explain whether you have made the institution aware of this or why you have decided not to do so.

No Company or participant will be named in this research. Companies will be given a numerical number, when represented in the data results and discussion of the thesis. However, Ministries will be named for this research, but interviewed participants will remain anonymous and given a generic title of Ministry Representative. Participants who were interviewed for their respective company will also remain anonymous and given the title of Company Representative. Statements will be approved by participants, by having the opportunity to read transcripts and omit and remove any statements.

32. Where will the project be conducted? It is recommended that interviews be conducted in public spaces, not in private homes. *The committee appreciates that in some cases there may be good academic reasons for conducting research in private homes. If you believe this applies to your project, we ask you to provide (a) a concise justification of why research in the home is necessary for your project, what alternative locations were considered, and why they were discounted, and (b) detail how you anticipate and will seek to mitigate potential risks to both participants and researchers when undertaking research in a private home(s).*

    Please note: in the case of research involving children, young adults and participants who need particular care, an adult other than the researcher is required to be present.

This research will conduct semi structured interviews in a meeting room at Aalto University Helsinki or at interviewee(s) place of work. The location will be decided by the participant.

Risk

If the answer to any of the following questions is "Yes", please indicate briefly the nature of the risk and what actions you could take, or support mechanisms you could rely on, if a participant should become injured, distressed or offended while taking part in this project. In order to maintain a distinction between the researcher and other roles, support should not be undertaken by researcher. At the very least, a list of support services should be included in the information sheet and also participants made aware of the possibility in the information sheet.

33. Is there any risk to physical well-being? YES/NO (delete inapplicable) If yes, describe processes in place to mitigate this/these risk(s).

No

34. Could participation involve mental stress or emotional distress? YES/NO (delete inapplicable) If yes, describe processes in place to mitigate this/these risk(s).

35. Is there a possibility of causing moral or cultural offence, inadvertently or otherwise? YES/NO (delete inapplicable) If yes, describe processes in place to reduce the possibility of causing such offence, and any consultation/awareness training undertaken.

No

36. Is deception involved at any stage of the project? YES/NO (delete inapplicable) If yes, please describe the deception, justify its use.

    Please note: the HEC considers the use of title in the documents for the participants that is designed to hide the real aim of the project, a deception however mild.
    Please attach the debriefing sheet or script that you will use to debrief each participant after they have participated in the project or at the end of the project itself. Ensure that the debriefing sheet includes an explicit reminder that the participant can withdraw without penalty given the deception involved.

No

37. If yes, please describe the deception, justify its use and attach the debriefing sheet or script that you will use to debrief each participant after they have participated in the project or at the end of the project itself. Please ensure that the debriefing sheet includes an explicit reminder that the participant can withdraw without penalty given the deception involved. The use in the information sheet or consent form or questionnaire of a title that differs from the project title given in this application form, in order not to reveal the real aim of the project, is considered to be a form of deception however mild.

No

Data Storage and Future use

38. Please provide details of how the data will be securely stored, and how you will separate identifying and non-identifying data. ie, What steps will be taken to ensure that information given by participants is safe and protected? All storage facilities including electronic equipment should be in rooms that can be locked. All data should be stored in password-protected files and, where on computers, the computers should be password protected. Data should be backed up or stored on the University servers. If you intend to store the data in cloud services please provide a justification and documentary proof that the data will be secure (eg, relevant sections of the terms of service of the provider).

Data will be stored on a personal hard drive and kept on a secure server at Aalto University Helsinki while the candidate is in Finland. This will be achieved through emailing files to a Aalto email account provided (christopher.butlin@aalto.fi). The post graduate email account provided by the University of Canterbury (christopher.butlin@pg.canterbury.ac.nz) will also hold an emailed copy of the submitted thesis. Data files will be emailed to the University of Canterbury email address for storage. Participant consent forms will be scanned and emailed to both Aalto University and University of Canterbury email accounts.

On the completion of the thesis and submission, all data and forms will be submitted as an appendix to the University of Canterbury. A physical hard drive containing the completed thesis and data will be posted to Michael Hall at the university of Canterbury in addition.

39. Who, apart from the researcher and their supervisor (where applicable) will have authorised access to the data? Research Assistants and transcribers need their own confidentiality forms and their participation needs to be made known to participants.

University of Aalto Supervisor Minna Halme, will also have access to data, this will be made clear in the participant information sheet.

40. What will happen to the raw data at the end of the project? Standard HEC principles are that data from research projects will be kept safely and then destroyed as follows:

At the completion of an Honours or similar project
After 5 years for an MA
After 10 years for a PhD or staff research

Please discuss and justify any variations to these guidelines that your project requires (for instance, if the data is to be kept permanently).
This information should be contained in all information sheets and consent forms.

The data will be stored and destroyed after 5 years per MA requirements.

41. What plans do you have for the publication of the data? Please note, and include in your information sheets, that Masters thesis and PhDs are public documents available via the UC library database. Also, participants should be offered summary of results.

Yes, it is hoped to publish from the research data, participants will be made aware of this intention in the participant information sheet.

42. Please describe plans for future use of the data beyond those already described above.

There are no future uses outlined beyond those that are already described above. Aalto School of Business staff will be named as supporting academics for research conducted. Michael Hall as the senior supervisor and the University of Canterbury will be recognised in the result any publications. Minna Halme, as the secondary supervisor from Aalto University School of Business, has no other intended use of data collected in this research.

9.6 Appendix 6; Information Sheet

School of Commerce, Management

Telephone: +358 46 529 5980
Email: christopher.butlin@pg.canterbury.ac.nz or christopher.butlin@aalto.fi
Date: 30/8/2017

"The European Commission 2050 Energy Road Map - implementation impacts for Finnish energy firms towards sustainable energy"

Information Sheet

My name is Christopher Butlin, I am a Masters of Commence student conducting a research for my thesis in partnership with the university of Canterbury and the University of Aalto.

This research aims to further develop literature towards understanding the success impacts of sustainable energy policy for firms. This will be done by measuring the specific actions and decisions made by firms towards sustainable energy policy, allowing a greater picture of policy effectives to be gained.

If you choose to take part in this study, your involvement in this project will be require a semi structured interview, that will be conducted via either at a meeting room at Aalto University or via phone conversation, discussions will be recorded and transcribed. Participants will have the opportunity to see and amend interview transcripts, and have the option to omit any statement(s) at their own discretion.

In the performance of the tasks and application of the procedures there are risks of confidential information to be discussed. This research does not want to collect this information, in the event of a participant disclosing confidential information this will be removed.

Participation is voluntary and you have the right to withdraw at any stage without penalty. You may ask for your raw data to be returned to you or destroyed at any point. If you withdraw, I will remove information relating to you. However, once analysis of raw data starts on *1st of December*, it will become increasingly difficult to remove the influence of your data on the results. Participation in this research will ensure that participant identity will remain anonymous. Companies will be given a numerical number when represented on the results, whilst interview participants will be given the title of Company Representative. Ministries will be named in this research, however participants interviewed will be given a generic title of Ministry Representative.

The results of the project may be published, but you may be assured of the complete confidentiality of data gathered in this investigation: your identity will not be made public without your prior consent. To ensure anonymity and confidentiality, any reference to you name will be omitted, complete anonymity cannot be ensured as positional descriptions will be discussed in the interview. A thesis is a public document and will be available through the UC Library.

Please indicate to the researcher on the consent form if you would like to receive a copy of the summary of results of the project.

The project is being carried out as a requirements for a Masters in Commerce, majoring in Management at the University of Canterbury, New Zealand. By Christopher Butlin under the supervision of Professor Michael Hall, from the University of Canterbury and Professor Minna Halme from Aalto University, who can be contacted at michael.hall@canterbury.ac.nz and minna.halme@aalto.fi. They will be pleased to discuss any concerns you may have about participation in the project.

This project has been reviewed and approved by the University of Canterbury Human Ethics Committee, and participants should address any complaints to The Chair, Human Ethics Committee, University of Canterbury, Private Bag 4800, Christchurch (human-ethics@canterbury.ac.nz).

If you agree to participate in the study, you are asked to complete the consent form and return [*give instructions for return of consent form below*]

9.7 Appendix 7; Consent Form

Consent Form

School of Commerce, Management

Telephone: +358 46 529 5980.
Email: christopher.butlin@pg.canterbury.ac.nz or
christopher.butlin@aalto.fi
Date: 30/8/2017

"The European Commission 2050 Energy Road Map - implementation impacts for Finnish energy firms towards sustainable energy"

Please tick the below if you agree:

- ☐ I have been given a full explanation of this project and have had the opportunity to ask questions.
- ☐ I understand what is required of me if I agree to take part in the research.
- ☐ I understand that participation is voluntary and I may withdraw at any time without penalty. Withdrawal of participation will also include the withdrawal of any information I have provided should this remain practically achievable.
- ☐ I understand that any information or opinions I provide will be kept confidential to the researcher and supervisors and that any published or reported results will not identify the participants. I understand that a thesis is a public document and will be available through the University of Canterbury Library.
- ☐ I understand that all data collected for the study will be kept in locked and secure facilities and in password protected electronic form and will be destroyed after 5 years.
- ☐ I understand the risks associated with taking part and how they will be managed.
- ☐ I understand that I can contact the researcher [*Christopher Butlin, Mob; +358 046 529 5980 email; christopher.butlin@pg.canterbury.ac.nz*] or supervisor Michael Hall email; michael.hall@canterbury.ac.nz or Minna Halme email; minna.halme@aalto.fi for further information. If I have any complaints, I can contact the Chair of the University of Canterbury Human Ethics Committee, Private Bag 4800, Christchurch (human-ethics@canterbury.ac.nz)
- ☐ I would like a summary of the results of the project.

☐ By signing below, I agree to participate in this research project.

Name:_____ Signed:_____ Date:_____

Email address *(for report of findings, if applicable)*:

_____

[Instructions for return the consent form, please state below:]

10. References:

Akbilgic, O., Doluweera, G., Mahmoudkhani, M., & Bergerson, J. (2015). A meta-analysis of carbon capture and storage technology assessments: Understanding the driving factors of variability in cost estimates. *Applied Energy*, *159*, 11-18. doi:10.1016/j.apenergy.2015.08.056

Aslani, A., Helo, P., Naaranoja, M. (2014). Role of renewable energy policies in energy dependency in Finland: system dynamics approach. *Applied Energy 113*, 758-765. doi:10.1016/j.apenergy.2013.08.015

Aslani, A., Naaranoja, M., Wong, K.F.V. (2013). Strategic analysis of diffusion of renewable energy in the Nordic countries. Renewable *Sustainable Energy Review*, *22*, 497-505. doi:10.1016/j.rser.2013.01.060

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