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COMMUNITY ENERGY NICHE IN SCOTLAND AND ITS ROLE IN THE SUSTAINABILITY TRANSITION: PERSPECTIVES OF INTERMEDIARIES

by

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Statement of Originality

'I hereby declare that this dissertation has been composed by me and is based on my own work.'

Signed: *Siti Astrid Kusumawardhani*

THE UNIVERSITY OF EDINBURGH

ABSTRACT OF THESIS

Title of Thesis **Community Energy Niche in Scotland and Its Role in the Sustainability Transition: Perspectives of Intermediaries**

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The multi-level aspect of sustainable development provides the opportunity for innovations at the local level to be part of the solution (Markantoni and Wolvin, 2013). Innovations, particularly technological development, have successfully created numerous transitions from one socio-technical system to another (Geels and Schot, 2007). In sustainable development, transitions are needed to provide alternative, more sustainable pathways to replace incumbent socio-technical systems that are no longer sufficient to cope with sustainability challenge, such as the energy system. Transitions away from fossil-fuel based energy systems and towards renewable energy system is required; such transitions require a complex reconfiguration of factors within the "socio-technical" regime that extend beyond the type of technology, such as user criteria, business models, value chains, organizational structures, regulations, institutional structures, and political structures (Rip and Kemp, 1998). To this end the Strategic Niche Management (SNM) (Kemp et al., 1998) and Multi-Level Perspective (MLP) (Schot and Geels, 2007) have been developed to manage the transitions, which can begin by managing sustainability niches. Community energy in the UK can be conceptualized as a niche that holds the potential of creating an energy transition towards renewable energy. As components of the community energy niche, community energy projects are challenged by many factors to simply survive (Bomberg and McEwen, 2012; Sefyang and Smith, 2007). However, the challenges of up scaling community energy extend beyond the projects and into the niche level, where community energy intermediaries operate (Hargreaves et al., 2013). Due to their strategic position, intermediaries can reveal the mores structural challenges that the community energy is facing, which will determine the potential of the niche to create a transition.

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List of Acronyms and Abbreviations

CARES – Community and Renewable Energy Scheme

CCF – Climate Challenge Fund

CES – Community Energy Scotland

DECC – Department for Energy and Climate Change

DEFRA – Department for Environment, Food and Rural Affairs

DTAS – Development Trusts Association Scotland

FIT – Feed in Tariff

IPCC – Intergovernmental Panel on Climate Change

LES – Local Energy Scotland

MLP – Multi Level Perspective

Ofgem – Office of Gas and Electricity Market

REIF – Renewable Energy Investment Fund

RHI – Renewable Heat Incentive

RO – Renewable Obligation

SNM – Strategic Niche Management

SRDP – Scotland's Rural Development Program

UKERC – UK Energy Research Center

Chapter 1. Introduction

1.1 Community Energy and The Energy Transition

While "sustainable development" has been set as a global objective, and consequently, dominated the global political discourse since the Brundtland Commission Report in 1987 (WCED, 1987; Dryzek, 2013), the strategies for sustainable development need implementation at the local level (Markantoni and Wolvin, 2013). This multi-level aspect of sustainable development thus provides the opportunity for innovations and initiatives at the local level to be part of the solution. Innovations, particularly technological development, have successfully created numerous transitions from one socio-technical system to another, such as the transition from horse-drawn carriages to automobiles within the transportation sector (Geels and Schot, 2007). In sustainable development, transitions are required to provide for and allow alternative, more sustainable pathways to replace incumbent socio-technical systems, which are no longer sufficient to cope with today's sustainability challenges.

One of the most important socio-technical system facing the pressures of population increase, scarcity of resources and negative impacts of climate change is the energy system (IEA, 2013). To mitigate climate change and realize sustainable development, radical transitions away from fossil-fuel based energy systems and towards renewable energy system is required. In order to be successful, such transitions will require a complex reconfiguration of factors within the "socio-technical" regime that extend beyond the type of technology, such as user criteria, business models, value chains, organizational structures, regulations, institutional structures, and even political structures (Rip and Kemp, 1998). To this end, several theoretical frameworks around managing such transitions have developed, which included the Strategic Niche Management (SNM) frameworks (*ibid*; Kemp et al., 1998) and the Multi-Level Perspective (MLP) analysis (Geels and Schot, 2007). The frameworks highlighted how innovations at the local level can be conceptualized as a niche, and if managed successfully, the niche holds the potential of triggering a regime shift and eventually create a transition.

Against the theoretical frameworks of transitions and niche management, the phenomena of community energy in the UK and Scotland can be observed as a niche, which theoretically, holds the potential of triggering a regime shift and create an energy transition towards renewable energy. Community energy, or "projects where communities (of place or interest) exhibit a high degree of ownership and control, as well as benefiting collectively from the outcomes" (Walker and Devine-Wright, 2008), have been growing rapidly in the UK and Scotland over the past decade (Sefyang et al., 2013; Harnmeijer et al., 2013). Community groups have organized themselves into various types of groups and business models, launched various types of renewable energy generation and energy conservation initiatives, and established their own aims and objectives (Bomberg and McEwen, 2012; Sefyang et al., 2013). However, a recent study found that while various community energy projects in the UK are displaying a characteristic of a growing niche, where visions were articulated, learning was shared and networks were built, the niche is neither strategic or managed (Sefyang et al., 2014). As an innovation niche originating from the grassroots, community energy face many challenges in simply surviving, let alone grow large enough to be able to create a transition (Sefyang and Smith, 2007); some of the challenge factors include group (not having key committed individuals), project (lack of resources and skills), community (conflicts within community groups), network (lack of transferrable learning), and policy (inconsistent policy support).

Because most literature on community energy tend to focus on the community energy project level, there seemed to be an emphasis on group, project, community and network challenges (Bomberg and McEwen, 2012; Sefyang and Smith, 2007; Sefyang et al., 2013). The challenges of policy and network, while seemingly most fitting to describe the overall community energy niche and not just community energy projects, have only been detailed in a few studies, including a comprehensive research by Hargreaves et al. (2013). To effectively analyze a niche and its role in a transition, Mourik and Raven (2006) argued that the niche management frameworks were best applied at the niche level, and for community energy the niche level is mostly occupied by intermediaries, or "organizations or individuals engaging in work that involves connecting local projects with one another, with the wider world, and through this, helping to generate a shared infrastructure and to support the development of the niche in question" (Hargreaves et al., 2013). Community

energy intermediaries include public sector organizations, non-governmental bodies, financiers and funders, and consultants and social enterprises, which are performing various roles in supporting the community energy niche-building process.

Intermediaries are seen as critical to the development of robust and successful niches that might be capable of surviving in the medium to long-term, and potentially of diffusing and scaling-up more widely (Hargreaves et al., 2013). According to SNM and MLP, intermediaries support the niche building process and enable alignment between the different levels of transitions: project, niche, regime and landscape (Kemp et al., 1998; Schot and Geels, 2007). Due to their strategic position, community energy intermediaries are able to operate "downwards" by assisting projects at the project level, and "upwards" by lobbying regime actors. Hence, intermediaries are more exposed to a wide range of challenges in up-scaling the community energy, especially those that are more structural, such as network and policy factors. Is it important to discover and understand these challenges in order to analyze the community energy as a niche, and more importantly, assess its potential to create an energy transition.

1.2 Research Objectives and Research Questions

The research objective of this dissertation is to portray and analyze the community energy sector in Scotland as a grassroots innovation niche, that can potentially create a sustainability or energy transition, from the perspectives of community energy intermediaries, who perform the role of up-scaling the niche and influencing alignment between the project, niche and regime level.

The research questions in this dissertation are:

1) Who are the intermediaries in Scotland's community energy sector? What are their specific roles, and do they share the same vision for community energy?
2) What do community energy intermediaries think about the current performance of community energy in Scotland?
3) What are the challenges that intermediaries experience and observe in the community energy niche-building process? Can the challenges be attributed to the nature of community energy as a 'grassroots innovation niche', or are there a

different set of challenges that intermediaries see as a result of their unique position between the project and niche or regime level?

4) How do these challenges contribute to the overall up-scaling of community energy niche in Scotland?
5) How applicable are niche-management frameworks in analyzing a currently developing, socio-technical niche, such as community energy?

1.3 Dissertation Structure

This dissertation will start with a Literature Review of relevant sustainable development, sustainability and energy transitions, niche management and community energy literature; the concepts will be linked to coherently describe community energy and its intermediaries. The chapter will be followed by a Policy Review of the development and current UK and Scottish Government policies on community energy. Next, the Methodology Chapter will consist of the methodological approach taken by this dissertation in designing the research, recruiting participants, collecting data and analysis. The Findings and Analysis Chapter will explain the findings gathered from the interviews, which will be further discussed against the literature reviewed and research questions, and finally will be reflected upon in the Discussions Chapter. The dissertation will close with a Conclusion Chapter, followed by an Appendix that contains some the technical details mentioned in the methodology.

Chapter 2. Literature Review

This literature review aims to review different concepts within sustainable development and link them together into a coherent description of the community energy sector in Scotland. It will start with the concept of sustainable development and how a "socio-technical transition" in the energy system is required to achieve sustainable development. Second, the origins and applications of the concept of transitions will be explained, particularly the role of niches and theoretical frameworks which aim to up-scale the niche to create a transition. Third, the concepts of grassroots innovations and how they can be constituted as niches will be elucidated. Fourth, the community energy sector will be introduced, where it will be presented as a grassroots innovation niche. Lastly, the chapter will explain the challenges of up-scaling the community energy niche, specifically from the perspectives of actors who are involved in the niche-building process, in other words, community energy intermediaries.

2.1 Sustainable Development and Sustainability Transition

Since the 1987 Brundtland Commission Report, sustainable development has become a dominant global discourse (Dryzek, 2013). The Report's definition of sustainable development, which remains the leading definition of this term, states that sustainable development is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987). It calls for "a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change, are all in harmony and enhance both current and future potential to meet human needs and aspirations" (*ibid*, p. 46). The concept of sustainable development is ambitious because it is not merely satisfied with societies' ability to maintain resources through garnering, but it demands for a development that resembles a life-support system where perpetual growth of human needs is met through an intelligent operation of natural and human systems in combination (Dryzek, 2013). Thus, in order to exist in a state of *being* sustainable, systemic changes in the form of transitions are required to take place and move us away from incumbent "socio-technical systems" that are no longer sufficient to respond to current sustainability challenges.

The term "socio-technical" captures the complex configuration of artifacts, institutions and agents that reproduce technological practices, which in turn provide services to fulfill the needs of societies. It reflects the pervasive technological mediation onto social relations and vice versa, the social nature of technological entities. In short, socio-technical systems highlight how established technologies are intertwined with "user practices and lifestyles, complementary technologies, business models, value chains, organizational structures, regulations, institutional structures, and even political structures" (Rip and Kemp, 1998). Along with socio-functional systems such as food, transportation and sanitation, the energy system can be conceptualized as socio-technical system, or a system which consists of "(networks of) actors (individuals, firms, and other organizations, collective actors) and institutions (societal and technical norms, regulations, standards of good practice), as well as material artifacts and knowledge" (Geels, 2004; Markard, 2011).

The sustainability of the incumbent fossil-fuel based energy system is fundamentally challenged by its rapid use of nonrenewable natural resources, outputs of greenhouse gas emissions and air pollutants, impacts on climate change, and uncertainties over energy supply and energy poverty (IEA, 2013). Perpetuating these challenges are increases in population, affluence and consumption of energy per capita. The recent Intergovernmental Panel on Climate Change (IPCC) 5th Assessment Report confirmed that climate change is occurring due to anthropogenic sources of greenhouse gas emissions; climate change irrefutably results from the combustion of fossil fuels in the energy sector (IPCC, 2013). Thus, to mitigate the negative impacts of climate change, a radical transition away from the incumbent energy system is required. Such transition will necessitate innovations in the form of clean and renewable energy, and a "factor 20" resource efficiency (Berkhout, 2002). However, fossil fuels continue to dominate the global power generation sector; while the share of fossil fuel based energy is projected to decline from 68% in 2011 to 57% in 2035, total share of renewable energy in power generation is projected to only rise from 20% in 2011 to 31% in 2035 (IEA, 2013).

The transition towards a renewable energy system is challenged by "path-dependencies" and "lock-ins" which result in inertia and prevent alternative and more sustainable pathways to take place (Nelson and Winter, 1982; Russell and Williams, 2002). Cognitive

frameworks surrounding routines, resources and capabilities around technology, the way specific social and technical practices are embedded, how incumbent practices enjoy economies of scale such as mass-markets and positive externalities, co-evolutions of institutions and prevailing market and social norms, all lock development into a fixed trajectory (Seyfang and Smith, 2007). Examples of lock-ins and path-dependencies in the energy system include an aversion to renewable energy technologies and the significant investment and lobbying power enjoyed by the fossil fuel industry.

Against this background, research studying how to transition into a more sustainable system has been growing over the past 10-15 years, particularly on governing transitions (Markard et al., 2012). A sustainability transition hinges on the occurrence of a socio-technical transition, or a "set of processes that lead to a fundamental shift in socio-technical systems" (Geels and Schot, 2007). This type of transition cannot occur from simply changing the technology; it involves far-reaching changes beyond technological domains, such as material, organization, institutional, political, economic and socio-cultural dimensions (Markard et al., 2012). During the course of a transition, new products and services can emerge to substitute or complement existing ones, along with new user practices and perspectives. For instance, the transition from horse-drawn carriages to automobiles in the transportation system during 1860-1930 was complemented by changes in road infrastructure, traffic rules and insurance services (Geels, 2005b). The automobile transition also affected social domains such as housing, working and commuting, trade and urban planning. Other examples of socio-technical transitions include the introduction of a pipe-based water supply (Geels, 2005a) and the switch from cesspools to sewers (Geels, 2006).

Transitions, which involve changing a socio-technical regime, can only be done slowly and gradually (Markard and Truffer, 2006). They involve multiple actors and unfold over extensive time period, often taking more than 50-100 years. Most changes in socio-technical systems have been incremental or have resulted from a piecemeal approach, such as introducing road pricing to reduce congestion and pollution in the automobile-based transportation system (Kemp and Van Lente, 2011); these changes are not sufficient to solve the basic problem of congestion. Likewise, doing similar adjustments to the energy

system, will not be effective in addressing its systemic sustainability challenges (Markard et al., 2012).

Sustainability transitions are "long-term, multi-dimensional, and fundamental transformation processes through which established socio-technical systems shift to more sustainable modes of production and consumption" (Markard et al., 2012). The process is a "dual challenge" because it not only includes the challenge of orchestrating change of systems of provision, but also the *criteria* that actors use to judge appropriateness of products, services and systems (Kemp and Van Lente, 2011). In the transition from sailing ships to coal-powered ships for example, the changes in user criteria were not significant; both types of ships still compete in speed, tonnage and reliability. In contrast, sustainability transitions require a drastic change in user criteria or else the transformations risk of being unsustainable, for instance, due to rebound effects (*ibid*). Sustainability transitions require both technological change and the way that technology is used e.g. a transition to electric vehicles to reduce emissions should be accompanied by changing user practices, such as selective use of automobiles and increased use of public transportation.

One of the key themes that emerged from this dissertation's review of sustainability transitions studies, is that transitions can be guided by long term goals, which inform the direction of the transition, with multiple actors working together in a strategic and coordinated manner (Smith et al., 2005). To this end, four main theoretical framings have emerged: Strategic Niche Management (SNM), Multi-level Perspective (MLP) on socio-technical transition, transition management, and technological innovation systems (Markard et al., 2012). While the first two are the most relevant to this dissertation, a map consisting of all frameworks could prove useful in demonstrating their shared theoretical origins and linkages (Fig.1).

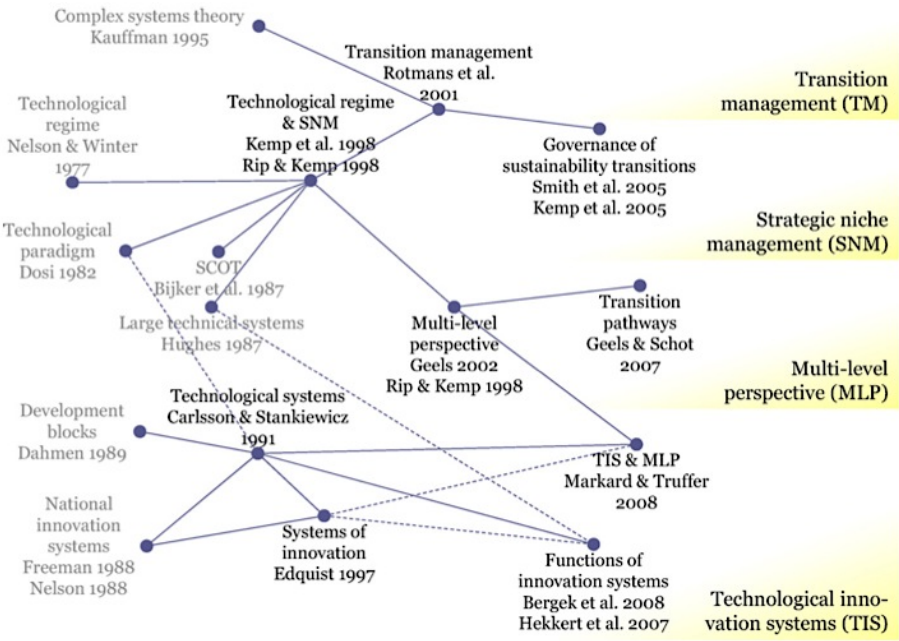

Fig. 1. Map of key contributions and core research strands in the field of sustainability transitions studies (Markard et al., 2012).

Central to all four frameworks is the concept of the socio-technical regime (Kemp et al., 1998; Rip and Kemp, 1998). The concept builds on key ideas from evolutionary economics (Dosi, 1982; Nelson and Winter, 1982) and history and sociology of technology (Hughes et al., 1987). The concept is central because it provides the *logic* and *direction* of pathways of development (Markard et al., 2012); it emphasizes how technology is socially embedded and negates the technological determinism of transition. The socio-technical regime was inspired by quasi-evolutionary perspectives on technical change, that variation is not blind as assumed by early evolutionary economists, but is *directed* to some extent by various actors, making the role of social actors and culture highly influential in development of a technology (Schot and Geels, 2008).

Having established the link between transition and its function in fulfilling sustainable development, it is important to now understand where and how transition begins. Even though sustainable development has been recognized as a global objective, it remains as a multi-level concept (Starik and Rands, 1995), where strategies require implementation at the local level (Markantoni and Woolvin, 2013). Therefore, innovations at the local level can have a part in initiating sustainability transition. The next section will address the concept of niches as sustainability innovations that originate and grow from the local level.

2.2 Managing Transitions: The Role of Niches

Historically, socio-technical regimes undergo radical changes due to external shocks, such as peak oil or economic recession, however, succession can also begin with a network of niches and niche practices on the margins (Seyfang and Smith, 2007). The "niche" has become a key concept in transition studies due to its pivotal role in the emergence of novel technologies (Markard et al., 2012). A niche can be defined as "a discrete application domain…where actors are prepared to work with specific functionalities, accept such teething problems as higher costs and are willing to invest in improvements of new technology and the development of new markets" (Hoogma et al, 2002, p.4). Niches provide a "protected" space to experiment with and develop new ideas and innovations that are, in practice, radically different from the existing regime, without being subject to the selection pressure of the prevailing regime (Kemp et al., 1998).

Niches are largely formed through a bottom-up process. As "platforms for interaction, niches emerge out of a process of interaction shaped by multiple actors" (Kemp et al., 1998). Still, actors such as governments, can contribute to a niche formation by providing spaces needed for their formation; the instrument to introduce and manage niches is the SNM framework, a theoretical concept that explores how innovations develop and grow, and how those processes can be harnessed strategically in order to challenge and potentially replace existing socio-technical system (Hargreaves et al., 2013). It is a tool to support the societal introduction of radical sustainable innovations (Mourik and Raven, 2006). Essentially, SNM refers to the deliberate creation and support of niches, which was suggested in early sustainability transition literature as a way to jumpstart the development of market niches to trigger regime shifts (Hoogma et al, 2002). Kemp et al. (1998) had succinctly defined SNM as:

> The creation, development and controlled phase-out of protected spaces for the development and use of promising technologies by means of experimentation, with the aim of (1) learning about the desirability of the new technology, and (2) enhancing the further development and the rate of the application of the new technology.

The SNM framework was developed to manage particular types of innovation, such as socially desirable innovations that serve long-term goals for example sustainability, and

radical novelties that face a mismatch with the existing regime (Schot and Geels, 2008). Using SNM, governments can subsidize and nurture innovations in niches, which are not yet profitable, with the expectation that they will become important for realizing societal and collective goals in the future. Furthermore, for a niche to successfully grow and in trigger a regime shift, the literature identified three internal niche-building processes that must occur: (1) articulation of expectations and visions, (2) sharing of social learning across multiple experiments and dimensions, and (3) building of heterogeneous social network, and (Kemp et al., 1998). Through these processes, niches can gain momentum and compete with established technologies (Geels and Raven, 2006 in Schot and Geels, 2008).

In early sustainability transition literature, niches were believed to initiate regime shifts through the bottom-up process of expansion; niches expand in mass and eventually overtake and replace the incumbent regime (Kemp et al., 1998). However, it became apparent that niches could not seed wider change on their own (Hoogma et al., 2002). Instead, regime shifts depend on contingencies and broader processes beyond the unilateral control of niche actors (Berkhout et al., 2004). The success of the East Anglia Food Link (EAFL) provides a useful case study, a local NGO that began promoting locally sourced organic food for local schools in 1999. The EAFL was experimenting with a food production system that is radically different from the current regime of high-intensive farming and large-scale distribution by food retailers (Sefyang and Smith, 2007). The EAFL also proposed a different social infrastructure of the food system, one that internalized the environmental costs food production (*ibid*). The NGO did not have a substantial impact until 2005, when a high profile television series criticized the low standards of food in schools. The series galvanized local communities to demand fresh, locally made, and healthier produce in schools; the school policies were changed and an organic farmer co-operative, consisting of the EAFL, was established to deliver the food to local schools.

Case studies similar to the EAFL have led to adjustments of the SNM framework to include the external processes that also influence the niche's ability to trigger regime shifts. In essence, niches grow, stabilize and decline in interaction with the dynamics of

prevailing regimes (Mourik and Raven, 2006). Additional studies of failed technologies and niches have also led to the key differentiation between the different levels involved in transition, most importantly, the differentiation between the project level and niche level (*ibid*) (Fig. 2). The project level consists of the various innovations and technologies, while the niche level is situated above the project level, and consists of an emerging community that shares cognitive, formal and normative rules. Niche development was thus conceptualized as progressing at both levels simultaneously (Schot and Geels, 2008).

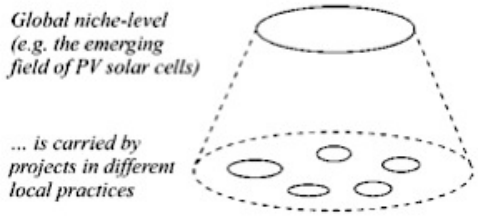

Fig. 2. Local projects and global-niche level (Geels and Raven 2006, in Schot and Geels, 2008**).**

Based on adjustments to the SNM framework, further strands of niche-based theories developed and led to the MLP analysis, which was mainly advanced by the work of Geels (Geels, 2002; Geels 2005a,b). Built on the SNM framework of Rip, Kemp and Schot (Kemp et al., 1998; Rip and Kemp, 1998), the MLP analysis applies three analytical levels: (1) micro-level, where niches are formed and radical novelties emerge, (2) meso-level, formed by socio-technical regimes in the form of existing large-scale existing systems (e.g. energy, transport), and (3) macro-level, formed by the socio-technical landscape, an exogenous environment beyond the direct influence of niche and regime actors (e.g. macro-economics, deep cultural patterns, macro-political developments) (Schot and Geels, 2008) (Fig. 3). The different levels can also be envisioned as projects at the micro level, government or national scale at the meso level, and the international political landscape at the macro level (Mourik and Raven, 2006).

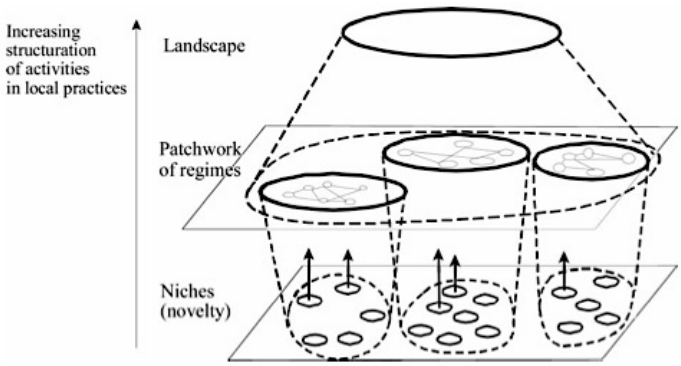

Fig.3. Multiple levels as nested hierarchy (Geels, 2002 in Schot and Geels, 2008).

The core notion of the MLP analysis is that transitions come about through interactions between processes occurring at different levels. Niche innovations at the micro-level build up internal momentum and they become elements of the new or existing systems. Changes at the landscape level create pressures on the regime, and destabilization of the regime creates windows of opportunity for innovations and niches to break out (*ibid*) (Fig 4).

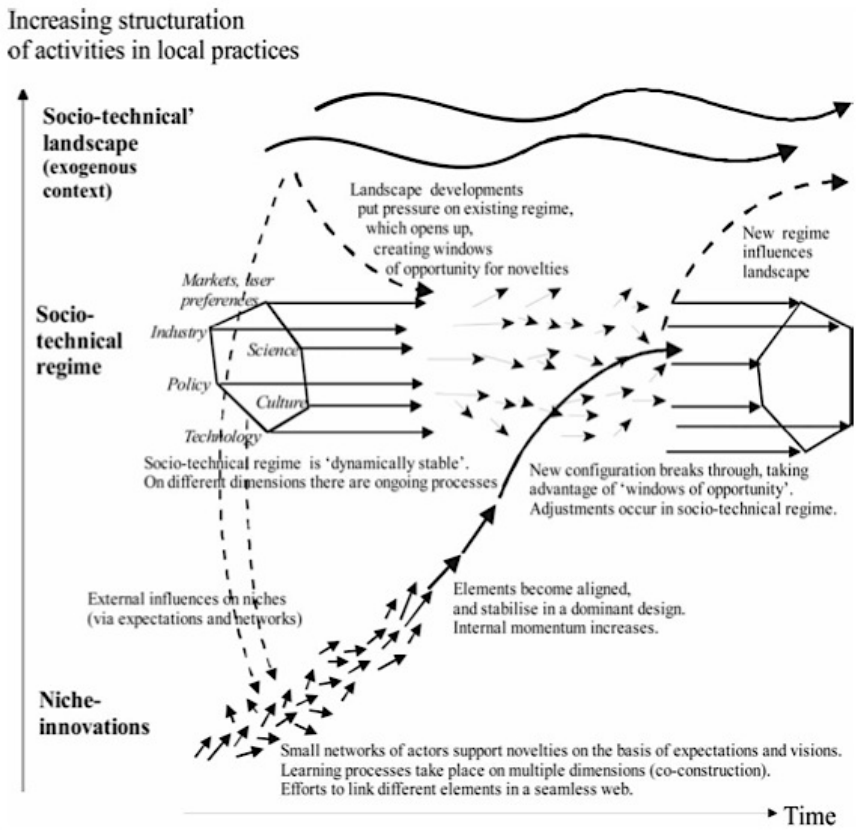

Fig. 4. Multi-level perspective on transitions (Geels, 2002 in Schot and Geels, 2008).

Consequently, imposing a normative goal, such as sustainable development, on existing socio-technical regimes implies connecting and synchronizing the changes amongst actors, institutions and artifacts, at different points within and beyond the regime (Sefyang and Smith, 2007). The MLP analysis thus corrects earlier assumptions that regime shifts can simply occur through niche expansion, instead, alignment between the different levels is required. While niches remain important for innovations, they cannot diffuse widely unless they connect with ongoing processes at the regime and landscape level (Schot and Geels, 2008). The MLP analysis also amended niches so that they can have multiple roles and need not always compete with or substitute prevailing regimes as assumed in early SNM literature. The conclusion led to a development of theoretical work to distinguish various types of niches and transition pathways; one key distinction is the difference between the simple versus the strategic niche, where simple niches were satisfied in existing around the margins without necessarily having the interest to scale up, trigger a regime shift and create a transition (Schot and Geels, 2008). Niches can be incorporated into existing regimes and transform the regime from within (Smith, 2007).

2.3 Grassroots Innovations and Niches

Niches in original SNM and MLP literature have been exclusively conceptualized as business-led technological niches that produce radical technological innovations in a market economy. Within this setting, the grassroots sector became "a neglected site of innovation for sustainability" (Sefyang and Smith, 2007). Grassroots innovations differ from the mainstream, market-based innovations that have been the mainstay of empirical research and theoretical development in transitions studies (Geels, 2005). As niches, grassroots innovations are not the exclusive, powerful vanguard for a more sustainable future, but rather a source of innovative diversity (Sefyang and Smith, 2007). Grassroots innovation can be defined as "networks of activists and organizations generating novel bottom–up solutions for sustainable development; solutions that respond to the local situation and the interests and values of the communities involved. In contrast to mainstream business greening, grassroots initiatives operate in civil society arenas and involve committed activists experimenting with social innovations as well as using greener technologies" (*ibid*, p. 585).

There are fundamental differences between market-based innovation and grassroots innovation, which include: organizational forms (firms vs. a range of organizations such as community trusts, co-operatives, informal groups and volunteer-run bodies, etc.), resource base (commercial income vs. grant funding, charity, voluntary labor, etc.), context (market economy vs. social economy), driving motivation (pure profit and rent seeking vs. fulfilling social needs, ideological pursuit and other collective values), and different vision of sustainable development (mainstream concept of "greening of business" and "ecological modernization" vs. radical reform of socio-technical systems) (*ibid*). Grassroots innovations exist within the social economy of community activities, with different emphases on social, ethical and cultural rules. Research into grassroots innovations have also revealed how symbolic values and shared practices can bring principal benefits, rather than tangible economic benefits, e.g. local currencies initiatives, where communities feel empowered by valuing people's labor equally, and local-food activities, where communities highly value their ability to bypass supermarket chains (Sefyang, 2009).

Recent studies on grassroots innovations, such as complementary currency (Seyfang and Longhurst, 2013), energy (Seyfang and Haxeltine 2012; Hargreaves et al., 2013; Ornetzeder and Rohracher, 2013; Seyfang et al., 2014), food systems (White and Stirling, 2013), and organic food (Smith, 2006) have revealed that while grassroots innovations differ from each other, they commonly face the challenges of simply surviving, let alone growing large enough to be able to replicate and diffuse into mainstream systems (Sefyang et al., 2014). In general, grassroots innovations face the challenges of being situated in a local context while facing pressures to scale up and become mobile or transferrable elsewhere. Grassroots innovations often attempt to address structural problems by project-based solutions, which can be highly challenging (Smith and Seyfang, 2013). In addition, the values that catalyzed their formation, can clash with mainstream commercial and policy priorities, making the translation and diffusion of innovations difficult even with support from dedicated intermediaries (Sefyang and Smith, 2007). Grassroots initiatives also often fail in the absence of long-term resources and institutional support.

The obstacles faced by grassroots innovations have been categorized by Sefyang & Smith (2007) into the categories of *intrinsic* and *diffusion* challenges. Intrinsic challenges refer to

internally focused issues of how grassroots innovations are organized and managed, the skills and resources they require, and the ways these can leave them more vulnerable to shocks such as funding cuts, loss of key people and changes in policies. Grassroots innovations often struggle with securing and sustaining participation and resources over time and mitigating "volunteer fatigue" among staff running the projects (Middlemiss and Parrish, 2010). Ideological disputes and internal conflicts within grassroots groups can also act as a barrier (Smith, 2011). Grassroots innovations may also experience difficulty in establishing strong links with the community (of place), especially if they do not reflect the diversity in that community (Sefyang and Smith, 2007). On the other hand, diffusion challenges refer to the barriers that reduce the wider, external influences that grassroots innovation may have, such as context-specificity and geographical rootedness, ideological commitments to being the "other" compared to the mainstream, competition from mainstream groups who may water down their purpose and the general risk aversion policy makers have when dealing with small-scale, radical and relatively informal organizations (*ibid*).

As a niche in sustainability transition, grassroots innovations can be analyzed with the SNM and MLP frameworks. Sefyang et al. (2013) argued that although transition and niche management literature does not explain the diffusion of social innovations in particular, the theories are still valuable to explain the niche scaling-up process and interaction between the niche and the mainstream. Niche frameworks could provide a fruitful bridge between analysis of grassroots niches as civil society activities and their role in sustainability transition (Sefyang and Smith, 2007). Although, a more flexible interpretation of niche and niche development is required when examining government programs, e.g. attempts to develop protected spaces for niche creation (Hielscher, 2011).

It important to highlight that due to the fundamental differences between market-based and grassroots innovations, it can be challenging to apply niche-based frameworks (Hargreaves et al., 2013). Scholars have noted the limitations to SNM and MLP when the unit of analysis is a grassroots innovation niche; the structured and managerial thinking in niche management can not capture the messier pluralities and voluntary associations of grassroots innovations (Smith and Seyfang, 2013). Identities, community dynamics and

power relations within the grassroots can also be easily underplayed (*ibid*). Schot and Geels (2008) further acknowledged that the role played by politics within regime shifts could not be easily captured in SNM and MLP.

In a study that applied SNM to a low-energy housing development in the UK, Lovell (2007) argued that SNM framework needed to be broadened in order to account for distinct characteristics of grassroots innovations and "the messiness of socio-technical system change." She pointed out how it was highly difficult for the Government to manage grassroots niches in a well-planned orderly manner. Furthermore, she argued that the neat and staged SNM model disregarded the politics of socio-technical change. She found that UK Government policies on eco-housing did not amount to a coordinated and coherent niche management. Instead, the Government was merely associating itself with an emerging niche to gain credibility in fulfilling its sustainability targets. She argued how niches-based policies were more appealing for governments compared to system-wide changes because they are less likely to threaten powerful interests embedded within current socio-technical systems.

Against the background of governing sustainability transitions by strategically managing grassroots innovation niches, the next section will introduce community energy as a niche that can potentially be managed in order to create an energy socio-technical transition.

2.4 Introducing Community Energy

2.4.1 Current State of Community Energy in the UK and Scotland

Walker and Devine-Wright (2008) defined "community energy" as "projects where communities (of place or interest) exhibit a high degree of ownership and control, as well as benefiting collectively from the outcomes." A graph has been made to demonstrate the flexibility of this definition, particularly on the varying degree of ownership and distribution of benefits according to group structures and business models (Fig. 5). On a graph, a community energy project will lie in opposite to a commercial energy firm, whose ownership is distant (i.e. centralized energy generation) and distribution of benefits private (i.e. shareholders).

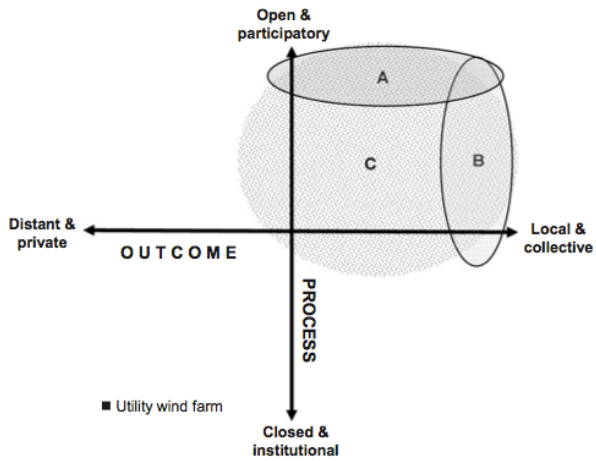

Fig. 5. Understanding of community renewable energy in relation to project process and outcome dimensions (Walker and Devine-Wright, 2008).

The term "community energy" can be applied to a diverse range of initiatives, reflecting the pluralistic nature of this sector. It encompasses energy conservation (demand) and sustainable energy generation (supply), for example, village hall energy efficiency retrofits, collective behavior change programs, such as Carbon Rationing Action Groups and Student Switch Off, Transition Towns, energy cooperatives, and community-owned wind power, such as the projects owned by the communities of Isle of Gigha and Isle of Eigg (Sefyang et al., 2014). Hielscher et al., (2013) identified three aspects that make this sector unique from other government or business-led initiatives, first, community energy groups are multi-faceted and rarely address only one technology or behavior; they can combine behavioral change alongside energy generation. Second, community energy groups can overcome structural limitations of actions by an individual by bringing together a group of people with a common purpose and objectives. Third, community energy enables citizen participation in sustainable development by providing local solutions that work in a local context, built on existing knowledge and network.

Over the last few years, there have been a flourishing number of community energy projects in the UK. In 2007, Walker et al. (2007) identifed over 500 community energy

groups across the UK, and by 2014, the online forum for UK community energy, EnergyShare (www.energyshare.com), have listed more than 1097 active "groups." According to a ResPublica Green Paper addressed to the UK government, the total operational capacity of community renewables in the UK has grown from 4.1 MW in 2003 to 58.9 MW in 2013 – a fourteen-fold increase (or an increase of over 1300%) (Harnmeijer et al., 2013). The figure is the summed capacity of 146 separate installations, 50 of which are located in England (21.6 MW); 83 in Scotland (33.7 MW) and a further 13 installations with a combined capacity of 3.7 MW across Wales and Northern Ireland (*ibid*).

In Scotland, the UKERC-funded project 'EnGAGE Scotland' has identified more than 300 community energy projects as operational (Harnmeijer et al., 2012), with a total installed capacity of 33.7 MW (Harnmeijer et al., 2013). Most of the projects are centered in the northwest Scotland in the Highlands and Islands regions (Fig. 6) and are dominated by on-shore wind, biomass and hydroelectric installations (Fig. 7).

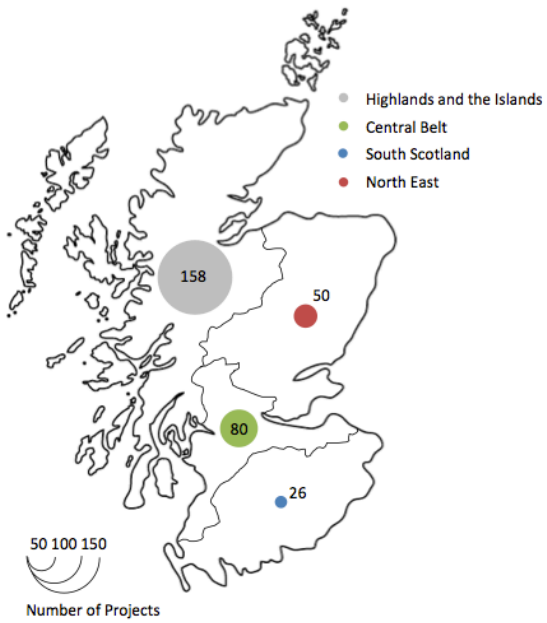

Fig.6. Distribution of community energy projects in Scotland (Harnmeijer et al., 2012).

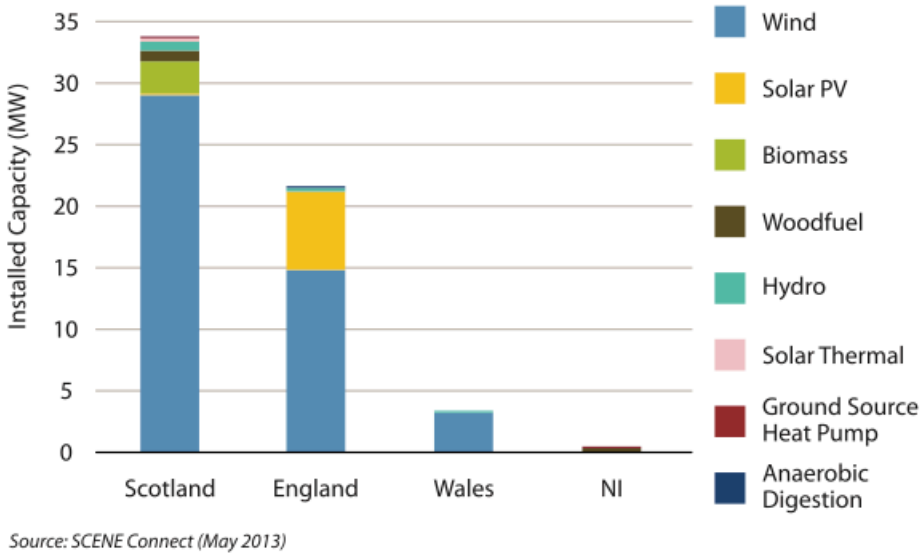

Fig 7. UK community renewable energy capacity by country and technology (Harnmeijer et al., 2013).

Policy support for community energy has also risen in recent years, particularly policies that support the role of communities in transitioning towards a low-carbon economy. In 2014, the first-ever 'UK Community Energy Strategy' acknowledged, "community-led action can often tackle challenges more effectively than government alone, developing solutions to meet local needs, and involving local people" (DECC, 2014). Furthermore, communities can "make a contribution to achieving … energy and climate change goals in a number of ways…" and "can help maintain energy security and tackle climate change" (*ibid*). In Scotland, the '2020 Routemap for Renewable Energy' outlined a target of 500 MW of community or locally-owned renewable electricity generation by 2020, as part of Scottish Government's emissions reduction target of 42% by 2020 from 1990 level (Scottish Government, 2011). A more detailed review on the UK and Scottish Government policies on community energy policies will be described in Chapter 3.

2.4.2 Community Energy Ownership Structures

Community energy is rooted in civil society and the grassroots; this is fundamental to its character and ability in engaging local communities, making it distinct from large energy companies. In a UK wide-survey of 354 community energy groups, Sefyang et al. (2013) found that groups were instigated by a diverse range of civil society groups, such as voluntary organizations, co-operatives, informal associations in partnership with social enterprises, development and community trusts, school clubs and societies, faith groups,

local businesses and local government or utility companies. Most groups were small in size; three-quarters of the groups had 10 or fewer core members and only two-thirds had paid staff. The survey found community energy group structures to be mostly informal, with groups working independently or becoming part of larger formal initiatives. Group structures vary according to ownership model and profit distribution, from charitable incorporated organizations, charitable social enterprises to limited companies with social purposes (Gubbins, 2010) (Table 1). These diverse structures demonstrate the flexible meaning of "community" in community energy, particularly when ownership structures allow for shareholders from outside of the community's geographical area and the private sector to take part (in joint ventures and co-operative model).

Table 1. Classification of Community Renewable Energy Projects (Gubbins, 2010)

Model	**1. For Profit**	**2. Profit and non-profit distributing**	**3. Non profit distributing**	**4. Community Benefit**
Description	Local developments providing opportunities for local private investors and "small" investors nationally	Joint venture arrangements between private and non-distributing companies	Developments by non-profit distributing bodies on behalf of all people in a community	Community benefit' arrangements with private commercial developers
Developer	e.g. Co-ops, farmers and rural businesses	e.g. private landowners and local development trusts	e.g. local development trusts, community interest co-ops	e.g. wind farm community benefit payments
Ownership	Individuals, profit distributing companies and co-ops	Special purpose vehicles (joint) or two separate companies, private and community	Community groups	Developer
Legal Basis	Companies Ltd. by shares, Industrial and Provident Society with profit distribution	Companies Ltd. with both owning shares; or separate Company Ltd. by shares, one owned by community group.	Typically Company Ltd. by guarantee with trading subsidiary limited by shares	Payments usually to an existing community trust or one established for purpose
Main Beneficiaries	Private individuals	Both private individuals and community groups	Community groups and wider community	Wider community

According to Harnmeijer et al. (2013), community energy business models can also be classified as follows:

- Community-led Ownership: The community organisation is responsible for implementing and financing the project, either via a wholly community-led energy co-operative or other community- led structures.
- Joint Ownership: An energy developer is responsible for implementing the project. These take two forms
    - Equity partners: For example, a community-benefit organisation purchases a stake in the project, such as the Neilston Community Wind Farm (a partnership between Neilston Development Trust and Carbon Free Developments).
    - Community shares: A community-owned organisation (e.g. an energy co-operative) purchases a stake in the project, such as Isle of Skye Renewables Co-Operative.
- Public/Community-led Ownership: A public body was involved in the implementation or financing of a project and the community also has part or full ownership of the project.

There are multiple reasons communities establish their energy projects; in the UK-wide survey, Sefyang et al. (2013) identified an average of 8 objectives per project. The most commonly cited (83% of projects surveyed) were economic incentives, such as saving money on energy bills and generation additional income. Other objectives include environmental concerns, such as reducing carbon emissions, improving local energy independence, community empowerment and generating income for local communities. Some groups were also motivated by wanting to improve the local environment, tackle fuel poverty, influence wider sustainability and climate change policies and improve the community's well-being. In Scotland, the most cited reason was to "generate local income and to strengthen the local economy", followed by "to decrease the community carbon footprint and/or increase energy awareness (Harnmeijer et al., 2012).

2.5 Conceptualizing Community Energy as a Grassroots Innovation Niche

Community energy can be conceptualized as a grassroots innovation (Seyfang & Smith, 2007; Seyfang et al., 2013). First, the forms of innovations within this sector are manifold. While the technologies used or behaviour adopted are not particularly novel, having been developed in mainstream settings, the fact of applying them in a community setting poses a wide range of challenges that demand innovations (Mulgan et al., 2007 in Hielscher, 2011). These innovations include alternative socio-technical arrangements, such as development of new legal frameworks, ownership and financing model to ensure that benefits are shared with the community, new operational approaches for technology implementation at a community-scale, and new organizational structures to ensure community's involvement in decision-making process (Hielscher et al., 2013; Hargreaves et al., 2013). Second, community energy is grassroots because it originates from the societal level, mostly initiated by committed individuals, activists and community groups. The varying organizational forms, the resource base of a mix of funds, grants and loans, their existence in the social economy, collective values and diverse motivations make community energy distinctly grassroots compared to market-based innovations.

To study how community energy can play a role in creating a sustainability transition, it can be conceptualized as a grassroots innovation niche, analyzed with SNM framework and MLP analysis (Walker et al., 2006). This conceptualization can help uncover the unique set of challenges faced by community energy, in comparison with renewable energy or energy conservation in general, especially when the challenges are amplified due to the "grassroots" nature of community energy projects (Capener, 2014). As a niche, community energy provides a protected space of a discrete application domain for experimentation of new technology and ideas that provide an alternative to the current regime (Sefyang and Smith, 2007). Community-owned wind power in Isle of Gigha, for instance, has been experimenting with a groundbreaking battery project to help store excess energy (CES, 2013), while projects in the Transition Town network have been promoting a radically different lifestyle compared from the mainstream, which is based on rebuilding resilience and reducing CO_2 emissions (Transition Town Network, 2013).

While community energy *can* be conceptualized as a niche, the question remains whether community energy is becoming a niche, i.e. is there a niche-building process taking place? In a recent study that applied SNM onto UK community energy, Sefyang et al. (2014) concluded that while there is an evidence of a community energy niche forming in the UK, it is neither strategic nor managed. In terms of common expectations and visions, the study concluded that there is not yet an influential niche able to shape development of future projects with an overall shared vision. In terms of learning and networking, the study established that learning is mostly shared peer-to-peer (between projects, informally) and that niche level actors are emerging but not playing a significant role in the process of aggregating shared learning and distributing it through the networks.

Middlemiss and Parish (2010) argued that envisioning community energy as a niche pre-assumes its capacity of becoming one. In fact, community energy faces considerable challenges at the project level, such as the mobilization of their existing structural and symbolic resources, gaining support and sustaining projects on the ground (Bomberg and McEwen, 2012). Similar types of challenges were found throughout the body of qualitative research around community energy, as observed by Sefyang et al. (2013), which were clustered into five areas of internal and external success factors:

- Group: not having key committed individuals to drive a project forward; lack of clear direction, ineffective organizing which hinder groups to maintain momentum and overcome setbacks;
- Project: a need for sufficient time, information, skills, money and material resources to carry out the project; financial viability;
- Community: overcoming public disinterest and mistrust of new energy systems; tackling a sense of disempowerment in the public; designing project to meet the community's needs; engaging with and developing trust with the community;
- Network: the need to consolidate learning and skills so they can be transferred to others; the need to form supportive partnerships and information- sharing networks; and,
- Policy: a lack of policy support; inconsistent and hard-to-access grant funding; difficulties with planning and other legal issues.

While the aforementioned list explains the challenges of building the community energy niche, as experienced by community energy projects at the project level, it does not fully represent the dynamics occurring at the niche level among niche-level actors. There seems to be a gap in the literature around UK and Scotland's community energy niche, as very few researches have been solely focused on niche-level actors, such as community energy intermediaries (see Hargreaves et al., 2013 as one noteworthy study on the subject). Because intermediaries operate at the niche level, they are able to interact "downwards" with the projects at the project level, and "upwards" with the Government at the regime level. In this light, intermediaries are much more strategically positioned to observe and experience the more structural challenges faced by the community energy niche, particularly challenges around "policy factors", such as the lack of policy support, inconsistent funding support, difficulties with planning process and other and legal issues, as mentioned by Sefyang et al. (2013).

2.6. Scaling-up the Community Energy Niche from the Intermediaries' Perspective

According to SNM and MLP, for niches to successfully a regime shift, an alignment must occur between the niche, regime and landscape levels. Because community energy groups are located at the project level, they need the assistance of community energy intermediaries that are operating at the niche level to enable this alignment. Intermediaries are "organizations or individuals engaging in work that involves connecting local projects with one another, with the wider world, and through this, helping to generate a shared infrastructure and to support the development of the niche in question" (Hargreaves et al., 2013). As observed through SNM and MLP, intermediaries operate "downwards" with the projects they are assisting, and "upwards" with regime actors, such as governments. Intermediaries are thus seen as critical to the development of robust and successful niches that might be capable of surviving in the medium to long-term, and potentially of diffusing and scaling-up more widely. However, in performing their tasks, community energy intermediaries are continually challenged by a shifting policy and funding landscape; intermediaries have been frequently forced to learn and adapt, often modifying and updating the types of support and services they provide to local community energy projects (*ibid*).

There have been three distinct "waves" of community energy intermediary groups development in the UK (*ibid*):

- The first wave, from the 1970s onwards, involved organisations such as the Centre for Alternative Technology or the Centre for Sustainable Energy (originally known as the Urban Centre for Appropriate Technology) who formed in support of the alternative technology movement.
- The second wave, in the late-1990s and 2000s, saw organisations such as the Energy Savings Trust and regionally-based organisations benefitting from the Community Renewables Initiative, such as Severn and Wye Energy Agency, or Thames Valley Energy Agency, emerge to manage public aid in support of community energy initiatives.
- The third wave, from 2010 onwards, has seen the development of independent consultants and professional service providers, such as Carbon Leapfrog (who provide legal support to community energy initiatives); looser networks for information exchange, discussion, and events, such as the Low Carbon Communities Network; as well as a growing interest in and advocacy for community energy from non-governmental organisations and think-tanks.

Currently, in the UK, there exists a highly differentiated layering of organisations, resulting in a complex field of community energy intermediaries, made up of a number of distinct organisations each with their own history, aims and objectives. From the survey of 94 different intermediaries in community energy in the UK, the main roles they perform are as follows (*ibid*):

- Initiating new community energy projects;
- Sharing information and developing forms of networking between local community energy groups (e.g. newsletters, seminars and conferences);
- Providing tools (e.g. carbon calculators) and resources (e.g. good practice case studies and handbooks);
- Offering specific professional services such as legal or financial advice;
- Managing and evaluating funding programmes; and
- Interfacing with policymakers and energy companies to further develop community energy.

Chapter 3. Community Energy Policy Review

This chapter will consist of the historical development and latest government policies published by the UK and Scottish Government regarding community energy. The policy review is included in this dissertation in order to provide the situational context for the community energy niche in the UK and Scotland, and also to provide the political context that community energy intermediaries operate in.

3.1 UK Government Policies on Community Energy

Communities were first included in the UK Government's energy policies in the late 1990s when rhetoric of "new localism" emerged, even though for over thirty years, grassroots activists had been initiating community-based energy initiatives without the support of public resources or energy companies (Hielscher, 2011). The ideas of "local energy generation" and "community ownership of energy" were first recognized in the UK Energy White Paper titled 'Creating a Low Carbon Economy' (2003), where *"small/local community power plan, fuelled by locally grown biomass, from locally generated waste, from local wind sources, or possibly from local wave and tidal generators…will feed local distributed networks, which can provide excess capacity into the grid."* (HMG, 2003, p.19). Subsequently, in 2005, the UK government stated, *"community groups can help tackle climate change, develop community energy and transport projects, help minimise waste, improve the quality of the local environment, and promote fair trade and sustainable consumption and production"* (HMG, 2005, p.27). The UK Government's Sustainable Development Strategy titled 'Securing the Future' (HMG, 2005) further demonstrated the increased policy attention on the capacity of the social economy to deliver sustainability transitions (Seyfang and Smith, 2007).

Institutional and financial support for the UK community energy sector come as a result of the benefits that community energy can provide, both from cost savings and generated income: *"we will encourage community-owned renewable energy schemes where local people benefit from the power produced. We will also allow communities that host renewable energy projects to keep the additional business rates they generate"* (HMG, 2010). To this end, several policies have been passed to increase the uptakes of community energy initiatives, such as the Microgeneration Strategy (2006), Communities and Local

Government Planning Act (2008), Climate Change Act (2008), DEFRA Rural Community Renewable Energy Fund (2012) and Local Energy Assessment Fund (Harrison & MacKay, 2010; Hielscher, 2011).

In 2009, the UK Government exhibited further interest in community energy with the publication of the 'UK Low Carbon Transition Plan'. It detailed the plans for reducing UK emissions by 80% by 2050 and called for increasing community-scale heat and local energy generation (HMG, 2009). In 2010, two key incentive schemes for communities and renewable energy were introduced by the UK Department of Energy and Climate Change (DECC) and Office of the Gas and Electricity Markets (Ofgem): first, the 'Feed in Tariff' (FIT) (a clean energy 'cash back scheme' that makes it possible for community groups to invest in low carbon energy generation, while receiving guarantee payment for electricity produced up to 25 years) and second, the 'Renewable Heat Incentive' (RHI) (the scheme pays participants that generate and use renewable energy to heat their buildings). The UK Government also established the 'Green Deal' and 'Energy Company Obligation' as part of the Energy Bill 2010/2011, providing communities with more ways to obtain benefits from community energy.

Latest developments include updates to the 'UK Renewable Energy Roadmap', which now included a separate chapter in "distributed and community energy." In the roadmap, the UK Government stated that it was:

> *"keen to maximise the potential of decentralised supply and distributed generation. Distributed energy can harness a wide range of smaller-scale renewable and low carbon energy sources and, as it is local, lends itself to community involvement and investment… involving some combination of locally generated renewable electricity, local heat networks, storage and electricity distribution systems"* (HMG, 2013).

In 2014, the first-ever UK Community Energy Strategy was published and outlined the need to "*transform how we generate heat to meet our decarbonisation goals"* (HMG, 2014). It proclaimed that communities could get involved in a number of ways by generating energy, reducing energy use, managing energy and purchasing energy. The strategy also outlined the definition, vision, role and challenges to the community energy sector, while also listing existing and planned government support for the sector.

Reflecting on UK Government's policy support for community energy, Walker et al. (2007) pointed out two distinct features the policies development: first, the emergence of programs and initiatives were not part of an overall governmental plan. Most were initiated independently of each other and without correspondence between different government departments. Second, initiatives were entrusted to direct their own actions without governmental direction. Meanwhile, Harrison and MacKay (2010) argued that these diverse policies substantiate the claim that community energy was facilitating a technological shift towards renewable technologies, promoting behavioral change and embedding social acceptability for large-scale sustainable energy technologies.

3.2 Scottish Government Policies and Support on Community Energy

In spite of devolution, much of the control over the energy sector remains with the UK Government, including generation, distribution, transmission of electricity, and supply of oil, gas and nuclear energy, as well as regulations of the energy industry and the energy market. However, the Scottish Government still asserts its targets and policies on community energy, derived from its jurisdictional responsibilities for the promotion of renewable energy and energy efficiency (Bomberg and McEwen, 2012). The Scottish Government has set ambitious climate changes targets that exceed those of the UK and EU, with 42% of emissions reduction on 1990 levels by 2020 (Scottish Government, 2011). Renewable energy is seen as a key strategy in achieving this target; in 2008, the Scottish National Party government set the target of sourcing 20% of all energy requirements from renewables by 2020 as part of the 'Climate Change (Scotland) Act' (Bomberg and McEwen, 2012).

Accordingly, community energy is seen as playing a role in achieving Scotland's climate change and renewable energy targets. Community energy is believed to bring additional benefits *"over and above the energy generated and financial benefits. For example, increased community cohesion and confidence, skills development and support for local economic regeneration"* (Scottish Government, 2011). The Scottish Government has set a target of 500 MW of "community and locally owned renewable energy by 2020" (Scottish Government, 2011). According to a survey of over 300 community energy groups in Scotland by the UKERC-funded project 'ENGAGE Scotland', as of 2012, around 20.2

MW of community energy had been installed, while 180 MW were at the various stages of the planning process (Harnmeijer et al., 2012).

Currently, the Scottish government has two main programs to incentivize uptakes of community energy: Climate Challenge Fund (CCF) and Community & Renewable Energy Scheme (CARES). CCF was launched in 2008 as part of the long-running 'Sustainable Action Fund' and contributed towards the Scottish government's broader 'Greener Scotland' objectives (Bomberg and McEwen, 2012). It started with a budget of just over £27 million over three years to provide grants to community-led initiatives aimed at reducing carbon emissions. Since 2011, CCF has an annual fund of £10 million, which will be distributed until March 2016 (CCF, 2014). CCF funding ranged from a few hundred pounds to hundreds of thousands, and spans a broad range of low carbon and energy-related initiatives, such as energy efficiency, energy audits, awareness raising and feasibility studies, preparation and support for renewable energy projects and financing employment of project officers (*ibid*). The largest award was given to 'Community Powerdown', a consortium of 25 community groups across Scotland, supported by Community Energy Scotland (CES) and the Development Trust Association Scotland (DTAS), with £1.5 million for energy audit of housing stock, community renewable energy generation schemes and community-based combined heat and power schemes (Bomberg and McEwen, 2012).

Support for larger-scale renewable energy installation has been supported by the CARES scheme, a consortium made up of Energy Saving Trust, Changeworks, the Energy Agency, SCARF and the Wise Group. CARES have been in operation since 2011 and was re-launched in January 2014. Presently, CARES funds are administered by Local Energy Scotland (LES), who also provides free, impartial advice to communities, rural businesses and land managers. During its first phase, CARES has a total budget of £5.35 million for supporting community owned projects and £2.4 million for supporting projects owned by land managers, farmers and Small and Medium Enterprises. CARES provides grant funding to help towards the start-up costs of feasibility studies, proposal development, community consultation and other preparatory costs; up to £10,000 is available to fund non-capital aspects of a project. Loans are provided for the pre-planning phase (up to

£150,000) and post-planning phase (Table 2). CARES also facilitates access to capital support for community generation and community buy-in to commercial schemes via the 'Renewable Energy Investment Fund' (REIF). While all projects are required to demonstrate a minimum level of community benefit to the local area, not all CARES beneficiaries have been 'grassroots', for instance, some housing associations, schools, libraries and art centers have received CARES funds for energy efficiency.

Table 2. CARES Funding Eligibility Matrix (Local Energy Scotland, 2013).

	Community Groups	Rural Businesses	National or regional distributions which are non-profit distributing	HAs/LAs	Co-op	Bencom
Start-up Grant - up to £10k	Eligible		Eligible			Eligible
Start-up Grant (communities buying into commercial developments) - up to £20k	Eligible		Eligible			
Community Buildings Grant	Eligible		Eligible			Eligible
Pre-Planning loan (no specified community benefit payments)	Eligible					Eligible
Pre-Planning loan (with minimum community benefit payments specified)		Eligible	Eligible	Eligible	Eligible	
Post planning Loan (REIF)	Eligible			Eligible		Eligible
IIF	Eligible		Eligible	Eligible		
Warm Homes Fund			Eligible	Eligible		

Note: There are broadly three types of eligible applicants:

1. **Community organisations** constituted of non-profit distributing community groups established and operating across a geographically defined community, including benefit communities (Bencom). Organizations are required to demonstrate a wider community benefit to the community in the vicinity.
2. **National or regional organizations**, which are not profit distributing and have charitable aims; these are typically charitable bodies and include housing associations and educational institutions.
3. **Commercial Businesses** include farmers, land managers, rural Small and Medium Enterprises, and profit distributing co-operatives.
4. **Housing Associations** (HAs), **Local Authorities** (LAs) are eligible for funding under the Scottish Government's Warm Homes Scheme.

For pre-planning loans where the applicant is not a community group, a minimum community benefit is specified to ensure local benefit from the project.

It is worth noting that over the past few years, the Scottish Government's support for community energy has shifted from grants (charitable funding that does not need to be paid back and has strict restrictions) to loans (funding that needs to be paid back but has fewer conditions) and revenue support, mainly through CARES loans, RHI, CCF, FIT and the Renewable Obligation (an obligation on UK electricity suppliers to source an increasing proportion of the electricity they supply from renewable sources) (Scottish Government, 2011). This shift was made in order to increase the financial viability for community energy generation projects and encourage private sector investment to develop the market (*ibid*). The UK government (DECC and Ofgem) however ruled that installations that have received public aid (grants) towards any capital costs are not eligible for the FIT unless the grants have been paid back.

In addition to CCF and CARES, there is a range of funding support for community energy in Scotland that provided by a diverse set of intermediary actors. Aggregated from the Energy Saving Trust funding database (2012), the Scottish Government's 'Rural Funding: Opportunities Guide' (2010) and Harrison and MacKay (2010), the following are some of the available funding support for community energy in Scotland:

- Grants are provided by CARES, CCF, Scotland's Rural Development Program (SRDP) through Rural Development Contracts, Local Development Projects, Social Regeneration Projects (such as the Highlands and Islands Enterprise Strengthening Communities Programs), various trusts and foundations such as the 'EDF Energy Green Fund' and 'ScottishPower Green Energy Trust' (there are over 4,000 independent trusts in the UK, which together offer around £3 billion annually to charities and community organizations), and the UK Big Lottery Fund through the 'Growing Community Assets Scheme'.
- Public loans are provided by CARES, REIF of The Scottish Investment Bank and Scottish Investment Fund.
- Commercial loans are provided by banks with their own dedicated environmental finance divisions such as Triodos Bank, Santander and The Co-Operative Bank, Social Investment Scotland and a few commercial developers.
- Additionally, communities can also raise their own capital by offering community shares.

- Communities can also receive benefits in the form of ‘community-benefits’ from commercial developers whose projects affect nearby communities; however, in this scheme, the communities are more reactive rather than pro-active, with no obligation to use the financial benefit for low carbon initiatives, thus many do not consider this model as ‘community energy’ (Bomberg and McEwen, 2012).

Chapter 4. Methodology

4.1 Qualitative Research Methods

Physical and human phenomena can be studied with scientific or social scientific approaches in order to generate empirical knowledge. In this dissertation, a qualitative research method is applied to examine the community energy phenomena in Scotland with the aims of generating knowledge about Scotland's community energy sector. Qualitative research, as contrasted with quantitative research, places more emphasis on the study of a phenomena from the insiders' perspective (Lapan et al., 2012); it is due to this main reason that the approach was selected, as the dissertation relies on community energy intermediaries resource persons as the sole source of primary information instead of quantitative data. While quantitative research methods attempt to remain independent of the phenomena being studied and aim to generalize the findings, qualitative research methods allow the researcher to immerse herself within the subject, viewing meaning as more context- and time-specific, thus in most cases, not generalizable (*ibid*). Correspondingly, this dissertation is not intended to generalize the findings into an overall description of the community energy sector and the intermediaries, instead, it is aimed at exploring some of the existing perspectives of intermediaries working in the sector. Therefore, the findings from this dissertation can not be claimed as representing the entire community energy intermediaries in Scotland.

Additionally, the strength of qualitative research is that it allows the use of critical theoretical views and interpretative frameworks to reveal how issues, such as power, is embedded in social contexts; qualitative research methods believe that reality is complicated and socially constructed (*ibid)*. Since one of the aims of the dissertation is to explore the appropriateness of niche management frameworks in analyzing the community energy phenomena, a qualitative research method was considered to be the most suitable approach to allow room for interpretations and critiques.

To collect data and information from the intermediaries regarding various topics within the subject of community energy and energy transition, the approach of semi-structured interviews with resources persons from the intermediaries was selected, as it is the most

appropriate method for understanding a range of perceptions of an issue by key people in a community (*ibid*). Moreover, while semi-structured interviews allows for flexibility, it provides a structure that enables comparability between information gathered from different respondents (Bryman, 2004). Because it was expected that similarities and differences in responses would occur among responses in interviews, a guiding set of questions was designed to ensure comparability. A list of themes and corresponding questions was initially created to guide the flow of interviews; a sample of the list of questions can be found in the Appendix. During interviews, respondents were provided additional time to pursue topics of particular interest or those that they feel they have more expertise in. Data collected from earlier interviews were also used to inform some of the topics explored in subsequent interviews.

4.2 Recruiting Participants

Consistent with the aim of the dissertation and the qualitative research method used, the list of identified intermediaries in this dissertation is not meant to be exhaustive or constitute as a sample to represent the total of community energy intermediaries in Scotland. This study employed three approaches to identifying community energy intermediaries in Scotland. First, they were identified based on the frameworks put forth in contemporary literature on community energy in the UK (Hargreaves et al., 2013; Sefyang et al., 2014). Secondly, some of the intermediaries identified were based on recommendations from Jelte Harnmeijer, Director of Scene Consulting Ltd. While a snowball method was applied throughout the identification process, which allowed referrals from interviewees to expand the network of informants and sample size, an effort was made to not solely rely on the snowballing method as the process may be biased towards like-minded persons. Hence as the third approach, intermediaries were identified based on their prominence as expert and guest speakers at various community energy conferences, which included the “Community Energy Seminar' in the All-Energy Conference in Aberdeen in May, 2014 and the “Community Energy Shared Ownership Conference” held by LES and the University of Edinburgh in Edinburgh Center for Carbon Innovation in June, 2014.

Initial contact was made by emails sent to the resource persons identified; the template of the email is included in the Appendix. Once each resource person agreed to take part in the

research and be interviewed, a meeting was arranged for the interview session. Before the start of each interview, respondents were asked for their consent to be recorded and identified in the research; all respondents have provided their consent. Initially, this study endeavored to interview a total of 12 resource persons from the main intermediaries identified, which included The Scottish Renewables Trade Body, Community Energy Scotland, Triodos Bank and Santander Bank. However, due to time limitations and the availability of respondents, ultimately 9 intermediaries resource persons were interviewed (Table 3). Although the final number of organization interviewed was less than the initial study plan, the interviews that were conducted represent key types of community energy intermediaries: public sector, non-government organizations, financiers and consultants and social enterprises. The rigourness of the data collected from the interviewees was further improved by conducting interviews with resource persons who were experts in their field and who held long-term senior positions in their organization. This ensured that the information collected would be accurate and credible, as well as reflect the history of community energy development in Scotland.

Table 3. Community Energy Intermediaries and Resource Persons Interviewed

Type	Organization	Description	Resource Person
Government / Public Sector	G1. Scottish Government	Has a target of 500 MW locally owned renewable energy by 2020; sets policies and funding support for community energy.	**Sue Kerns,** Head of Renewables Policy – (email correspondence)
NGOs	N1. Local Energy Scotland	A consortium that administers CARES grants and loans on behalf of Scottish Government.	**Jennifer Ramsay**, Community Benefit Officer
	N2. Friends of the Earth Scotland	An NGO that runs "Community Power", a UK-EU community energy development program.	**Anne Schiffer,** Energy Campaigner (Community Power)
	N3. Development Trusts Association Scotland	Member-led charity organization that assist communities in 'community regeneration.'	**Kelly McIntyre**, Program Manager, Community Shares Scotland
Financiers	F1. Co-op Bank (previous position)	A UK high street bank with an Ethical Policy and a dedicated environment team for green loans.	**Chris Matthews,** Senior Manager, Renewable Energy and Asset Finance Department

	F2. Scottish Investment Bank (Renewable Energy Investment Fund)	REIF provides financial assistance to projects that will deliver energy from a renewable source or reduce the cost of renewable energy; delivered by the Scottish government's Scottish Investment Bank.	**Andrew Smith,** Head of REIF – Scottish Investment Bank
	F3. Big Lottery Fund	Annually distributes millions of pounds from the National Lottery to community groups and projects that improve health, education and the environment.	**Eric Samuel,** Senior Policy and Learning Manager
Consultancy / Social Enterprise	C1. Scene Consulting Ltd.	A social enterprise that assists community energy projects development.	**Jelte Harnmeijer**, Director
	C2. Energy4All	A social enterprise made up of community energy co-ops, promotes co-op models and assists community energy projects development.	**Paul Phare**, Regional Development Manager Scotland

4.3 Data Analysis

Analytic decisions should be made based on the research question, research design and the types of data collected (Lapan et al., 2012). In this dissertation, data was collected from 9 in-depth interviews that ranged from approximately 20 minutes to 1 hour in length; a record of the collection methods is included in the Appendix. Information from the interviews were further supplemented by informal conversations with experts in the community energy field and information gathered from conferences and seminars on community energy; they are not directly quoted, but were considered in the analysis. Once completed, interviews were fully transcribed. Because analysis of qualitative data should progress through classification of ideas, themes, topics, activities and other categories relevant to the study (*ibid*), coding was applied onto the data collected from the interviews. Interview transcripts were broken down and classified into different code categories that are related to the themes of sustainability transition and niche management and useful in analysis. Analysis involved looking for of consistencies, contradictions, links, gaps and unique findings and variations within each code category. As findings were interpreted against the reviewed literature on transitions and niche management frameworks, a grounded theory approach was employed.

Chapter 5. Findings and Analysis

This chapter will discuss findings from the interviews, which will be categorized based on the research questions. The aim of this study was not to summarize the generalities within this field, but rather capture the diversity of perspectives among intermediaries. Thus, this chapter will explore the narratives and themes that emerged from the in-depth interviews conducted. The first part will explain the roles of community energy intermediaries in Scotland, which will be followed by their vision for community energy in Scotland. Furthermore, the chapter will describe the intermediaries' perspective on the current performance of Scotland's community energy sector, and whether they think there is strategic management in place. The chapter will end with the perspectives of intermediaries regarding the challenges involved in up-scaling the community energy niche and its part in Scotland's sustainability transition.

5.1 Community Energy Intermediaries in Scotland

One of the aims of this study was to discover the various community energy intermediaries who are working in Scotland and the specific roles that they play. Identified intermediaries fell into one of the following categories: public sector, NGOs, financiers and consultancies/social enterprise. As community energy intermediaries, each organization performed one or more of the following roles described within SNM framework and MLP analysis (Hargreaves et al., 2013) (Table 4), with regards to community energy projects:

- Initiating new projects directly
- Networking and sharing info between community energy groups
- Supporting projects by providing tools and resources
- Funding, managing and evaluating funding programs
- Interfacing with policy makers, energy companies and other stakeholders to further develop the community energy sector

Table. 4. Roles of Community Energy Intermediaries in Scotland

Type	**Organization**	**Role as Intermediary**
Government / Public Sector	G1. Scottish Government	Networking, Supporting, Funding
NGOs	N1. Local Energy Scotland	Networking, Supporting, Funding, Interfacing
	N2. Friends of the Earth Scotland	Networking, Supporting
	N3. Development Trusts Association Scotland	Networking, Supporting
Financiers	F1. Co-op Bank (previous position)	Funding
	F2. Scottish Investment Bank (Renewable Energy Investment Fund)	Funding
	F3. Big Lottery Fund	Funding
Consultancy / Social Enterprise	C1. Scene Consulting Ltd.	Networking, Supporting, Interfacing
	C2. Energy4All	Initiating, Networking, Supporting, Interfacing

From the table above, it is evident that there are different types of community energy intermediaries who perform differing functions under different objective and mandates in Scotland. The most commonly shared functions were providing support and networking to community energy projects. Support was characterized by providing print and web-based knowledge repositories, such as guide books and toolkits, as well as offering consultation. Networking entailed the creation of infrastructural support in the forms of networks, or "forums that enable (and induce) the gathering and interaction of actors, the exchange of experiences the organization of collective action" (Geels and Deuten, 2006, p. 267-268). Although, Hargreaves et al. (2013) and Sefyang et al. (2014) have found that the community energy networks being formed were not functionally robust, as learning has mainly been shared informally through ad-hoc channels and peer-to-peer between projects, as opposed to having been aggregated and then widely shared by intermediaries through the networks. This was perhaps due to the fact the community projects greatly vary in their context, objectives and challenges, thus making it difficult to produce generic guidelines for success (Sefyang et al., 2014).

Some intermediaries, particularly LES, were found to take a more active role compared to others in leading the scaling-up of community energy in Scotland. During the "Community Energy Shared Ownership Conference" in June of 2014, LES shared its plans of creating a new online "match-making" portal between financiers / developers and community groups to facilitate share-ownership models of community energy. Given the limitations on securing funding, the leadership demonstrated in initiating this portal is particularly significant.

According to SNM and MLP, for the community energy niche to successfully scale-up, two processes are required: (1) niche-building, which consist of articulation of shared visions and expectations, shared learning and networking, and (2) alignment between the different levels of niche, landscape and regime. By performing the roles initiating, networking, supporting, funding and interfacing community energy projects, intermediaries support the occurrence of the two aforementioned processes. Particularly, intermediaries play a significant part during niche building by aggregating learning and sharing it through networking. Intermediaries can also support and enable alignment through their "interfacing" role, where they work "downwards" with the projects, and "upwards" with policy-makers at the regime level. Intermediaries can lobby and push forward agendas at the regime level and represent the "voice" of community energy projects. However, it was discovered that a common "voice" may not be possible because community energy projects and groups in Scotland are highly diverse in their types, aims and objectives. This raises the question of whether or not community energy intermediaries are able to synchronize the different aims and objectives among the projects, if it was required by the niche to scale-up.

5.2 Visions and Definitions of Community Energy

The first interview question posed to the intermediaries pertained to their vision for community energy in Scotland. This question was asked because, according to SNM and MLP, a niche is supposed to have a shared vision and expectation that are properly articulated in order for the niche to scale-up and influence the mainstream (Rip and Kemp, 1998; Kemp et al., 1998; Schot and Geels, 2008). Hence, this study sought to discover whether or not a shared vision existed among the intermediaries who were performing different functions under different objectives. From the interviews, it was found that the

Scottish Government's target of 500 MW of locally-owned energy by 2020 was a commonly shared goal and a driving force among the intermediaries. Organizations that do not specifically focus on community energy, such as DTAS and the UK Big Lottery Fund, also support the 500 MW target through their non-energy related programs, such as community regeneration and the 'Growing Community Assets' scheme. In fact, the 500 MW target, in addition to CARES, was seen as instrumental and set Scotland apart from the rest of the UK in its attempt of a transition toward a renewable energy system. This was commonly illustrated by the interviewees who would refer to the international reputation of Scotland's community energy policy, perhaps best articulated in the following statement:

> *"I know there a lot of European member states who look at Scotland and think 'wow, we wish we had what you had as a policy environment, because you got targets for community energy, you got CARES [where] communities can get access to the risk of finance to build projects,' you don't get like that anywhere else in Europe."* (C2)

While the 500 MW goal for community energy was commonly shared, it became evident that intermediaries differed on what approach they believed would be best for realizing this goal, e.g. types of business models and ownership of community energy projects. The different opinions ranged from only including and supporting wholly community-led projects to including the joint-ownership and co-operatives model. In essence, these variations can be explained by the differing interpretation of the term 'community' in the phrase, 'community energy'. Some intermediaries *"take a very broad definition...[where] community energy is renewable energy produced by, or which non-specialist play key and controlling role"* (C1). Similarly, some argued that the word "community" should be used:

> *"as wide as possible…[communities can] own projects and stakes in projects in a wide range of ways. So ideally, you would have community which own 100% of projects, community which own usually locally the electricity they generated…own significant stakes in larger projects…also communities that are geographically desperate included in the various ownership strategy."* (F2)

However, other intermediaries, such as DTAS and the UK Big Lottery Fund, tended to not support the co-operative model of community energy because *"the money is going back to the members as opposed to being put in the project or the community…"* (F3). On the other hand, all intermediaries agreed that the community-benefit model, where communities receive compensation in forms of benefits from a developer, but without any obligation for

the communities to invest the money into low-carbon initiatives, should not account as community energy.

Following this preliminary inquiry, the intermediaries further revealed on whether or not different working definitions of the term 'community' among intermediaries affected their performance and the overall community energy sector development in Scotland. This study sought to explore if differing definitions hindered the niche-building and alignment process required by the niche to influence the mainstream. Some intermediaries responded that the different visions could somewhat hinder *"how the community of facilitators lobby the government in its community renewable policy"* (C1). However, most see the diverse definitions to be positive because *"it's diversifying the opportunities"* (N3). Others similarly noted that:

> *"as long as we have more community energy…We [intermediaries] can have diverse opinions about what is community energy, but still have things that we can work on together…for example public outreach…consultation responses. We all actually have very similar ideas about what we should say in that instance. So actually, diversity is fine."* (N2)
>
> *"Obviously each organization will have their own structure that they want to see…generally I think everybody is working towards the same goal, it's quite a supportive and inclusive sector… It's almost better that they are diverse. A community might have an idea of which structure is going to suit them… such as community vehicle, financial structure, even the type of technology."* (N1)

Another intermediary noted that the different definitions were not different visions, but rather different needs according to the objectives of each intermediary:

> *"So from a political perspective, the driver is for communities to own interest in the projects and that's regarded by politicians as a good thing…then the funders have their own principle in making profit…then there are intermediaries who are providing solutions…"* (F2).

Thus, it seemed that the different definitions of community energy did not hinder intermediaries from co-operating. It was also observed that intermediaries openly discussed their suggestions to upscale the sector during the "Community Share Ownership" conference held by LES (attended by more than 20 different intermediaries and private energy developers). Intermediaries called for clearer government policies and support especially for FIT projections, improved engagement with communities by the

private sector and better flows of information from intermediaries, particularly on preparing communities to be involved in a long term scale when partnering with a private company (at least 25 years) while equally bearing the risks.

However, it was not evident, from the interviews or literature reviewed, if the intermediaries, despite their different objectives and definitions, are actually coordinating together in a strategic manner, i.e. strategically building the community energy niche based on the shared goals (500 MW target). Mourik and Raven (2006) stated that substantial history of cooperation, stable network and formalized relationship between actors (in the networking process) were required for alignment to occur and the niche to scale-up. In this light, some intermediaries mentioned that there might be a sense of "competition" and "a natural tension" among the different agendas being pushed forward; *"at the end of the day, it is a very small market"* (C1). Perhaps coordination among intermediaries was not evident because it may require a more specific line of questions and further probing during interviews, especially when delicate issues are involved, for example competition for funding, clients and government tenders.

On visions and definition of community energy, the Scottish Government clarified its position in a policy statement that is due to be published in August, 2014. Sue Kearns, Head of Renewables Policy of the Scottish Government, stated the following in a shared draft of the statement's summary:

> *"Community energy covers a spectrum of activity – from direct ownership to community benefits, and national policy demonstrates our ambition across the full range... The Scottish Government wishes to encourage new models of investment in commercial renewables to reflect our ambition to spread the benefits of our indigenous renewable energy resource throughout the nation."* (G1)

The Scottish Government appears to be interested in including as many forms of community energy as possible, including community benefits, even though intermediaries (except LES) agreed that this should not constitute as "community energy." Arguably, the Scottish Government's policy statement can be seen as a strategy to upscale and manage the community energy niche. However, as Lovell (2007) pointed out, niche-based strategies can be a way for the government to simply co-opt green niches in order to gain

credibility towards its own sustainability targets. Hence, strategies and targets do not necessarily lead to the more difficult socio-technical transitions that are needed.

5.3 Current Performance and Strategic Management

In response to this study's second research question, the intermediaries were asked to share their perspective of the current performance of community energy in Scotland; particularly, this study was interested to see if there was a commonly shared opinion on the topic, which may affect the niche-building process taking place. Almost all of the intermediaries agreed that Scotland is still behind in terms of its community energy capacity: *"there still seems to be a fair interest… there could be more probably"* (F3), *"because of lack of community confidence and policy awareness, it can be seen to be under-performing"* (N3), *"I think it's not good unfortunately… what I do think is very good is the policy environment for community renewables in Scotland… yet at the same there is very few community chain projects in Scotland"* (C2). Another intermediary thought that even though *"there are lots of support mechanism for community energy in Scotland…the uptake isn't as great as Denmark or Germany*" (N2).

Only one intermediary had a positive perspective on Scotland's community energy commitments, they stated:

> *"It's doing well… Around 285 MW have been installed, it's over half-way and we're getting more and more interest. I think compared to maybe three or four years ago before the CARES loan started, there were hardly any community groups that were doing large-scale revenue generating projects…"* (N1).

The comment by N1 was contradicted by another intermediary who criticized that achieving the 500 MW target could not be automatically assumed as a positive indicator for community energy development, because the total energy capacity only accounted for a very small proportion. Furthermore, the 500 MW target may not consist of "actual" community energy projects (whereby the term "locally-owned" can mean structures where communities have minimum involvement or benefits, such as the community benefit scheme, or installations owned by farms and estates):

> *"To be frank…the 500 megawatt is peanuts. In the largest scale that represents…probably, three percent of actual generation in Scotland. So it's very little. And then indeed, even that, as you point out as being watered down, by including 'local', which translates as urban enterprise, is basically commercial as*

> *what many researchers would call that, into the vault. By our assessment, purely community projects, as we understand the, make up about 60 megawatts right now."* (C1)

The comment by C1 demonstrated how the performance of community energy in Scotland is intimately linked with the definition of "community energy" that a particular organization has adopted. This raises a key point that when it comes to evaluating the progress of the community energy sector, the exercise can be subjective.

Against the background of community energy niche-building and improving its current performance, the intermediaries were asked if they viewed the community energy sector as being strategically managed. An explanation[1] on the concept of "strategic niche management" was briefly provided to ensure they all had the same requisite knowledge of this theory. Intermediaries mostly agreed that: (1) it was the Scottish Government who is supposed to be implementing the strategic management, and that (2) there was no clear strategic master plan in place. Regarding strategic management, the answers provided by all intermediaries were analogous with one statement from F2: *"there is a degree of strategic intervention* [by the Scottish Government]*...but we have to recognize that there is natural competition with other policies and with the budget that's available to deliver policies."*

More than one intermediary noted the lack of a master plan by the Scottish Government, particularly on persuading more communities to take up community energy:

> *"I think the Scottish Government is trying their best through all the various funding mechanism…so I think there's definitely a sort of an overview, whether or not it is being managed, or whether 'management' is the right word, I'm not very sure… I'm not sure there are efforts to actually persuade communities to go down this path. I don't think there's any master plan to drive this thing forward, even though the Scottish Government has this target…"* (F3).

> *"I think there's a top-down kind of Government strategy…but perhaps from the grassroots level, I've never heard a community energy group say to me 'Oh, the Scottish Government has a target, therefore we have to invest in such community energy."* (N2)

[1] SNM was explained as a tool that can strategically introduce a radical innovation, such as community energy, and manage that innovation so it can grow and eventually create a transition, in this case, an energy transition towards renewable energy system.

One intermediary cited that the reason for the lack of a master plan or a clear guidance was because the Scottish Government has *"never set up or never been involved in doing the financial models, they don't have the intricate knowledge in setting the project up, so how can they advise one it? It's difficult to create a policy if you've never had the hands-on process"* (F1). Another intermediary also emphasized how the 500 MW target was not necessarily a form of strategic management being implemented by the Scottish Government, especially with the internal politics inside the Scottish Government regarding community energy; in fact, the target may actually hinder the development of community energy:

> *"Well, the government is a very big entity, and the government itself has got a lot of internal conflicts and interests... Renewables and community renewable are very political issue; it's a potential vehicle… I do think to a large extent, at the highest level, community renewable has been given lip service…the success of Scottish community renewables have been hugely overplayed… The 2020 target is actually hindering the plight of Scottish community renewables. Because strategically…these grassroots' renewables development would be too slow and cumbersome to meet these highly political targets…if you look at the actual decisions that are made, for instance, tendering off the best resources to very large, purely commercially-oriented developers, like the developers with no interest in engaging with communities at any sort of innovative level. Well that's exactly what happened. But, they do get the job done faster. So I think paradoxically we might be looking at a situation where highly ambitious decarbonization and renewable generation targets are actually damaging the cause of community renewables"* (C1).

It seemed that all intermediaries agreed that while government intervention, policy targets and funding mechanism signal the Scottish Government's interest in the community energy sector, they do not necessarily make up a coherent, strategic niche management. More importantly, they raise the question of whether setting up an ambitious target is necessarily positive for community energy.

5.4 Challenges in Up-Scaling Community Energy

The final set of research questions related to what the intermediaries viewed as the main challenges in up-scaling the community energy niche. This study was interested in examining whether or not the challenges mentioned in literature were consistent when the question was asked to intermediaries, as opposed to community energy projects at the project level. The challenges highlighted by the literature included group and project factors (lack of skills and volunteer time, lack of group capacity and resources, conflict

within communities), network factors (lack of transferrable learning and skills) and policy factors (lack of consistent policy support and access to funding) (Sefyang et al., 2013). This study found evidence of all of the above-mentioned challenges, however, policy factors seem to be cited more frequently compared to group, project and network factors. This was perhaps due to the unique position of intermediaries who are interfacing between the projects, the niche and the regime level; hence they are more likely to place emphasis on structural-type challenges.

One intermediary noted that one of the initial challenges in the sector was related to policies, as the Scottish Government initially wanted to:

> *"define community energy only as a non-profit distributional organization that could deliver social outcomes… It's taken this long for Scotland to understand that other models are available. It's okay for communities to do a joint ownership with a commercial developer…form a co-operative and invite people from outside of the community to invest…"* (C2).

While the challenge above has not been specifically mentioned in the academic literature around community energy as grassroots innovation (Sefyang and Smith, 2007; Hargreaves et al., 2013; Sefyang et al., 2014), however, it was found in reports published by consultancies addressed to the UK Government (Harnmeijer et al., 2013).

Other intermediaries believed that financial issues and inconsistent policy support were the main challenges in up-scaling community energy:

> *"The first thing is 'how much can I lend into this market', the second is 'how stable is the market'… I don't know if the FIT [Feed In Tariff] is going to be around next year or the year after…you need a clear vision going forward, the banks need to see that this is a market worth getting involved in"* (F1).

> *"You have to make the sector fundable by conventional finance…to get enough projects to happen to begin to realize the potential community ownership in Scotland…it comes down to developing models that work and that the market will adopt"* (F2).

> *"If you don't have the clarity or security of what would the subsidy regime look like, preferably over twenty-five year time scale, it greatly adds to the complication"* (C1).

Other challenges mentioned mainly related to the technical issues of planning and grid connection:

> *"planning policy that is not designed to promote community renewables and… there is no policy that incentivizes grid providers to develop transmission and distributed networks in a way that would facilitate community renewables"* (C1).
>
> *"it's the funding and infrastructure issues that must be sorted out"* (N3).
>
> *"one of the most limiting factors is to be able to get access to the grid… community groups would like to make use of those but can't get access because it has been bought by private developers, that tends to be the major problem for communities…"* (F3).

A minority of intermediaries interviewed mentioned, "group factors" to be the main challenges: *"volunteer time and capacity, and keeping people engaged in the process over a number of years. And making it as easy as possible for them, making sure they don't give up"* (N1). Intermediaries who mentioned "group factors" also noted that these challenges existed on a case-per-case basis and that each community group each had their own unique setting, therefore, it was challenging to generalize a set of common group challenges.

One observation that can be made is that intermediaries revealed challenges that were mostly related to their role, for instance, only intermediaries with financing roles explicitly mentioned financial challenges. Systemic challenges of policies and infrastructure were most commonly shared as most intermediaries perform the functions of supporting and networking, which expose them to these sets of challenges. Group factors challenges were the least mentioned, perhaps because only a few of the intermediaries dealt directly with the day-to-day issues within community energy projects; only LES performs "hand-holding" with projects throughout all phases of development.

5.5 Community Energy and the Sustainability Transition

The final question that was asked was with regards to the intermediaries' view on whether or not community energy can enable an energy socio-technical transition towards renewable energy in Scotland. Overall, most intermediaries felt that there was a promising potential, as *"community renewables come from a very low base, but it is growing at 30 per cent per year… three times as fast as the commercial sector"* (C1).

However, some intermediaries provided different responses, as community energy only makes up a small part of the renewable energy capacity:

> *"A small role I think. The large-scale projects are always going to be much higher cost and higher risks, and it's going to be the big developers who take those forward. Communities generally have much smaller projects. Probably communities can be more involved through shared ownership projects… but it's still a very small proportion of the overall installed capacity in Scotland"* (N1).

Another intermediary noted that although the trend reflects how renewable energy capacity is increasing, this might not necessarily include community renewable energy:

> *"…Scottish Renewables, there's a trade association that has lots of money being poured in by Scottish Power. All of the big developers, who are members, ensure that the interest of the private sector is being protected… that the policies are in the favor of the 'Big Six'…"* (C2)

In a broader context, some intermediaries also noted the mixed messages coming from the UK Government, as fossil-fuels continue to dominate energy policy making: *"if you listen to the government rhetoric coming out from Westminster, it's all about supporting fossil fuels, shale gas and fracking. It sends a bad signal"* (N2). Thus, it seemed that there were no straightforward answers in regards to community energy being part of an energy transition; the responses provided by intermediaries further stressed the importance of external factors influencing niche-development and scaling-up process, and the politics involved in transitions.

Chapter 6. Discussion

The chapter will contain discussion and reflection from the findings, which will be put in the context of sustainability transition and niche management frameworks literature described in the literature review. There will be four main themes of discussions: community energy niche in Scotland, challenges of up-scaling the community energy niche, community energy and its role in sustainability transition, and finally, reflections on the applicability of niche management frameworks onto socio-technical innovations and systems change.

6.1 Community Energy Niche in Scotland

From the findings and literature reviewed, some reflections can be made about the community energy niche in Scotland. First, community energy projects in Scotland are highly diverse in their objectives, which is consistent with the literature reviewed on community energy in the UK (Walker et al., 2006; Sefyang and Smith, 2007; Hargreaves et al., 2013; Sefyang et al., 2014). However, Scotland's community energy sector seemed to be even more diverse compared to the rest of the UK, particularly on project ownership structures and business models; similar observation has been made by community energy studies specifically on Scotland (Bomberg and McEwen, 2012; Harnmeijer et al., 2013). In Scotland, the diversity found among community energy projects seem to extend to the community energy intermediaries. While niche-based studies on community energy (Sefyang and Smith, 2007; Sefyang et al., 2014), have discovered that diverse visions and expectations at the project level, the studies did not accentuate how diversity also exists among intermediaries at the niche level.

From the interviews, intermediaries shared their different visions for community energy in Scotland, particularly on how to upscale it through different business models and ownership structures. It was revealed that the intermediaries' different opinions result from their different definitions of "community" in community energy. While the inquiry of "what constitutes a community" have been found in almost all of the literature reviewed on UK community energy (Sefyang and Smith, 2007; Hielscher, 2011; Bomberg and McEwen, 2012; Sefyang et al., 2014), it was not highlighted in a study specifically on community energy intermediaries (Hargreaves et al., 2013). Even though some

intermediaries believed that the diversity in business models and ownership is positive for up-scaling community energy, this raises the question on how to strategically manage a niche with such varying expectations and visions.

Second, the term "grassroots" may not be an entirely accurate term to describe or generalize community energy projects in Scotland. Grassroots innovation was defined as "networks of activists and organizations generating novel bottom–up solutions for sustainable development", and in contrast to mainstream business greening, grassroots initiatives operate in civil society arenas that are not purely profit seeking (Sefyang and Smith, 2007). While the literature reviewed emphasized the grassroots nature to be vital in community energy (ibid; Sefyang et al., 2014), the interviews revealed that community energy projects in Scotland are not always purely grassroots in nature or origin. Intermediaries revealed the variety of projects that they were assisting, which included those initiated by private developers and private investors, who would later pitch the energy project business to community groups adjacent to the project site. Furthermore, community groups can adopt the co-operatives structure, which consist of members interesting in making profits and return of investment, as well as profit-seeking private investors from outside of the community's immediate geographical area. Community energy groups can also be made for purpose, for instance, as a legal entity to receive community benefits, without strictly being non-profit or aiming for 'environmental sustainability'. As the trend shifts towards ensuring financial viability of community energy projects, evident from the increasing prominence of the shared ownership and joint-ownership models between community groups and profit-seeking private developers, perhaps the term strictly "grassroots" will become less accurate when describing the Scotland's community energy niche. In fact, the term may hinder funding opportunities, for instance from commercial banks, where the term "grassroots" can be associated with less professionalism and higher risk.

Third, intermediaries were found to be vital in Scotland's community energy niche, however, it seemed that few of the intermediaries interviewed were performing the "interfacing" or lobbying role. Intermediaries perform the following key roles in growing the niche: initiating, supporting, networking, funding and interfacing (Hargreaves et al.,

2013). There seemed to be some overlap of roles, particularly supporting and networking, and to a certain extent, funding. However, very few intermediaries were performing the "interfacing" role, or brokering partnerships and interacting upwards with the regime level through lobbying and pressure. While this particular role was found to be crucial and newly emerging among community energy intermediaries in the UK (Hargreaves et al., 2013), only a minority of the intermediaries interviewed was performing this role. This raises the question on the possibility and effectiveness of alignment between the niche and regime level, especially when community energy intermediaries are not performing or have no lobbying power towards the regime level. Hence, with the approach taken by this dissertation, it was difficult to establish whether or not the 500 MW community and locally-owned renewable energy target of the Scottish Government, and subsequent Community Energy Policy Statement 2014, were the result of the "interfacing" role performed by intermediaries in their attempt to create alignment.

6.2 Challenges of Up-scaling the Community Energy Niche

Some reflections can also be made regarding the attempts of growing the community energy niche. First, niche-building challenges are occurring among intermediaries at the niche level, in addition to the project level, although in different forms and scales. This dissertation attempts to analyze the community energy sector as a niche and applies the niche management theories and frameworks; this categorization has been supported by studies which indicated that community energy in the UK is displaying characteristics of a growing niche, that there were visions and expectations being articulated, learning being shared and networks being built (Walker et al., 2006; Sefyang et al., 2014). According to SNM and MLP, a niche must articulate expectations and visions, share learning and build networking in order to successfully grow, trigger a regime shift and eventually create a transition (Rip and Kemp, 1998; Geels and Schot, 2008). Particularly, the niche-building processes were found to be more challenging for grassroots niches due to the inherent *intrinsic* and *diffusion* challenges present at the project level, which are less detrimental in market-based technological innovations (Sefyang and Smith, 2007). However, for the community energy niche, it seemed that niche-building challenges also exist among intermediaries at the niche level; it was also difficult for intermediaries to articulate visions and expectations, share aggregated learning and build coherent and robust networking, hence reducing their ability to influence an alignment between the niche and regime level.

Articulating visions was challenging due to the different working definitions of community energy. While learning can be aggregated, such as through guidebooks and success stories, learning was difficult to be generalized and shared because each community project is unique in their context and sets of challenges. While networking seemed to be frequently carried out through forums, seminars and conferences, it was difficult to determine if the networks were strategic, in that they were clearly aimed to align the levels of project, niche and regime, and bring about a transition. Intermediaries were supposedly playing an "interfacing" role (Hargreaves et al., 2013), which has been noted as the most effective role in influencing an alignment between the different levels, however, there seemed to be no community energy intermediary lobby group that is performing this key role.

Second, while the literature reviewed seem to focus on community energy niche-building challenges occurring at the project level, intermediaries are observing an additional set of challenges that are more structural in nature; these were arguably underplayed in some of the community energy literature reviewed. Structural or systemic challenges were seen as obstructing the development of community energy in Scotland; the challenge include government policy support, difficult access to grid connection, ineffective financial policies, particularly the digressing rate of FIT and that inability for projects to receive both public funding and FIT, and infrastructure policies that amplified challenges for community energy, particularly lengthy and costly planning process. In addition, intermediaries have been frequently forced to learn and adapt, often modifying and updating the support services they provide to local community energy projects, in order to survive within a shifting policy and funding landscape around community energy (Hargreaves et al., 2013).

Third, it seemed that all intermediaries share the assumption that the community energy niche must be scaled up, even though the niche-based literature have distinguished the difference between simple and strategic niches, where the former is content with simply existing without the aims of scaling-up (Schot and Geels, 2008). The intermediaries all supported the Scottish Government's target and believed that community energy must be scaled up to fulfill the 500 MW target, and ultimately, the overall renewable energy target. Effectively, it was assumed that existing and future community projects wanted to be part

of Scotland's sustainability targets and energy transition. However, not all community energy projects have the political aim to grow and be part of a transition, some were only interested in generating income, achieving energy autonomy or a more environmentally responsible lifestyle. It seemed that the highly political targets took no account of the possibility of the community energy being a simple niche, as opposed to a strategic niche. It could potentially be an interesting area for a follow-up research to discover how community energy groups in Scotland perceive their projects as being a part of the energy transition, and explore the common and different visions between energy projects and the intermediaries.

6.3 Community Energy's Role in Sustainability Transition

One of the key reflections from this research is regarding community energy's role in sustainability transition. First, it seems that envisioning community energy as a niche and applying niche management frameworks could not overcome the fact the overall energy generation capacity of community energy is very small. While all intermediaries agreed that community energy has a role in Scotland's sustainability transition, the role is minor. In a scenario analysis of the UK community energy sector, Capener (2014) calculated that at most, in the 'high (strong & sustained) scenario' where there is a flourishing community energy market with clear policy signals and support, by 2020, there could be an estimated 2300 community energy organisations focused on renewable electricity, with 3GW of wind, solar and hydro capacity installed, which generates 1.4% of total UK electricity consumption. While both intermediaries and literature noted that the community energy sector was growing at a pace faster than renewable energy in general, its overall small capacity raises the question on whether or not the niche has the ability to trigger a regime shift and create a transition. Middlemiss and Parish (2010) highlighted that envisioning community energy as a niche pre-assumes its capacity of successfully becoming one. At best, community energy perhaps can influence, or become an addition to the renewable energy sector, which is currently being dominated by private renewable energy companies.

Second, it seems that while policy statements of the Scottish Government mentioned the need for a transition, the targets and policies do not necessarily reflect a move towards an energy transitions. Rip and Kemp (1998) proposed that in order to promote and support transitions, long-term goals and effective learning mechanisms needed to be formulated to

guide the transition process. In this case, the transition in question would be the emergence of a wide-scale and significant community energy sector within the national energy system; Walker et al. (2006) have concluded that such overriding visions are not in place. The goals for community energy seemed to based on short term strategies, such as the 500 MW by 2020 target, which is supported by temporary grants and funding schemes; there is no clearly stated strategies which aim to replace the current fossils-fuel based energy system with one that is renewable, decentralized in distribution, and locally owned. Because of the lack of a goal towards transition, community energy was said to be "remaining firmly in its expanded state but not a transforming niche" (Walker et al., 2006, p. 13). It can be argued that UK and Scottish Government policies were not "a paradigmatic shift in thinking, but rather a fragmented and partial recognition that community approaches had a role to play in 'co-provisioning' alongside established energy generation" (Walker et al., 2007, p.74). Instead, community energy policies were motivated by the assumption that community energy is a possible solution to grow the renewable energy market, diminish opposition to wind farms, enhance rural generation and increase capital investments, as opposed to an overall transition towards an alternative, more sustainable energy socio-technical system (*ibid*).

It seems that the transitions literature and niche management frameworks could not capture the 'politics of transition', that government's sustainability targets may not reflect a well-intended transition, but other political agendas and interests, for instance, gaining political support from rural communities through community energy being packaged as a community regeneration issue (Lovell, 2007). With the mixed messages coming from the UK and Scottish Government in the form of continued support for the fossil fuels industry, it also becomes challenging to determine if the government is truly planning an energy transition, or is community energy merely a "lip service" used by the Government to gain credibility on the sustainability front.

6.4 Applicability of Niche Management Frameworks on Community Energy

This research have found some challenges of applying SNM and MLP onto socio-technical innovations and niches, such as community energy. First, the neatly linear assumption of niche-development and alignment do not represent the 'messiness' of the community energy sector, that there exists different visions and strategies that make the niche far from

uniform. Studies have pointed out how the managerial thinking in niche literature seemed to be less appropriate amidst the pluralities and voluntary associations of grassroots innovation (Smith and Sefyang, 2013). The importance of identities, community dynamics and power relations in grassroots innovation is also underplayed by strategic niche management approaches (*ibid)*. Furthermore, structural challenges, such as non-conducive government policies created at the regime level, were not also adequately represented in the SNM and MLP models. The limitations perhaps result from the fact that niche-based theories were first developed for technology and market-based innovations, not social innovations. There seems to be opportunities to further develop the theories to fully capture the non-technology aspects of the socio-technical transition. While the concept of the "socio-technical system" and "socio-technical regime" have successfully represented the social and political dynamics of the systems in societies, it seems that niche management frameworks have not successfully done the same.

Secondly, niche management frameworks seemed to be under theorized when it comes to niches that consist of highly diverse projects. Key contributors have acknowledged that "the role of consumers and grassroots initiative in transitions is underrated and under-conceptualized, there we welcome new perspective which theorize changes in demand-side practices as motors for transition" (Grin et al., 2010, p. 331). The SNM and MLP frameworks assume initiatives and projects must have a common, overriding vision in order to scale up and replicate (Rip and Kemp, 1998; Mourik and Raven, 2006; Schot and Geels, 2008), however, there are multiple aims and visions within the community energy niche. The varied forms and types of community energy both challenge this assumption and raise the question on how to manage such a complicated niche to create a transition. Even though, Sefyang et al., (2010) noted that while transition and niche management literature do not examine social innovations in particular, the frameworks could still provide valuable insight into scaling up process required by niches and the interaction between niches and mainstream.

Third, it seems that niche management theories were not specific on *who* should be implementing strategic management or creating alignment. Mourik and Raven (2006) noted that the SNM and MLP can support program managers who aim at orchestrating the

interaction among local projects and between the local and global level, which then contributes to the stabilization of a niche that holds the potential to initiate a system change. Although all intermediaries agreed that it was the Scottish Government's duty to 'manage' the sector through policy interventions, the intermediaries did not mention themselves as being part of that strategic management or implementing strategic management. While some studies mentioned the roles expected of intermediaries (Hargreaves et al., 2013), SNM and MLP frameworks did not mention clearly how intermediaries can be integrated within a strategic management, and more importantly, *who* should carry out the task. There seemed to be a lack of practical guidelines in employing the SNM and MLP frameworks for practicing project and niche-builders. However, Mourik and Raven (2006) argued that authors have been reluctant to create such guidelines because historical cases have demonstrated the complexity and contingencies of radical technological change, and that no single actor is able to grasp the full control of transition. This raises the question on the usefulness of niche management frameworks as a strategic tool to manage a currently and rapidly developing niche, such as community energy. Perhaps this is why niche-based literature have hinted that the SNM and MLP are more powerful as an ex-post tool compared to an ex-ante tool (*ibid*), which can be used to observe a socio-technical transition that has occurred, such as the transition from horse-drawn carriages to cars.

Chapter 7. Conclusion

This dissertation has sought to analyze the community energy sector in Scotland as a grassroots innovation niche and apply niche management frameworks to assess its role and potential to create an energy transition; the research was focused on the perspectives of community energy intermediaries.

Analysis of interviews findings and the literature reviewed have led to some concluding points, first, while community energy in Scotland can be categorized as a growing, grassroots innovation niche, it consists of projects and initiatives that highly vary in objectives, types, visions and expectations; this diversity is expected to complicate strategic niche management employed by niche actors. Second, the diversity in visions extend to community energy intermediaries, who have different ideals on the best strategy to upscale the community energy niche in Scotland; while it was not clear whether or not differing visions would negatively affect strategic co-ordination between intermediaries, the diversity further challenges the linear management assumed and advocated by SNM and MLP. Third, similar community energy niche-building challenges were revealed when analysis was applied to community energy projects at the project level, and when asked to the intermediaries at the niche level; the commonly shared challenges included group, project and community factors. However, by performing research on the intermediaries at the niche level, more structural challenges were discovered, which included network, policy, financial and infrastructure. Fourth, as the consequence of the structural challenges, the role and potential of the community energy niche to create a transition seemed to be trivial, especially when its overall energy generation capacity is very small even within the renewable energy sector. Finally, the dissertation discovered some challenges and limitations in applying niche management frameworks onto social grassroots innovations, such as community energy; the linear and neatly structured frameworks could not capture the messier pluralities of the community energy niche and the "politics of transitions."

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Appendices

Appendix 1: Template email for recruiting participants

Dear xxx,

I hope this email finds you well. My name is Astrid Kusumawardhani and I'm a Masters student at the University of Edinburgh currently doing a dissertation research on Scotland's community energy. I was wondering if I could interview you for the research?

My dissertation focuses on community energy intermediary actors, such as xxx, specifically on their role in up scaling community energy. Some questions that I will be asking include: what are the main challenges faced in up scaling community energy, from the point of view of your organisation? Can these challenges be attributed to the "grassroots" nature of community energy projects, or are there a different set of challenges that intermediaries experience? I hope the research can add to the body of knowledge around community energy, as there have been only a few studies in Scotland, especially on intermediaries.

For this, I would like to conduct a 30-45 minutes interview with you. The findings will only be used for the dissertation; participants can choose to be anonymous and read through the findings to ensure quotations are accurate.

It would be great if I can speak to you directly in-person or via Skype, whichever suits you best, sometime this week. Please feel free to contact me via email or to xxx if you have any questions.

Thank you in advance for your time and help.

Kind regards,

S. Astrid Kusumawardhani
MSc Environmental Sustainability 2013-14 - University of Edinburgh
http://uk.linkedin.com/in/sitiastridkusumawardhani

Appendix 2: Sample of interview schedule

This is an example of the themes and questions that were asked during the interviews with intermediaries. As interviews were semi-structured in nature, the questions varied during each interview. Not all the questions were asked at all interviews, some depended on the answers provided or the particular expertise of the respondents.

Theme	Questions
Personal Background	- What is your position and role in the organization? - How long have you been in this position?
Vision	- What is your organization's vision for community energy in Scotland? Do you think this vision is commonly shared among intermediary groups? - How do you think community energy is performing right now as a sector? Do you think that this sector is being strategically managed? - What do you think is the future potential of the community energy sector?
Community Energy Sector	- What do you think are some of the unique characteristics of the community energy sector (or community energy projects)? - Would you agree if community energy were labeled as "grassroots innovation?" If yes, why? If no, why? - Would you agree if community energy groups were labeled as "niche"?
The organization	- What is the role / function of your organization in the community energy sector? How does your organization fulfill these roles? - Do you see your organization working to upscale community energy? - What are the support that your organization receive in carrying outs its roles and function? Do you think the support is sufficient? What can be improved? - Do you network with other intermediaries? If yes, through what channels? Are there any obstacles in cooperating with other intermediaries?
Challenges	- What are the challenges that your organization face in assisting community energy groups, according to your roles and functions? - What are the challenges that arise in your attempt to upscale community energy groups? - Do think these challenges occur due to identified characteristics of the community energy sector? If yes, which ones? - What do you think is most needed to grow the sector?

Appendix 3: Data collection methods

Code	Participant	Method	Length
G1	**Sue Kerns,** Head of Renewables Policy, Scottish Government	Email correspondence	N/A
N1	**Jennifer Ramsay**, Community Benefit Officer , Local Energy Scotland	Phone interview, recorded, notes taken	15:38
N2	**Anne Schiffer,** Energy Campaigner (Community Power), Friends of the Earth Scotland	In person interview, recorded, notes taken	29:18
N3	**Kelly McIntyre**, Program Manager, Community Shares Scotland, Development Trusts Association Scotland	In person interview, recorded, notes taken	51:24
F1	**Chris Matthews,** Senior Manager, Renewable Energy and Asset Finance Department, Co-op Bank (previous position)	Phone interview, recorded, notes taken	33:38
F2	**Andrew Smith,** Head of REIF – Scottish Investment Bank, (Renewable Energy Investment Fund)	In person interview, recorded, notes taken	20:00
F3	**Eric Samuel,** Senior Policy and Learning Manager, Big Lottery Fund	Skype interview, recorded, notes taken	26:07
C1	**Jelte Harnmeijer**, Director Scene Consulting Ltd.	In person interview, recorded, notes taken	22:00
C2	**Paul Phare**, Regional Development Manager Scotland, Energy4All	In person interview, recorded, notes taken	50:16