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Small and steady:

The role of the town energy committees in the energy transition in Vermont

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Abstract

International and national carbon reduction plans and targets have constituted the subject of a copious amount research in recent years. Concurrently, the number of cities, regions, companies and communities that have set ambitious targets for renewable energy and energy efficiency has been growing. Among these actors, rural communities in the developed world and their efforts toward the transition away from fossil fuels have sparked limited interest to date. This thesis addresses the dearth of research on this topic by analysing the role of a group of voluntary town energy committees in the transition to clean energy in the predominantly rural U.S. state of Vermont. The study explores the ways in which these actors are driving the energy transition in a rural, developed world context, the challenges with which they grapple and solutions to improve their effectiveness.

The research design was exploratory and employed a triangulation approach based on a review of the literature on socio-technical regimes, grassroots innovations, grassroots energy action and rural energy transitions; qualitative data collection from 24 semi-structured interviews; and the results of a longitudinal survey of town energy committees made available by the local NGO Vital Communities.

Findings suggest that town energy committees play an important role in compensating for shortages in expertise and manpower in local administrations, by advocating for behavioural change among local energy consumers and by acting as mediators amongst different groups of stakeholders. Their activities complements Vermont's ambitious renewable energy and energy efficiency regulations by addressing those areas of energy consumption that are not incentivised by policy instruments. However, the degree of organisational strength of these volunteer organisations was found to vary widely, and for their effectiveness to be hampered by volunteer burnout and by the lack of support from local officials and residents.

Several recommendations on how to address this challenge were made based on the information shared by local civil society informants and grey literature. However, the applicability of abstract knowledge to the different contexts was deemed to be limited. Instead, the provision of ongoing operational support from local NGOs was found to significantly impact the level of activities and outcomes of town energy committees. The findings of the study could be useful for local volunteers and the organisations that support them to inform future strategies.

Keywords: town energy committee, Vermont, local energy action, rural energy transition

Executive Summary

Humanity needs an energy transition away from fossil fuels of exceptional scope, depth and speed in order to contain global temperature rises below the threshold level of 2 degrees Celsius by the end of the century (IRENA, 2017). Said transition requires the cooperation of actors at all levels of society through complementary actions (IPCC, 2014). Global efforts to reduce CO2 emissions through the Kyoto Protocol and the Paris Agreement have been accompanied by regional, national and local plans to reduce energy consumption and increase the amount of energy derived from renewable sources. According to REN21 (2017), there has been an increase in the number of cities, corporations, communities and regions committing to targets related to energy efficiency and renewable energy in recent years.

Problem definition

Due to their sheer size, weight in the global economy and the climate-related impacts they have experienced, cities have been much more widely studied compared to rural areas in the context of sustainability transitions and specifically of energy transitions. In the global south, the transition to more distributed forms of energy generation has been employed as an opportunity to advance socio-economic development in rural areas (Bradshaw, 2010). But less attention has been paid to rural areas in the developed world, despite the fact that they have been the destination of a large portion of the investments in renewable energy installations to date (OECD, n.a.).

Studies of Australian and Canadian households (Wiedenhofer *et al*, 2013, Norman *et al,* 2006) have shown that rural areas in the developed world are less energy efficient on a per capita basis compared to cities because of higher energy use in buildings and poorer transportation performance. Furthermore, as a result of the long-term decline in agriculture as a source of revenue, these regions are grappling with socio-economic problems like depopulation and reduced human and resource capacity at the local level (Bergmann *et al.,* 2008).

Purpose statement and research questions
This thesis aims to add to the limited literature on the topic of rural energy transitions in the developed world by zooming into the role that a movement of volunteer town energy committees has played in the energy transition of the U.S. state of Vermont. Three main research questions have guided the study:

> RQ1: What role do the town energy committees play in the energy transition in Vermont?
>
> RQ2: What challenges do town energy committees face and how do they hamper their activities?
>
> RQ3: How can the energy committees enhance their effectiveness, given the challenges observed?

Methodology
Seeing how a reduced number of pre-existing studies on the topic were found, the research design was exploratory. A triangulation approach using literature review, qualitative data collection in the form of 24 semi-structured interviews and the results of a longitudinal survey conducted by the local NGO Vital Communities was employed in order to enhance

the soundness of the results and to make warranted inferences. The findings in relation to the research questions were as follows:

RQ1: What role do the town energy committees play in the energy transition in Vermont?

The town energy committees were found to operate on a spectrum between grassroots activists campaigning for clean energy and energy efficiency in their communities of place and intermediary actors that make up for shortages in expertise and capacity in the resource-constrained local administrations in Vermont. Their activities complement top-down state policy instruments that incentivise cleaning the power mix, distributed generation and energy efficiency with efforts to address demand-side aspects related to energy consumption in municipal buildings and local residences and the pervasive use of single-occupancy vehicles for transportation. In light of an increased backlash against utility-scale renewable energy installations at the local level, town energy committees have limited themselves to promoting those clean energy solutions that have not constituted grounds for controversy. Their level of activities was found to vary widely based on the characteristics of their towns and the skills of the volunteers themselves; some groups have only engaged in awareness campaigns, others have acted as consultants to municipal energy projects.

Measuring the effectiveness of town energy committees in the energy transition by using a proxy metric of self-assessed satisfaction with performance rendered inconclusive results. Part of the reason for this is the fact that much of their work has had intangible results. In an effort to maximise their impact, town energy committees have traded off time spent on activities that would strengthen their organisational capacity, such as setting clear and achievable goals and clear priorities, in order to organise as many external activities as possible. In the absence of clear goals and strategies, volunteers were found to adopt a project-based approach while pursuing structural changes -decentralising and decarbonising the energy system. The large number of local organisations promoting clean energy solutions in Vermont was found to play an important role in supporting town energy committees by running centralised outreach campaigns, aggregating knowledge and providing ongoing guidance and opportunities for networking.

RQ2: What challenges do town energy committees face and how do they hamper their activity?

Volunteer burnout and participation and insufficient support from local residents and officials were cited as the main challenges facing town energy committees. According to previous studies (MacNeela, 2008; Seyfang & Smith, 2007), grassroots groups active in a variety of locations and areas grapple with the challenge of merely surviving. In Vermont, efforts to address this challenge have consisted of support from local NGOs and attempts to professionalise the work of volunteers, wherever possible, by hiring full-time sustainability coordinators in larger towns, securing grants for interns in smaller ones or by having energy professionals staff the groups of volunteers. Starting off with a core group of volunteers was identified as an important way to keep the organisation's momentum up.

There is no blueprint on how to avoid challenges associated with insufficient support at the local level. Rather, this finding points to the difficulties in defining clear-cut manners to build trust in new technologies in local communities. Diversifying the energy committees' projects to ensure that they target different groups of stakeholders - and therefore that the success of one project does not define the success of the entire group - was identified as a useful strategy to address this challenge.

RQ3: How can town energy committees enhance their effectiveness?

During the course of the research, local informants have shared a number of handbooks, lists of tips and other materials on how to run successful town energy committees. However, the validity of such aggregated knowledge over time and across different contexts is questionable. Instead, it was found that those town energy committees that benefitted from specific, ongoing guidance from local NGOs, those that were staffed by energy and civil society professionals and those that had been founded by a core group of retired volunteers with greater time availability reported the highest degree of success and level of activities. Centrally-run weatherisation and solarisation campaigns organised by the local NGO Vital Communities, which has relied on town energy committees as boots on the ground to deploy the campaigns, rendered great results and highlighted the importance of providing ongoing operational support to volunteer groups. Seeing how the Vermont state legislature has recognised the importance of town energy committees to building local know-how (VPS, 2016), making more state resources available to support their activities could enhance their effectiveness.

Reflections on methodology and recommendations for further research

The theoretical framework used drew on the review of several socio-technical transition theories to construct a typology of factors that could affect the internal and external performance of the town energy committees. While seven of the eight factors identified were found to be applicable to the case of hand, the typology chosen failed to account for the cultural capacity of the local communities and the personal skills of the volunteers themselves, which previous studies (Middlemiss & Parish, 2010) identified as being relevant to the work of volunteer groups. Both of these aspects were also brought up during interviews. Therefore, a future study could look at the behavioural and psychological elements underpinning energy network interactions and manners to elicit behavioural changes in the energy transition in rural areas.

While the generalisability of the results is constrained by the complexity of socio-technical systems and by the diversity of grassroots groups (Bergmann *et al.*, 2010), this study adds to the limited literature on local energy action in the U.S. (Klein & Coffey, 2016) at a time when American communities are grappling with policy confusion and when local energy action has taken precedence over national policies.

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Abbreviations

EAN- Energy Action Network

LED - Light-emitting diode

NGO - Non-governmental organisation

UNFCCC - United Nations Framework Convention on Climate Change

1 Introduction

Anthropogenic emissions of greenhouse gases have led to an unprecedented level of climate change observed since the 1950s, which has impacted natural and human systems across all continents and oceans. Continuing business as usual will result in levels of temperature rises that will interfere irreversibly and pervasively with human habitats and ecosystems. In order to effectively avoid such a bleak scenario, cooperation through complementary actions at all levels of society, including international cooperation, is necessary (IPCC, 2014).

Seeing how the use of fossil fuels, cement manufacturing and gas flaring jointly accounted for over 93% of all the global anthropogenic CO2 emissions in 2010 (IPCC, 2014), humanity needs an energy system transition of exceptional scope, depth and speed in order to contain global temperature rises to 2 degrees Celsius by the end of the century (IRENA, 2017). Such a transition would require, among other things, the ramping up of low-carbon technologies all over the world, stringent low-carbon and energy efficiency mandates, improvements in energy and material efficiency, generating 95% of all the global electricity from low-carbon sources, switching 70% of all the vehicles to electricity and lowering the CO2 intensity of industry by 80% by 2050 (IRENA, 2017).

Humanity has previously undergone several energy transitions - from wood to coal during the Industrial Revolution and from coal to primarily oil, gas and nuclear power during the 20th century (O'Connor, 2010). However, the current energy transition is not defined by the type of fuel to which we need to switch, but rather by its end-goal, which is that of lowering greenhouse gas emissions. The co-evolution of a plethora of technologies, institutions and stakeholders is needed to bring about a low-carbon energy transition (Bolton & Foxton, 2015).

Efforts to reduce CO2 emissions at the global level started with the United Nations Framework Convention on Climate Change (UNFCCC), which set binding emissions reduction targets for developed countries through the Kyoto Protocol of 1997; and continued with the voluntary, but more widely-adopted targets of the 2015 Paris Agreement (Jackson *et al.*, 2015).

But global emissions reduction targets and schemes have elicited different outcomes in different parts of the world. If, in the EU, the introduction of binding renewable energy targets through Directive 2009/28/EC boosted the contribution of this fuel source to 16.7% of the gross energy consumption by 2015 (EC, 2017), the uptake in renewable energy and energy efficiency in Australia and North America has been slower (Jackson *et al.*, 2015). Meanwhile, in the global south, the focus has been on boosting markets for mini-grids and stand-alone systems to enhance electrification, and using renewable energy sources to power these new installations (REN21, 2017).

1.1 Problem definition

While efforts to address climate change at the international (Jackson *et al.,* 2015) and at the national levels (Kaphengst & Velten, 2014) have been widely studied, less is known about local actors, how they conceive of their role in the low-carbon energy transition and what types of actions they undertake in this regard. That is despite the fact that, according to REN21 (2017), there has been an upsurge in the number of cities, corporations, communities

and regions committing to targets of energy efficiency and 100% renewable energy in recent years.

Seeing how cities are home to more than half of the world's population (PRB, 2017) and account for 65% of the total energy consumption (REN21, 2017), much of the literature on energy transitions at the local level has concerned the role of municipalities and municipal climate action. Furthermore, the fact that cities have disproportionately felt the effects of extreme weather events resulting from climate change has also made them a focal point for climate mitigation policies and research (Crimmins *et al.*, 2016). In the U.S., cities have become particularly central to the energy transition in the wake of the equivocation in federal energy policy since January 2017. After the federal government decided to rescind the country's commitment to the Paris Agreement in May, the mayors of 369 cities across the country vowed to continue to uphold the targets of the accord (Climate mayors, 2017).

However, the energy transition in rural communities, particularly in the developed world, is an under-researched topic (Seyfang *et al.*, 2014). Accounting for only 22.3% of the EU's and 19% of the U.S.' population - but for 51.3% and 72% of the territory, respectively (EC, 2017; USDA, 2017) - rural areas in the developed world are understandably not central to the efforts to decarbonise energy production and consumption. Despite the lack of research on energy transitions in rural areas in the developed world, these regions are significant because they "attract a large part of the investment related to renewable energy deployment, tending to be sparsely populated but with abundant sources of renewable energy" (OECD, n.a., p.1). The fact that approximately 55% of the investment in renewable energy in the U.S. has been in rural areas (OECD, n.a.) illustrates the importance of rural regions to the low-carbon energy transition in the country.

Their importance as destinations for renewable energy investments notwithstanding, rural areas have different energy consumption profiles compared to urban centres, making the understanding of rural energy contexts all the more necessary. Studies of urban and rural settlements in different parts of the world - of Australian households (Wiedenhofer *et al.*, 2013) and of households in rural and urban areas in Canada (Norman *et al.,* 2006) - have revealed time and again that population density and per capita energy consumption are inversely proportional. According to Hui (2001), thanks to their compactness and economies of scale, cities are more energy efficient compared to rural areas because the reduced time of travel results in better transportation performance and the higher density in lower per capita energy use in buildings. Cities are also more likely to adopt new technologies faster than rural areas, the author argues, which results in the speedier use of more energy efficient technologies in urban settings.

1.1.1 The energy transition in a rural, developed world context

To date, academic research on energy transitions in rural contexts has largely concentrated on poverty-stricken regions in the developing world, where transitioning to distributed generation based on renewable sources could be a means to enhance equity, personal freedom and socio-economic development by providing safer and more reliable solutions for power generation, transportation and heating (Bradshaw, 2010). Distributed generation is believed to be part of the solution to the social and economic problems that plague rural areas in the developing world, such as poverty, by electrifying those places that are not connected to the grid (Raman *et al.*, 2012).

Meanwhile, in higher-income countries, "what exactly 'sustainable communities' might look like is still being debated, but it is clear that [...] such communities must have drastically lower

rates of carbon emissions than is currently the norm" (Middlemiss & Parrish, 2010, p. 7). But, like their counterparts in the developing world, rural areas in developed countries are also grappling with economic problems that differentiate them from cities, such as the consequences of the long-term decline of agriculture as the major source of income and development, which has resulted in a host of socio-economic problems like depopulation and particularly youth migration to urban areas (Bergmann *et al.*, 2008).

Concurrently, increasing concern about climate change, the desire for energy sufficiency, favourable market conditions, the need of jobs and economic growth and amenable policies in the EU and some U.S. states have prompted a proliferation of distributed generation initiatives in rural areas, with many consumers becoming 'prosumers' by way of either household renewable energy installations or by participating in collective generation schemes (van der Schoor & Scholtens, 2015).

Local renewable energy generation could be part of the solution to some of the economic struggles with which rural areas in developed countries contend, by providing new sources of revenue, jobs and economic opportunities, innovation in products and policies, capacity building and affordable energy for remote communities (OECD, n.a.).

Notwithstanding broader top-down rural development initiatives, such as the EU's framework for rural development programs (EC, 2017), which fosters resource efficiency and ecosystem conservation as part of a sustainable growth agenda, much of the momentum in rural sustainability transitions has been injected by the communities themselves thanks in part to what Ivanko & Kivirist (2009) call the "rural Renaissance". Driven by improved connectivity that has enabled telecommuting, urban dwellers are increasingly drawn to the more scenic parts of the countryside, the authors argue, where they engage in sustainable living schemes, land conservation, homesteading and an overall "back-to-basics" existence.

1.1.2 The town energy committees in Vermont

This thesis aims to shed light on the role of local actors in the low-carbon energy transition in a developed world, rural context by zooming into the network of **town energy committees** in the U.S. state of Vermont. Active in over 110 of the 255 towns and municipalities in Vermont (VECAN, 2017), these groups of volunteer community representatives are unique in their set-up and under-studied; only one previous academic paper (Rowse, 2014) on the topic was found during the course of the research, and no other instance of community energy engagement at the local level of similar geographical concentration, energy-specific scope and depth was encountered in the U.S. or other countries.

Their fast growth in Vermont - their number increased from two dozen in 2007 to over 110 at the moment - indicates that town energy committees are gaining traction in the state. In light of the shortage of research on this movement, this study sets out to enhance the understanding of town energy committees, the extent to which they contribute to the clean energy transition in Vermont and the kind of challenges they are facing.

Vermont makes for an interesting case study on the role of local actors in the energy transition due to a number of factors. The legislature of the small and highly rural state (USCB, 2012) has set ambitious renewable energy and energy efficiency targets (VPS, 2016). At the same time, the uptake in wind and solar power in recent years has prompted significant backlash from local communities against commercial-scale energy installations (Rowse, 2014), meaning that actors at the local level are navigating an increasingly complex

social and political landscape regarding energy projects. Vermont is also one of the most progressive states when it comes to clean energy adoption in the U.S. (UCSUSA, 2017), but grapples with challenges specific to rural areas, such as the prevalent use of single-occupancy vehicles as a means of transportation (EIA, 2017).

1.2 Research questions

The purpose of this research project is to shed light on the role of local, grassroots initiatives in the transition to clean energy in a rural, developed world context by studying the network of town energy committees in Vermont. Three main research questions guided the project.

RQ1: What role do the town energy committees play in the energy transition in Vermont?

SRQ1.1: With what stakeholders do they engage?

SRQ1.2: What kind of activities do they perform?

SRQ1.3: How do they perceive the effectiveness of their work?

Rationale for RQ1: By employing three descriptive sub-questions, this part of the study seeks to make warranted inferences about and reflect on the impact that these stakeholders have on the energy transition in Vermont. In the last sub-question, perceived effectiveness was used as a proxy metric to measure the effectiveness of town energy committees.

RQ2: What challenges do town energy committees face in rolling out their activities?

SRQ2.1: How do these challenges affect their performance?

Rationale for RQ2: The aim of this descriptive question and reflexive sub-question is to understand the external and internal factors that hamper the activities of the movement.

RQ3: How can the energy committees enhance their effectiveness, given the challenges observed?

Rationale for RQ3: Drawing on the findings from the previous two sections, this part of the study seeks to identify solutions to address some of the shortcomings and challenges identified.

Answering the above-listed research questions serves two main objectives. First, this study aims to add to the limited body of literature on rural energy transitions in the developed world. Second, the practical goal of this study is to support the ongoing efforts of the town energy committees with insights and suggested strategies to overcome their challenges.

1.3 Overview of methodology

The topic was identified during a 12-day site visit to Vermont, during which unstructured interviews, a statehouse hearing on wind power and public health and a conference on distributed generation served as a basis to understand the state of the energy sector. Subsequently, a review of previous research on the topics of sustainability transitions, energy transitions and the role of local stakeholders (grassroots and intermediary actors) in the energy transition in rural, developed world contexts (primarily Europe) was conducted.

Template analysis of transcripts resulting from semi-structured interviews with town energy committee members and representatives of other institutions that work closely with them was then performed. In order to avoid a common pitfall of qualitative data analysis, which is that presenting evidence in an anecdotal fashion gives little sense of the relative importance of the emerging themes, some quantification of qualitative data was done to reveal the generality of the findings, as suggested by Bryman & Bell (2003). Furthermore, to enhance the reliability of the findings, triangulation of the data using results from a longitudinal survey of town energy committees made available by a local NGO and content analysis of websites, reports and other grey literature publicly available or provided by informants was employed.

1.4 Scope and limitations

The scope of this research project was to explore the role of a network of local volunteer groups, the town energy committees, in the energy transition in Vermont. Given the exploratory nature of the research design and the specifics of the location, the findings may not be generalisable to other forms of community energy organisations in other locations.

Furthermore, several limitations associated with the data collection and analysis methods were identified. Firstly, the sampling of informants introduced two biases in the collection of data. It was observed that the eight informants that rejected the interview request by email cited the lack of activity of their committee as a primary reason for not wanting to participate in the study. Therefore, it could be inferred that a number of town energy committees are inactive and were not interested in participating in the study. The applicability of the findings to such organisations is therefore likely limited. Furthermore, the contact information that was publicly available was that of the chairs of energy committees- as opposed to that of regular members. Only two of the informants were regular members. Therefore, their opinions are disproportionately represented in the study.

Secondly, interview responses can be influenced by a variety of factors, therefore interviewing a different set of respondents could alter the results of the study (Golafshani, 2003). Nevertheless, qualitative data collection was deemed to be an appropriate method in this study in light of previous research employing the same method to study other local energy initiatives (Hargreaves *et al.*, 2013b; van der Schoor & Scholten, 2015; Seyfang *et al.*, 2014).

Thirdly, the triangulation method used to verify the reliability of the findings revealed some discrepancies between the results of this study and those of a three-year survey conducted by a Vermont-based NGO as it concerns the challenges that town energy committees face. Longitudinal studies relying on quantitative data collected from a larger number of respondents could therefore render a different set of results compared to the results of this study.

Lastly, the town energy committees operate in an evolving policy, economic and social landscape. This study captures their reality at the time it was conducted, and does not purport to account for the entirety of the historical evolution of the movement or reflect possible future changes in its operating environment.

1.5 Ethical considerations

The initial site visit to Vermont was conducted upon the invitation of the Sweden-New England Cleantech Link, an organisation that supports exchanges of know-how and investment in clean technologies between the New England region of the U.S. and

Scandinavia. A representative of the organisation assisted the author in scheduling background interviews in Vermont, but the research was conducted using entirely the latter's own resources and the content of this thesis was produced independently.

Attention was paid to maintaining academic integrity throughout the entire research process, with a focus on avoiding plagiarism and faithfully representing the information collected. The interviewer requested permission from informants to record the conversations and use their name and information in the study; when permission to use the name of the informant was denied, the name of the informant and the institution they represent was duly anonymised. The data was used entirely for the purposes of this research project and its handling was conducted with due diligence - the interviews were transcribed, to the best of the author's knowledge, as accurately as possible and efforts were made to avoid biases in the interpretation of data.

1.6 Outline

This paper is structured in the following manner:

Chapter 2 presents the research design and methods used to collect and analyse the data, as well as the theories that informed the data collection methods and the selection of previous studies for the literature review.

Using a review of grey and academic literature and observations from the on-site visit to Vermont, Chapter 3 provides background on the energy transition in Vermont in order to lay the foundation for the subsequent discussion on the role of the town energy committees in the energy transition.

Chapter 4 summarizes the findings from previous research on grassroots energy initiatives that were relevant to this study. Following a discussion on top-down versus bottom-up approaches in the energy transition, specific examples including the Transition Towns global movement and community energy are discussed.

Meanwhile, Chapter 5 consists of the findings derived from the primary data collection related to the functioning of the town energy committees in Vermont.

In Chapter 6, the findings are analysed in relation to previous research and the research questions that guided the study.

Chapter 7 reflects upon possible ways forward for the town energy committees and the suitability of the research methodology to the case at hand.

Lastly, Chapter 8 concludes with a summary of the findings, how they contribute to the literature on grassroots energy action and suggests further research on the topic.

2 Methodology

This chapter elaborates on the design of this research project by describing the research process, the analytical framework, and data collection, analysis and interpretation methods. Due to the limited existing literature on the topic, the study was exploratory and therefore inductive in nature. In order to enhance the level of confidence in the findings, multiple methods were used to answer the first two research questions using a triangulation approach (Bryman & Bell, 2003). The methods used to answer each research question are summarised in Table 2-1 below and expanded upon in the following sections.

Research questions	Methods
RQ1: What role do the town energy committees play in the energy transition in Vermont? SRQ1.1 With what stakeholders do they engage? SRQ1.2 What kind of activities do they perform? SRQ1.3 How do they perceive the effectiveness of their work?	Literature review Template analysis of transcripts of interviews with town energy committee members and other stakeholders
RQ2: What challenges do town energy committees face in rolling out their activities? SRQ2.1: How do these challenges affect their performance?	Literature review Template analysis of transcripts of interviews with town energy committee members Longitudinal survey conducted by NGO Vital Communities
RQ3: How can the energy committees enhance their effectiveness, given the challenges observed?	Template analysis of interview transcripts and of grey literature.

Table 2-1 Methods used to answer the research questions

2.1 Research process and design

Before delving into the specifics of the methodology employed, a timeline of the research process will be described to enhance clarity about how the project unfolded. As mentioned in Section 1.3, a 12-day on-site visit to Vermont was conducted between June 5 and 16 in order for the researcher to familiarise herself with the energy transition in the state. During that time, 17 unstructured interviews, which are informal conversations based on a list of topics (Bryman & Bell, 2003), were conducted. The informants comprised a variety of stakeholders working in the energy sector (NGO representatives, a policy maker, the founder of an eco-village, of a building resilience centre, electric utility executives and employees, think tank employees). The full list of informants from the on-site visit is included in Annex A. In addition, the researcher participated in a Vermont statehouse hearing on wind power and public health on June 8 (Walters, 2017) and a conference (GridWise) on distributed generation and electric utilities on June 7 in Burlington, VT. Some of the observations and insights about the energy transition in Vermont derived from the on-site visit are included in Sub-chapter 3.4.

The topic of the town energy committees was identified following interviews with Informant #1, the VECAN program coordinator, and Informant #2, the chair of a town energy committee. Subsequently, a literature review was conducted to identify instances of grassroots actors' involvement in energy transitions in other places and the aspects that

emerged as being the most pertinent to their performance. The literature review helped to identify relevant themes that informed the design of the interview guide. The bulk of the data was subsequently collected through 24 telephone, Skype, Wire and email interviews. The data was analysed using the template analysis or thematic coding method as described by King (1998), with the interview guide serving as the higher-order coding level (see section 2.4).

The study employed a case-oriented research (COR) design of 18 town energy committees. Unlike case-based studies, COR allows for the analysis of the causal effects of particular variables or factors on outcomes in various contexts, thus allowing for comparisons among cases and the identification of patterns (6& Perry, 2012).

2.2 Analytical framework

In order to answer **RQ1**, a review of the literature on the role of actors in sustainability transitions was conducted before and during the data collection process and four theories were selected to construct a typology of factors that could inform a study on the role of the town energy committees in the energy transition in Vermont: strategic niche management (SNM), the multi-level perspective (MLP), the middle-out approach (MOA), and the actor-network theory (ANT). A description of the theories and how they were employed in the different studies is included in Chapter 4.2. All theories were found to have limitations in their applicability to the case at hand, which are summarised in Table 2-2 below and to partly overlap in some aspects. However, they were selected because previous studies have used them to analyse the role of grassroots and intermediary actors in energy transitions and because they address different aspects of grassroots movements and stakeholder interactions, ranging from internal processes to network support and modes of intervention in pre-existing socio-technical regimes.

Theory	Studies that used it	Selected aspects	Limitations to its applicability
SNM	Seyfang&Smith (2007), Seyfang& Haxeltine (2012) Seyfang *et al.* (2014)	Key niche processes: learning, network creation and expectation setting;	"Strategic" niches are those niches that are seeking to grow and SNM primarily looks at the conditions favouring their expansion. However, not all niches are interested in expanding (Hargreaves *et al.*, 2013b).
MLP	Geels& Deuten (2006)	Role of intermediaries: aggregation, networking and guidance;	Focuses on technology to the detriment of actors in socio-technological systems. Does not explain the agency and role of the different stakeholders (Lawhon & Murphy, 2011).
MOA	Parag& Janda (2014), Janda& Parag (2011)	Direction of intervention: upstream, downstream, sideways.	Focuses on how intermediary actor(s) influence technical systems, does not explain how the system influences actors.
ANT	van der Schoor& Scholtens (2015)	Networks; commitment of local actors (organisational development, shared vision, level of activities).	Does not distinguish among various categories of local stakeholders, treats "community commitment" as a monolith.

Table 2-2 Theories that informed the data collection and analysis

The selected aspects from the above-mentioned theories were divided into internal, organisation-specific factors and network factors and are summarised in Table 2-3. One additional factor - level of satisfaction with performance - was included as a proxy metric to

measure the effectiveness of the town energy committees. Other metrics - like CO2 emissions averted as a result of the activities of the town energy committees or the number of solar installations per household in the towns where the energy committees operate - were considered, but eventually discarded due to insufficient data availability and suitability to measure the intended variable, which was the effectiveness of town energy committees.

Internal factors (town energy committees)	Organisational development
	Shared vision
	Expectation and priority setting
	Level of commitment
	Learning mechanisms
	Self-assessment (level of satisfaction with performance)
Network interactions	Directions of intervention (upstream, downstream, sideways)
	Level of activities
	Network support (aggregation of learning, guidance, networking).

Table 2-3 Typology of factors used to answer RQ1

In answering **RQ2**, a typology of the common factors that influence the performance of community energy groups was identified in Seyfang *et al.* (2013b). The typology is included in Table 2-4. However, it was used merely as backdrop for an exploratory approach in which informants were asked directly to specify the challenges they encountered using an open-ended question.

Factor	When it can act as an enabler	When it acts as a challenge
Group	When it has committed individuals to drive the project forward, to maintain momentum and overcome setbacks.	When there is a lack of clear direction or management.
Project	When there is sufficient time, skills, information, money and material resources to carry out projects.	When there is a need for skills, information, and financial and material resources.
Community	The project is designed to meet the community's needs.	The group has difficulties overcoming public disinterest and mistrust.
Network	When the group forms supportive partnerships and information-sharing networks.	When skills and learning are not being transferred to others because they are too contextualized.
Policy	When there is a supportive policy context.	When there is a lack of policy support.

Table 2-4 Factors that can serve as challenges and enablers for community energy initiatives. Source: Seyfang et al. (2013b)

No framework was used to answer RQ3. Rather, findings were derived from grey literature, the findings related to the first two research questions and the opinions of the civil society professionals interviewed.

2.3 Data creation and collection methods

2.3.1 Literature review

The literature reviewed falls under four main categories. The first concerned previous studies on grassroots actors and their role in energy transitions. This search rendered three main types of actors: Transition Towns chapters (Seyfang, 2009; Seyfang *et al.,* 2012); community energy (Klein & Coffey, 2016; Walker & Devine - Wright, 2008; Hoffman & High-Pippert, 2010; van der Schoor& Scholtens, 2015) and intermediary actors like building professionals as facilitators of energy transitions (Parag& Janda, 2014; Janda & Parag, 2011; Hargreaves *et al.*, 2013b). The findings from this part of the literature review are summarised in Chapter 4.1.

The second body of literature consulted focused on socio-technical transition studies in order to identify the prevalent theories used to study sustainability transitions, which Markard *et al.* (2012) define as "multi-dimensional, fundamental transformation processes through which established socio-technical systems shift to more sustainable modes of production and consumption" (p. 956). Out of the four most common approaches to conceptualise such transitions - SNM, MLP, transition management (TM) and technological innovation systems (TIS) - the first two were determined to be more pertinent to this study. Two other relevant theories - MOA and ANT - were identified during literature interview in Janda & Parag (2011) and van der Schoor & Scholtens (2015), respectively, and were also taken into consideration. The findings from this section of the study are summarised in Chapter 4.2.

The third type of literature consulted concerned energy transitions in rural areas in order to contextualise the activity of the town energy committees and the energy-related issues observed during the on-site visit to the predominantly rural Vermont. These findings are summarised in Chapter 3.

Lastly, grey literature comprising primarily the websites of town energy committees, those of local NGOs and the materials made available by informants (reports, manuals, summaries of activity) was reviewed and used to complement the primary data; these findings are interspersed with the primary data in Chapter 5.

2.3.2 Interviews

Qualitative data was collected through 18 semi-structured interviews with 20 committee chairs, members and town energy coordinators. Three members of the same committee participated in one of the interviews (Informant # 23). Informants were contacted via email after their contact information was collected from a database of 110 committees listed on the VECAN website (VECAN, 2017). All the informants in the database were contacted; 28 replies were received within a week, of which eight declined the interview request. In one case, a mutually convenient time was not identified. In another, the respondent sent written answers to part of the interview questionnaire, but the answers were not included because they did not touch upon some of the key aspects concerning the research topic. The questionnaire was made available in advance to respondents upon request. The researcher stopped interviewing informants after a level of knowledge saturation was reached, despite the fact that she received more positive responses to her initial interview invitation after that date.

Probability sampling was used - all the town energy committee members with publicly available contact information were contacted and those who responded were interviewed, but the researcher checked that the respondents represented town energy committees from different parts of the state and municipalities of different sizes (ranging from 588 to 9,312 residents) during the process of scheduling interviews in order to ensure an adequate representation of the different types of communities and geographies in Vermont. However, as mentioned in Chapter 1.4, the sampling was somewhat biased because the contact information that was publicly available belonged to energy committee chairs, as opposed to regular members. Therefore, their opinions are disproportionately represented here.

In addition, six other interviews were conducted with the following informants: one informant that set up the first town energy committees in Vermont (#16), two that oversee their activity and organise campaigns for energy committees through the NGOs Vital Communities (#18) and VRNC/VECAN (#1); one with an informant that works for an NGO that finances grassroots energy projects (#22); one informant that works for a regional land planning commission (#19); and one informant that works for a solar developer (#24). A list of all the informants is included in Annex G.

Two informants (#1 & #2) were interviewed twice - once, during the initial visit to Vermont and the second time over the telephone and email. In two cases (#2 & #3), respondents expressed their preference for answering the questions in writing; the rest of the interviews were conducted over the telephone and applications Skype and Wire. When clarifications or additional materials were needed, interviews were followed up by email.

The questionnaire used to interview energy committees had four sections:

- an introductory section to set the stage regarding the history of the committee, when the informant had joined, the number of hours they dedicated to the energy committee, the number of members, official affiliation, motivations for joining and vision/mission (questions 1-6);
- a section on their projects and stakeholder engagement (questions 7-10);
- questions about the internal functioning (11-14) of the committees, including expectation setting, team dynamics, benchmarking and learning mechanisms and priority setting;
- and a section on their challenges and overall level of satisfaction with their performance (15-16). The questionnaire is included in Annex B.

According to Bryman & Bell (2003), administering interviews by telephone has some advantages compared to in-person interviews (faster, cheaper to administer, easier to supervise, remoteness removes some of the answer biases), but also some drawbacks (telephone interviewers cannot engage in observation). The latter drawback was addressed by asking follow up questions when respondents paused or the interviewer believed they were bewildered, confused or surprised.

The interviews ranged in duration from 13 minutes (#19) to 54 minutes (#23). The sizeable difference is explained by the fact that the six informants who did not represent town energy committees were administered a different set of questions to understand how they interact with the town energy committees.

During the interviews, efforts were made to refrain from asking leading questions. Bryman & Bell (2003) emphasise the importance of flexibility in administering semi-structured interviews in order to understand how informants conceive of their social world. As such, the questionnaire was used as a guide, rather than as a fixed template, and no two interviews

were conducted in the exact same manner. Sometimes, questions were skipped completely if the informant had answered them while talking about a different issue. At other times, follow up questions were asked during the interview and, on a few occasions, after the interview by email when it was determined that the answers were not clear or that more information was needed.

2.3.3 Survey

Informant #16 - a program manager working for the NGO Vital Communities - made available the results of an unpublished longitudinal (three-year) survey conducted among energy committees. The survey, which was administered via the website www.surveygizmo.com in 2015, 2016 and 2017, overlapped with this research project in that it asked respondents to identify the top four challenges that they were facing.

It received 36 replies in 2015, 32 in 2016 and 36 in 2017. After obtaining permission from Vital Communities, the survey results were used to triangulate the qualitative data concerning RQ2. The shortcoming of this method is that the researcher had no control over the sample. However, the advantages of using quantitative data collected over time (something which the author could not have done), which consistently pointed to similar results, were deemed to outweigh this shortcoming. The survey results are included in Annex C.

2.4 Data analysis

All 24 interviews were transcribed and analysed using a technique called template analysis (King, 1998), which is a hybrid between content analysis and grounded theory. This method differs from grounded theory, which argues for no a priori definition of codes in favour of an iterative data interrogation approach (Glaser & Strauss, 1967 by way of Bryman & Bell, 2003), in that it argues for the inclusion of at least a tentative coding scheme from the beginning, in the interview questionnaire. This was accomplished in the current study by using the literature-derived typology included in Table 2-3 to inform the questionnaire design. Template analysis allows for subsequent tweaks and the addition of secondary, tertiary and other levels of coding (King, 1998) depending on the data collected.

A common issue with template analysis is determining just how many pre-defined codes researchers should devise. Too few would pose the risk of a lack of clear direction and being overwhelmed with a mass of rich, complex data; too many codes could prevent the acquisition of data that may contradict key assumptions (King, 1998). A middle-of-the-way approach, in this case, was to descriptively identify eight themes emerging from the literature review on socio-technical transition studies and to group them into two self-explanatory groups - internal and external/ network-related factors. One extra code was identified and included a priori, which was that of the self-assessment of performance, used to answer the third sub-question to RQ1.

In order to avoid a common pitfall of qualitative data analysis, which is that presenting evidence in an anecdotal fashion gives little sense of the relative importance of the emerging themes, some quantification of qualitative data was done to reveal the generality of the findings, as suggested by Bryman & Bell (2003). The quantification of qualitative data was performed using the summative content analysis method recommended by Hsieh& Shannon (2005), whereby the instances in which certain topics were mentioned were counted and tabulated. The quantitative data was analysed in Microsoft Excel.

Quantification, supported by anecdotal answers, was the approach used to answer RQ2 about the challenges that committees encountered. Those were determined through an open-ended question, the answers to which were coded based on the coding scheme included in Annex D.

2.5 Validity and reliability

While validity and reliability are important criteria to determine the soundness of quantitative research (Bryman & Bell, 2003), there is an ongoing debate among social studies researchers about the applicability of these metrics to qualitative research. Lincoln (1994) by way of Bryman & Bell (2003) propose an alternative set of metrics - credibility, transferability, dependability and confirmability - to be applied to qualitative research instead of validity and reliability. These criteria roughly correspond to external and internal reliability and external and internal validity, but are better suited to qualitative research because they do not demand that studies be perfectly replicable. By these metrics, the present study likely performs best in the area of confirmability and worst in transferability (See Table 2-5).

Criterion	Definition	How it was pursued in the present study
Credibility	The degree to which the account reflects the social reality it seeks to convey.	The paper was sent to an informant in Vermont (Ralph Meima) to assess whether the account was correct; his feedback was incorporated into the final draft.
Transferability	The degree to which results are applicable in other contexts.	The conclusions are not transferrable in other contexts; however, in order to compensate for this shortcoming, a thick description of socio-cultural aspects was performed.
Dependability	The degree to which the research is trustworthy.	Bryman & Bell (2003) mention a technique whereby researchers were asked to make their data available for "auditing" by others and to keep good records of their data at all times. No auditors were identified in this case that were willing to perform the task.
Confirmability	The researcher can be shown to have acted in good faith, avoiding bias or ideological approaches to data sets.	Efforts were made in this regard. Since the researcher does not belong to any particular school of thought regarding energy transitions, she sought to account for all the approaches and ideas she identified in previous studies.

Table 2-5 Criteria for the soundness of qualitative research

2.6 Ontological and epistemological considerations

Interpretivist epistemological and constructionist ontological approaches are inherent to qualitative research strategies (Bryman & Bell, 2003), and therefore also characterise this study. Rather than adopting a natural scientific model approach, this research project pursues the goal of understanding the complexity of the energy transition in a predominantly rural context - the U.S. state of Vermont - and how local actors in this context make sense of their role in the process and overcome their challenges. Furthermore, rather than purporting utmost objectivity in her approach, the author understands the unit of study - the town energy committees - as a complex actor that is co-evolving with an ever-changing social and energy landscape, and therefore her understanding of the phenomenon as an imperfect approximation of its complex reality.

3 The energy transition in Vermont

This chapter sets the stage for the study of the town energy committees in Vermont by providing background information, gleaned from literature review and background interviews conducted on-site, on rural energy transitions, emerging forms of local energy action in the U.S., the energy profile of the state of Vermont and emerging issues related to renewable energy installations. In section 3.1, a definition of the energy transition is attempted, followed by background on rural America and the energy transition (section 3.2), emerging forms of local energy action in the U.S. (section 3.3), the energy transition in Vermont (section 3.4) and a summary of the chapter (section 3.5).

3.1 Defining the energy transition

The concept of *transition* has been increasingly employed in the social sciences to study change processes (Berkout *et al.*, 2012). An entire area of study - transition studies - looks to shed light on the interactions between technology on the one hand and society on the other (Markard *et al.*, 2012). The main differences between transitions and other change processes are that transitions take a longer time to accomplish, are structural and radical in nature and lead to transformative rather than piecemeal outcomes (Avelino & Kunze, 2009).

Energy transitions are not new, for, as noted in Chapter 1, humanity has undergone various shifts in energy sources in the past - from wood to coal during the Industrial Revolution and from coal to oil, natural gas and nuclear power in the 20th century (O'Connor, 2010). However, in its current form, the term energy transition has become widely used in the wake of Germany's success with its own energy transformation program, Energiewende, to mean a low-carbon energy transition (Farla *et al.*, 2012). Early elements of the current transition can be traced to the energy crisis of the 1970s, when Amory Lovins (1977) envisioned a decentralised energy system as a soft path to economic prosperity, environmental sustainability and political stability.

The term appears in literature under various forms, including "sustainable energy transition", "clean energy transition", "renewable energy transition" and "low-carbon energy transition". While the exact definitions of these terms may vary slightly, the shorthand form of "energy transition" is used in this study to refer to the shift to low-carbon energy systems, encompassing generation, consumption and storage.

3.2 Rural and small-town America and the energy transition

According to the U.S. Census Bureau, Vermont ranks as the second highest U.S. state based on the percentage of its population living in rural areas - 61.1% - after Maine and the second smallest by population after Wyoming (USCB, 2012). Its population as of July 2016 stood at 624,594 (USCB, 2017). The bureau defines rural areas as those which are not urban, and urban areas as those localities with a population of over 2,500. While many municipalities in Vermont surpass that mark and therefore are not "rural" according to this classification, this study uses the term "rural" to refer to both rural areas and small towns. The population of the towns from which the informants hail ranges from 588 to 9,312 (USCB, 2017).

Placing the town energy committees in Vermont in a rural context was deemed to be important background because the observed challenges facing the small communities where they operate, such as the shortage of human capacity in local administrations and few local

employment opportunities, result in patterns of energy consumption that differ from those in larger settlements. For example, the commutes in Vermont tend to be longer compared to those in cities and, in the absence of an extensive public transportation system, are largely based on single-occupancy vehicles, making gasoline used for transportation the primary source of emissions in the state (EIA, 2017); the greater distances that electricity has to travel translate in greater transmission and distribution losses compared to cities; and heating is decentralised and partly reliant on fossil fuels like propane and heating oil, making it another important contributor to overall emissions (EIA, 2017).

However, little research has been found that studies energy transitions in rural versus urban contexts in an aggregate manner. Instead, the previous studies relevant to the research topic, which will be discussed in Chapter 4, have largely comprised of case-based analyses of rural community energy projects operating primarily in Western Europe.

One of the few studies on the geographical underpinnings of the energy transition encountered was a seminar series organized by a group of British researchers in 2009-2011. Summarised in Bridge *et al.* (2013), the seminar series sought to identify the geographical factors that condition the transition to clean energy, naming landscape, territoriality, location, spatial embeddedness and scaling as the most pertinent geographical aspects. In the British context, the authors argue that geography conditions the type of energy systems that are workable in distinct locations because the latter are functions of the overall economic system (with economic activity concentrated in and around urban areas); of local cultures and values, including how power is organised at the local level; of the availability of resources like biomass and hydropower; of demography; and of land planning. Their recommendation to policy makers is to seek to promote geographically-constituted transitions that work with the different spaces. Otherwise, geography can interfere with the implementation of national energy policies and "complicate many of its assumptions" (p. 339).

Furthermore, studies of urban and rural settlements in other parts of the world - of Australian households (Wiedenhofer *et al.*, 2013) and of households in rural and urban areas in Canada (Norman *et al.,* 2006) - have revealed time and again that population density and per capita energy consumption are inversely proportional. According to Hui (2001), thanks to their compactness and economies of scale, rural areas are less energy efficient compared to cities because the increased time of travel results in a poorer transportation performance and the lower density results in higher per capita energy use in buildings. Rural areas are also slower to adopt new technologies than cities, the author argues, which results in a delay in the incorporation of energy efficient technologies.

As noted in Chapter 1, rural and small-town America offers its dwellers fewer employment opportunities compared to urban centres, which are often linked to a limited number of employers, meaning that residents face greater job uncertainty and tend to have longer commutes; the local tax base is smaller, meaning that local administrations work with limited staff and resources; and local job creation is an important driver for local policies. Case in point, in Vermont, the fact that renewable energy and energy efficiency have created employment opportunities has been an important driver for policy support for these sectors; the number of jobs created by the energy efficiency and renewable energy sub-sectors is one of the indicators used to measure the growth of the clean energy sector (PBS, 2017).

Furthermore, some rural areas in the U.S. lack the medical, educational, financial, social, and recreational services that urban dwellers would consider basic (Zimmerer & Basset, 2003). According to Kelly-Reif & Wing (2016), our economies are set up in such a way, that urban

populations obtain most of their energy and food from rural areas and return much of their waste to the same areas that produce them, giving rise to a phenomenon they dubbed "urban-rural exploitation" or the unwitting exploitation of rural areas at the hand of urban consumers.

Due to the fact that rural areas do not lend themselves to economies of scale, rural and small-town America has a longstanding tradition with local energy ownership. For instance, local electric cooperatives were instrumental to the country's rural electrification starting in the 1930s, and such cooperatives remain important in servicing those areas that are too remote or spread out to be profitable for investor-owned electric utilities (NRECA, 2017).

3.3 Emerging forms of local energy action in the U.S.

The U.S. has historically been a source of technological innovation and social activism, but when it comes to climate change, McAdam (2017) notes that it has spawned a surprisingly low level of grassroots activism. That said, examples of climate activism can be found all over the country. Even a small state like Vermont has produced initiatives like 350.org, the global network that organises peaceful protests worldwide to rally communities against oil, gas and coal projects (350.org, 2017).

By and large, climate action at the local level in the U.S. has stemmed primarily from municipal authorities in the form of mayoral energy task forces (C2ES, 2011), whereby mayors appoint community members as advisors on energy issues; local climate adaptation plans (Woodruff & Stults, 2016), and state clean energy plans. In a more isolated but increasingly popular fashion, the number of sustainable living schemes like eco-villages and intentional communities has been on the rise (IC, 2017). According to Wheeler (2008), the fragmentation in local energy action in the U.S. has stemmed from the absence of a substantial national energy policy, and resulted in local energy plans that were poorly devised, for which there was inadequate monitoring and which were not substantiated by projects and commensurate allocation of resources.

In a more recent development, towns, cities and counties are increasingly engaging in community choice aggregation, a scheme whereby local administrations register as electricity purchasing collectives and are able to offer local residents electricity that is up to 100% renewable (DeShazo, 2017). Having started in Massachusetts, the scheme is statutorily enabled in seven states and is becoming increasingly popular in California. In order for local communities to compete against utilities and other power purchasing companies, the state where they operate needs to make legislative changes to enable such actors to purchase electricity in the first place (ibid).

While specific municipalities across the country - like Denver and San Francisco - have called upon local residents and experts to form energy task forces in order to inform local energy planning, the type of widespread network of energy committees present in Vermont has not been encountered anywhere else in the country, though some towns in the neighbouring state of New Hampshire have begun to set up their own iteration of town energy committees, drawing inspiration from the ones in Vermont (NHEnergy, 2017).

3.4 The energy sector in Vermont

Vermont is one of the most energy efficient states in the U.S., ranking below the national average for its per-capita consumption of energy for the residential, industrial and commercial sectors and transportation (EIA, 2017). Its relatively low energy consumption is

partly due to the fact that the small and predominantly rural state has little industry, its economy being primarily driven by services (EIA, 2017). Overall, the state ranks as the eighth most energy efficient per capita in the country, with a total energy use of 210.8 British thermal units (Btu), compared to a national average of 303.1 Btu. Transportation is the largest source of energy consumption (EIA, 2017), due to the insufficient public transportation system and low population density.

In a 2017 report ranking U.S. states for the progress achieved in adopting clean energy, Vermont ranked second after only California (UCSUSA, 2017). The ranking, which uses 12 metrics to measure progress, found that Vermont was a leader in generating clean energy employment and for its state carbon reduction target, and ranked amongst the top five states in energy savings, electric vehicle adoption and energy efficiency policy. However, less than a fifth of its total consumption of energy comes from renewable and clean sources at the moment. Some 65% of that is derived from a power mix that has a heavy hydropower component (22% of all electric energy), as well as biomass (20%) and wind (4%) (VPS, 2016).

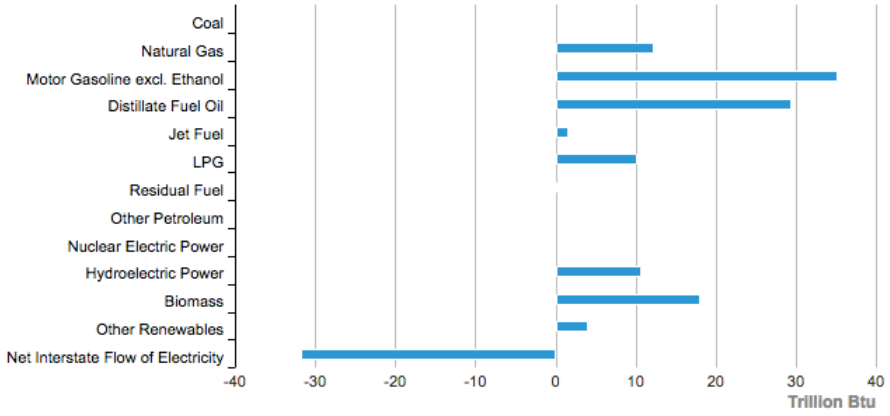

Figure 3-1 Energy consumption in Vermont by fuel type. Source: EIA (2017)

3.4.1 Energy production and consumption

Electricity

Electricity accounts for less than a third of the total energy consumption in the state. Vermont has no fossil fuel reserves and only generated approximately a third of its own electricity consumption in 2016 (EIA, 2017). It imported the remainder from other New England states and the province of Quebec in Canada (primarily hydropower). This state of affairs is rather new for Vermont, which used to rely on nuclear energy until the Vermont Yankee Nuclear Plant closed down in 2014 (EIA, 2017). At the moment, almost all the electricity generated in the state comes from renewable or clean sources, primarily hydropower (50%), biomass (25%) and wind farms (15%) (EIA, 2017).

The state is serviced by 17 electric utilities. The largest of them, Green Mountain Power, is privately owned by a Canadian company, vertically integrated and covers approximately 85% of the residents in the state (personal communication with Informant I). There are also 14 municipally-owned utilities and two cooperative electric utilities (EIA, 2017). One noteworthy particularity in Vermont is the presence of Efficiency Vermont, the country's first energy efficiency utility. Established in 2000, the utility's mandate is to reduce the

electricity consumption in the state by organising awareness programs and incentivising energy efficient solutions for residential and commercial buildings.

Transportation

Transportation accounts for three quarters of Vermont's consumption of fossil fuels and almost half of its entire energy use (EIA, 2017). Residents of the state are reliant upon personal vehicles because public transportation in the sparsely populated state is insufficient and concentrated in metropolitan areas or confined to a few commuter bus lines. Public transportation options connecting Vermont and other states are also limited; there is only one daily train operated by Amtrak railway company that connects the largest towns in the state to Washington DC (Amtrak, 2017), and a few bus lines to Boston in nearby Massachusetts.

The sale of electric vehicles is slowly picking up, with almost 1% of car sales in 2016 consisting of electric vehicles (EIA, 2016). As of 2016, almost 180 electric charging stations had been installed in Vermont (ibid.). According to the Vermont Public Service Department, people would travel fewer miles if accessibility to services improved (VPS, 2016), which poses a Catch-22 for rural areas, where services are concentrated in a few larger municipalities.

The state legislature anticipates that the passing of Vermont's first renewable energy standard in 2016 - Act 56, see Section 3.4.2 - will lead to a significant shift in transportation and heating from fossil fuel generation onto the grid (VPS, 2016).

Heating

Biomass has historically been the main source of heating for Vermonters and, according to the EIA (2017), one in six state residents continue to heat their homes using biomass. However, heating oil and propane account for the lion's share of residential sector heating fuel, and for a fifth of the petroleum consumption in the state (ibid.). In the past, biomass was used for power generation - Vermont has two biomass-fuelled power plants that were built in the 1980s, but the state is now focusing on promoting wood- and pellet-based boilers for residential uses. Thermal energy in public-sector buildings like schools and hospitals comes primarily from biomass-based boilers, and wood-based advanced heating systems are also becoming more common in the residential sector (personal communication with Informants C & L). Given the fact that three quarters of the state is covered in forests (EIA, 2017), the fuel for wood-based and pellet-based boilers is abundant.

3.4.2 Overview of policies and regulatory environment

The Vermont Public Utility Commission regulates electricity and natural gas-based heating, along with several other public services. This entity influences retail electricity rates by capping the return on equity for electric utilities (currently at 9% per annum) (personal communication with informant I). The federal government regulates inter-state electricity trade and transmission. Meanwhile, municipalities have the decision-making power on facility siting and environmental impacts. Heating and transportation are not regulated at either state or federal level (Lazar, 2016).

A 180-member legislature called the General Assembly passes state energy bills and laws. The Vermont state legislature passed Act 56 setting the state's first renewable energy standard in 2016. The three-tiered act mirrored similar legislation passed in neighbouring states (personal communication with Informant A) and requires electric utilities to ensure that at least 55% of

their power generation comes from renewable sources by 2017; that at least 1% by 2017 and 10% by 2032 of the electricity sold comes from distributed energy sources; and that utilities receive credits for fossil fuel reduction, which can be used to invest in "transformative technologies" like energy storage. By 2032, utilities have to increase the percentage of renewable energy in their power mix to 75% (VTLEG, 2015).

Beside the mandatory renewable energy standard, Vermont has a comprehensive energy plan (VPS, 2016) that is commonly known as "90% by 2050". The voluntary plan devised in 2011 and revisited in 2014 and 2016 sets targets for the incorporation of renewable energy in the energy mix (90% of all energy consumption should come from renewable sources by 2050) and energy efficiency. The plan also notes that the uptake in distributed renewable energy generation has been met with some degree of backlash, and advises that town energy committees and coordinators be supported in their efforts to strengthen local energy expertise.

3.4.3 Social aspects

While statistics tend to conceal significant diversity at the local level, Vermont and some of its neighbouring states stand out compared to the national average in their racial homogeneity (over 94% of the population is "white alone"), which correlates with a number of healthcare, social and economic outcomes - such as higher education levels compared to the U.S. average, slightly higher household income, higher median age, higher suicide rates and lower mortality rates, among others (Boluc&Kessel, 2008). However, the towns sampled in this study displayed a great deal of variety. For instance, poverty rates range from 3.2% of the total population in Jericho to 19.6% in Pittsford; the average poverty rate in the country being 13.5% (USCB, 2017).

Such statistics are relevant to the energy transition because of correlations encountered amongst socio-economic factors like race and ethnicity and attitudes toward energy efficiency and renewable energy (Leiserowitz & Akerlof, 2010), with ethnic minorities frequently being more supportive of clean energy policies even when they are costlier than business-as-usual. Furthermore, according to Wilson *et al.*(2012), ethnic minorities in the U.S. are also disproportionately affected by fossil fuel-based energy generation plants. Thus, more than 75% of African Americans reside within 30 miles of a coal-fired power plant, and those living near such plants are more likely to have lower income and be ethnic minorities.

Observations from the site visit also revealed the existence of a strong and prevalent tradition of participatory democracy in the state, the ultimate expression of which is the town meeting day in early March, when residents across the state gather to vote on the town budget, discuss other town issues and elect town officials (Markowitz, 2003). Furthermore, interested citizens customarily participate in public hearings on state legislation. The communities tend to be tight-knit, to strive for self-sufficiency in areas like food and agriculture and there is a strong streak of "town pride" (Rowse, 2014). Vermont has a high concentration of farmer's markets, food co-ops and organic farms (USDA, 2015).

In the seven national elections since 1990, the state voted overwhelmingly with the Democratic candidate (270towin, 2016), which is noteworthy because of the differing attitudes toward climate change among left- and right-leaning Americans (McCright & Dunlap, 2011). However, historically speaking, Vermont is the most right-leaning state in the country, having voted for Republican candidates uninterruptedly between 1856 and 1960, and, according to some observers, there continues to be some tension between the "new", progressive and the "old", conservative Vermont (Cohen, 2011). Both houses of the state

legislature are currently dominated by Democratic representatives and senators, while the governor is Republican.

3.4.4 Controversies related to energy projects in Vermont

Phadke (2010, 2011), who studied two instances of rural communities opposing wind power developments in Massachusetts and Nevada, concluded that the alteration of rural landscape, which goes against an imagined American pastoralism, has prompted the emergence of an opposition movement to large wind power developments in those places. Similar concerns as those identified in Nevada and Massachusetts were also encountered in Vermont, where attendance to a state legislature hearing about windmills, noise and public health and conversations with different energy stakeholders identified the existence of an increasing backlash against wind power in the state. While few academic studies (Rowse, 2014) were found that reflect this debate in Vermont, it has been widely covered by the local and national media (Wright, 2011; Harvey, 2017; McCullum, 2017; Bryce, 2016). The state legislature is currently mulling a bill that will impose more stringent noise limits for windmills to deliver on electoral promises by the current governor (Bielawski, 2016); critics of the bill complain that it will effectively amount to a moratorium on further wind power developments in the state (Page, 2016).

An issue that has emerged as being particularly important in the wind power debate is that of siting renewable energy installations so as not to interfere with ecosystem conservation and the state's unspoilt, mountainous landscape. Attempts to place turbines on ridgelines, where there is more wind, in the past have created a great deal of opposition to the technology as a whole. Dubbed the "Green Mountain State" after the eponymous mountain range that crosses the state from north to south, green, unspoilt ridgelines are central to the locals' identity, and any alterations to the state of the mountains is unpopular with many. Reflecting popular demand for better siting regulations for renewable energy, the state legislature passed a voluntary standard in 2016 (VTLEG, 2016) recommending that gravel pits, decommissioned mines, brownfield sites and similar locations be prioritised when choosing the siting of solar arrays or other energy generation infrastructure.

The debate about siting renewables in Vermont brings little new to the research on the social acceptability of renewable energy: authors like van der Horst (2007) and Wustenhagen *et al.* (2007) have studied opposition to wind power installations in other places. The studies prompted the development of a strand of research called "energy justice", which looks at the aspects of energy projects that make them more socially acceptable. Sovacool & Dworkin (2014) define energy justice as "a global energy system that fairly disseminates both the benefits and costs of energy services, and one has representative and impartial energy decision-making" (p. 436), and theorise that several key elements are necessary in order for projects to meet the norms of energy justice: equitably distributed outcomes and impacts; having inclusive development procedures, such as public access to information and public consultations; and recognizing if and when segments of the population are ignored or misrepresented in the process (Sovacool & Dvorkin, 2014).

With respect to the visual impact of energy projects, Seyfang *et al.* (2012) note that people's relationship with their proximate vicinity tends to be sensitive, and that abrupt changes can lead to conflicts. In order to avert such situations, the authors recommend, local politics need to take public opinion into account, and developers ought to communicate their vision, measures and processes at an early stage of the project.

Determining whether the reasons behind the backlash against wind power in Vermont are related to perceived breaches of the principles of energy justice or have other causes is not the object of this study. However, the debate is relevant to the topic at hand because it complicates the definition of what the energy transition means in the state. In light of recent developments, it appears obvious that the energy transition will likely not entail all the clean energy technologies available on the market to the same extent.

Rowse (2014), who studied the energy plans of 40 towns in Vermont and contrasted them to the state comprehensive energy plan, found that 100% of the towns were in favour of energy conservation projects, 98% of energy efficiency, 83% of small-scale renewable energy and 78% of sustainable vehicles. However, only 5% of towns were in favour of a railway connection, only 10% had expressed an interest in smart grids and only 23% favoured commercial-scale renewable energy installations. In two fifths of the town plans, concerns were expressed over utility-scale installations, particularly wind farms, with some plans expressly forbidding any form of man-made construction at high elevation (above 1,700 feet) or on specific ridgelines in town. Such stipulations are in contradiction with the state comprehensive energy plan, which expressly recognises the importance of large-scale installations in the transition to clean energy (VPS, 2016).

For the time being, the technologies that appear to have gained social acceptance and policy support in Vermont are biomass-based heating solutions; heat pumps; solar installations, particularly if they are located on rooftops or in places acceptable to the local communities; energy efficiency; and, to a smaller but growing degree, electric vehicles (personal communication with Informants C& L). Some stakeholders interviewed during the on-site visit spoke of the all-electric future for Vermont and the U.S. in general, whereby both transportation and heating would be incorporated into the grid via technologies like electric vehicles and heat pumps, and the state would continue to green and expand its electric generation capabilities (personal communication with Informants M& O). While such opinions echo studies like Baruah *et al.* (2014), it is too early to anticipate how an all-electric future will pan out and whether the challenges to achieving it (new, seasonal peak loads, the need for a sizeable grid expansion) can be overcome.

The opposition to wind power in Vermont also raises questions about the state's ability to reach the ambitious targets it set out in its Comprehensive Energy Plan (VPS, 2016), in which wind, solar and hydropower are to account for approximately half of the total energy consumption (including transportation and heating) by 2050 (See Annex E).

Various scenarios devised by entities like the local NGO Energy Action Network (EAN, 2017) on how the state could achieve its goal of 90% renewable energy by 2050 feature wind as an important piece of the energy puzzle. Furthermore, personal communications with three electric utility representatives in the state revealed that Vermont was unlikely to meet its renewable energy targets from domestic production without wind power, because the local climate, which averages only 167 sunny days per year, is better suited for wind rather than solar power generation (personal communication with Informants I, K & O).

3.5 Summary

Rural energy transitions have received little attention to date, partly because of the relatively smaller economic and demographic importance of these regions compared to cities. However, studies indicate that rural areas in the developed world grapple with distinctly different economic and energy issues compared to urban areas. Economically, the decline of the traditionally important source of revenue in these regions - agriculture - has resulted in

depopulation, a lack of job opportunities, scarce and concentrated services and limited resources at the local level. From an energy standpoint, rural areas are less efficient as measured by per capita energy consumption compared to cities because of how spread out they are. A comparatively less efficient building sector and transportation network are particularly important sources of energy consumption.

The U.S. state of Vermont stands out in the country thanks to its progressive policy and ambitious goals for renewable energy and energy efficiency. However, local stakeholders have differed regarding the pathways to achieving these goals. While some clean energy technologies, like rooftop photovoltaic panels, biomass-based boilers and heat pumps have been received with a broad level of support, energy generation installations that are visible, particularly utility-scale wind farms and solar arrays, have been met with an increasing degree of backlash by local communities.

4 Literature review

Chapter 4 looks at two main bodies of research in order to contextualise the activity of the town energy committees in Vermont. The first comprises previous studies on grassroots groups and their engagement in promoting renewable energy and energy efficiency, and delves into the arguments made for and against the importance of these initiatives (Section 4.1). The second part of the chapter looks at how different socio-technical transition theories conceive of the role of actors in energy transitions (Section 4.2). Section 4.3 contains a brief summary of the findings from the previous sections.

4.1 Grassroots engagement in the energy transition

Grassroots participation in the energy transition constitutes the subject of an increasingly large body of research, which has grown in size as distributed energy has become more prevalent (Strachan *et al.*, 2015). While scientists have largely converged on the need to transition to more sustainable forms of energy in order to prevent catastrophic increases in global temperatures, the pathway to get there, specifically the role that communities can play in this transition, remains the subject of open debate (Middlemiss & Parrish, 2010).

Fossil fuel-based energy systems have traditionally been centralized in the hands of a few companies and regulators overseeing production and distribution to passive consumers. This form of energy governance has been supported by a complex, crystallised and multi-layered set of laws, institutions and regulations (Goldthau, 2014). Technological innovation may have enabled consumers to both lower their energy consumption and generate energy on their own, but there will continue to be a need for large-scale energy infrastructure, like the grid. Therefore distributed generation and large infrastructure will need to co-exist, posing technical, governance and financial challenges on how to integrate and balance the two (Goldthau, 2014).

Proponents and detractors of local energy engagement have long debated whether its perceived contributions to the energy transition- potential for disruption, social inclusion, potential impact on policymakers, eliciting behavioural changes amongst groups of consumers - outweigh its limitations - limited human and financial capital; limited geographical scope; limited scope of activities coupled with ambitious, global expectations; challenges balancing growth with local relevance; organisational challenges; and the risk of becoming absorbed into existing power structures, among others (Smith *et al.*, 2013).

Some authors (Strachan *et al.*, 2015) argue that bottom-up approaches can influence the transition to cleaner energy by impacting carbon and energy policies. Penna & Geels (2012) contend that grassroots movements have proven their utility historically, because sustainability has not always been high on political agendas and it was precisely grassroots movements that pushed politicians to pay closer attention to it. Thanks to their influence on policymakers, communities and electorates can therefore influence the regulatory regime in favour of greater sustainability (Farla *et al.*, 2012). Parag & Janda (2014) argue that communities are important agents for bottom-up policy change, because they have the ability to create the political space and cultivate the support needed for the introduction of new energy policies. Furthermore, Smith *et al.* (2013) argue that changes within the regime can only be "path-dependent and incremental" (p. 440), and that it takes grassroots innovation to bring about radical changes.

Meanwhile, Hildingsson (2014) contends that the state is a key actor in governing social change and therefore should play a central role in the transition to clean energy as a governance-shaper. Pierre & Peters (2000) contend that, while the current form of governance calls for the participation of various stakeholders in decision-making, government institutions ultimately wield the power of decision. Meanwhile, Dawley (2014) contends that governments are central to the energy transition not only because of their regulatory role, but also because they can act as managers, facilitators and controllers in mediating scenarios for the transition to low-carbon fuels.

While the debate between the two sides arguing for top-down versus bottom-up leadership in the energy transition is far from settled, other scholars have found a middle ground by recognising that actors at a variety of levels need to co-evolve into new governance structures that will enable and support the transformation of energy systems (Betsill & Rabe, 2009).

Unlike the profit-driven actors that control the energy system at the moment, grassroots initiatives frequently rely on volunteers with limited power, resources and ability to influence others. Most grassroots groups working toward sustainability seek to influence others by changing their own behaviour and encouraging others to follow suit. But volunteer initiatives are faced with challenges like hostility from local people, hampered access to funding and burnout among the members of the group (MacNeela, 2008).

Seyfang & Smith (2007) acknowledge that grassroots initiatives aiming to change societal behaviour need to embrace a healthy dose of idealism, because they run contrary to and yet seek to overturn the dominant individualist and consumerist lifestyles. Furthermore, grassroots engagement with sustainability frequently consists of ideological or policy, rather than market, propositions, therefore making effective links with other actors, securing funding and diffusing ideas that run contrary to the status quo become more difficult (Seyfang & Haxeltine, 2012). Grassroots energy actions have largely been fragmented to date, which has made it difficult to gauge their impact on the transition to low-carbon economies in an aggregate manner; most of the research studying them is therefore case-based.

4.1.1 Community energy

Much of the literature on community engagement in the energy transition has focused on community energy, which some researchers define as group ownership of renewable energy and energy efficiency projects (Klein & Coffey, 2016) or as groups having managerial control of and making financial investments in energy projects (Walker, 2008). According to Klein & Coffey (2016), some 76 articles on the topic of community energy were published between 2001 and 2016 in English, 64 of them focusing on renewable energy and 47 of them on the UK and other European countries. The level of academic interest in community energy in Europe is likely related to the proliferation of such projects, which consist primarily of renewable energy cooperatives, in the Old Continent since the turn of the century. As of 2015, there were some 2,400 renewable energy cooperatives in Europe (IRENA, 2015); more than a third of them were set up in Germany between 2006 and 2015 (DGRV, 2015).

According to Walker & Devine-Wright (2008), community energy can vary in terms of the type of communities that are stakeholders in energy projects (geographic community, farmers, businesses), the way the financial benefits flow between the project, the community, patterns of energy use (purely local/ for the grid) and the extent to which community members are engaged in the development of the project. Furthermore, community energy was found to take a variety of forms in the UK at the time, which included cooperatives, charities, development trusts and share donations. In a study on community energy in Japan,

Yamamoto (2016) concluded that "the best organizational model for community energy in a given context depends on cultural, social, historical, and economic considerations [...] Developing models appropriate to given cases will facilitate diffusion of renewable energy use."

According to Hielscher *et al.* (2013), three aspects of community energy differentiate this form of energy governance from government- or business-led schemes. First, community energy projects are multi-faceted, incorporating various technologies, and frequently combining behavioural initiatives with efficiency measures in holistic interventions. The second main difference is that community energy overcomes the structural limitations of individualistic measures by bringing together groups of people with common purpose and by empowering communities to collectively change their contexts toward greater sustainability. Thirdly, by building on local knowledge and networks, community energy enables participants to develop solutions that are tailored to the local context to solve local problems, which can range from fuel poverty and economic underdevelopment to the need for more participatory democracy.

However, Lauber (2012) notes that the term "community energy" can be deceiving, because a significant part of the community energy projects in Germany and Denmark had actually stemmed from businesses like farmers' cooperatives, the ownership of which was shared with the greater public, which included private companies as much as communities and individual citizens. Such ownership structures would therefore undermine the very premise of community energy, which is to be a counterpoint to the incumbent system of centralised energy infrastructure run for profit by commercial ventures.

Academic studies on the topic of community energy have focused on the barriers and incentives in the uptake of cooperatively-owned renewable energy (Hoffman& High-Pippert, 2010), the role of intermediaries in community energy (Hargreaves *et al.*, 2013b), group mobilisation and political influence (Bomberg & McEwen 2012), public perceptions around community energy (Rogers *et al.*, 2008), financing citizen-owned renewable energy (Yildiz, 2014), impacts and limitations of renewable energy cooperatives (Tarhan, 2015) and the role of cooperatives in the diffusion of distributed generation (Bauwens *et al.*, 2016).

Many of the publications concentrate on single or multiple case-based studies on renewable energy cooperatives from different countries, predominantly Scandinavia and Western Europe. Amongst them are Devine-Wright (2005), who studied cooperatives in the UK and Flieger & Klemisch (2008), who did so in Germany.

The merit of community energy, according to Klein & Coffey (2016), is that it has the potential to change consumer behaviour by transforming groups of consumers into producers and owners of energy infrastructure. Meanwhile, individualistic theories and programs that focus on changing behaviour in isolation are not as effective, because consumption is to an extent a function of the social context where it takes place. Furthermore, in studying community energy in the U.S., the authors found that, regardless of their ownership structure (privately/ community-owned), all initiatives had benefits like producing lasting mainstream impacts, supporting sustainable energy policies at the local and national level, fostering second-order learning, decreasing energy costs and climate threats, building strong communities and increasing civic gratification.

However, Hargreaves *et al.* (2013b) argue that community energy is often portrayed in the form of "success stories", which "could be potentially demotivating and even disempowering

because such 'success stories' offered little detail on the processes gone through, the challenges faced and the pitfalls experienced which can leave people feeling that "we can't do that here""(p. 872). Grassroots groups in the UK have, according to the authors, begun to move away from presenting success stories to aggregating lessons and tips on how to develop projects in manuals and toolkits.

One of the problems with energy cooperatives thus far has been, according to Bauwens *et al.* (2016), Walker & Devine-Wright (2008) and DGRV (2015) that it is susceptible to changes in policy. Thus, Bauwens *et al.* (2016) finds that support instruments and planning policies for renewable energy cooperatives in four European countries - Denmark, Belgium, the UK and Germany - have dwindled over time, resulting in a more hostile environment that placed cooperatives at a distinct disadvantage compared to traditional energy developers. The other authors make similar observations about the British and German contexts. A second issue, according to Tarhan (2015), is that communities that can afford to invest in shared energy generation projects tend to be well-to-do, and that few case studies of such projects in economically disadvantaged communities exist (Tarhan, 2015).

4.1.2 Grassroots innovations as strategic niches

Seyfang & Smith (2007) expand the understanding of community energy to encompass various forms of community innovation and action on energy, coining the term "grassroots innovation" to refer to broader sustainability schemes like local Agenda 21 strategies, Transition Towns chapters, energy cooperatives and energy task forces.

Arguing that this form of innovation has received little attention from academia compared to technological innovation, the authors employ strategic niche management (SNM), a commonly used framework to study the uptake of new technologies in protected niche environments, to analyse community action. Over the next decade, a group of predominantly UK-based researchers developed a body of literature (Seyfang, 2009; Seyfang, 2010; Seyfang & Haxeltine, 2012; Whitmarsh *et al.*, 2011; Seyfang *et al.*, 2013a, Seyfang *et al.*, 2013b, Hargreaves *et al.*, 2013a; Hargreaves *et al.*, 2013b; Seyfang *et al.*, 2014) that studies community energy action using SNM as a framework, arguing that the "niche framework provides a potentially fruitful bridge between analyses of grassroots initiatives as civil society activities and a role for them in sustainable innovation policy" (Seyfang & Smith, 2007).

Unlike market-based innovations, grassroots innovations emerge out of what communities perceive as being social injustices or environmental problems caused by conventional innovation models, and seek to develop in a socially inclusive manner by sharing knowledge, processes and outcomes (Smith *et al.*, 2012). "Whether focused on resource-based sectors, or manufacturing and services, whether in rural or urban settings: dissenting voices and movements periodically call for a quite different vision and practice of innovation and technological change" (Smith *et al.*, 2012).

Niches are "protected spaces where sub-optimally performing experiments can develop away from regime selection pressures. Niches comprise intermediary organisations and actors, which serve as 'global carriers' of best practice, standards, institutionalized learning and other intermediary resources such as networking and lobbying, which are informed by, and in turn inform, concrete local projects" (Seyfang & Haxeltine, 2012). Initially, SNM was used to study the "creation, development and controlled phase-out of protected spaces for the development and use of promising technologies by means of experimentation" (Kemp *et al.*, 2009, p.186) in order to shed light on the circumstances under which niche innovation can be successful (Schot & Geels, 2008). Schot & Geels (2008) argue that three main activities

are important to the well functioning of niches:

1. **Articulating expectations and visions** is considered essential to guide learning, engage stakeholders and legitimize the innovation. In order for expectations to contribute to niche building, they have to be: robust (i.e. shared by several actors), specific and high quality (i.e. projects must be aligned with the expectations).

2. **Building social networks** is important to creating a constituency for the innovation, to facilitate interactions among stakeholders and to ensure access to know-how and financial and human resources. In order for networks to contribute to niche buildings, they would have to be broad (encompass various stakeholders) and deep - conducive to resource and human capacity mobilization.

3. Lastly, **learning processes**, which can encompass learning about market preferences, technical aspects, social and environmental impacts, and others, are important particularly if and when they focus not only on the accumulation of facts and information about how to improve the niche (first-order learning), but also on questioning the premises and assumptions of the innovation process. This type of learning is called second-order learning, and involves reflexive activities that can inform future strategies.

In addition to these three basic preconditions for the **intrinsic** functionality of niches, Seyfang & Haxeltine (2012) argue that, for those niches that are looking to grow into wider geographies or contexts, their **diffusion** is contingent upon their employment of **translatable practices** that can permeate into the mainstream and being **replicable and easily up-scalable**. One example of how Seyfang & Haxeltine (2012) used the framework to study the Transition Towns (TT) chapters active in the UK at the time is summarized in Table 4-1 below.

SNM Pillar	Indicator	Findings on TT (Seyfang & Hexaltine, 2012)
Diffusion	Replication	The movement had successfully replicated across continents, with over 200 TTs listed on the website as of October 2011.
	Scaling up	However, scaling up the level of involvement of the communities in TT activities was cited as a challenge for the majority of respondents to a 2009 survey.
	Translation	Mainstream actors were increasingly adopting some of the practices espoused by TT, such as localizing production, reskilling and thrift.
Niche processes	Expectations	Both internal and externally communicated expectations were not realistic or achievable, therefore not conducive to action.
	Networks	TTs had strong ties with other TTs and NGOs, but weaker links to other types of stakeholders.
	Learning	Focus on second-order learning (questioning and re-evaluating) was found to be detrimental to efforts to engage with the wider public.

Table 4-1 Transition Towns as strategic niches. Adapted from Seyfang & Haxeltine (2012)

In essence, the authors treat the Transition Towns movement as a locus of social innovation and experimentation in alternative governance models and analyse to what extent the practices it espouses had been picked up by the mainstream or by other niches. In so doing, Seyfang & Haxeltine (2012) turn the orthodoxy of decades of transition studies, which has traditionally treated technology as the object of study and the actors in socio-technical regimes as agents of diffusion, on its head, arguing that novel practices and actors can be studied in the same fashion as new technologies. The implicit assumption is that creating a functional and sustained network of activists to carry out sustainability practices is as innovative as inventing new technologies.

Seyfang & Smith (2007) argue that grassroots innovations can provide sustainability solutions where top-down approaches fail, because community action frequently relies on knowledge of their localities and can make sustainability more meaningful and personal to local communities. In a later study of community energy in the UK, the authors conclude that, in order to be effective, grassroots innovations have to solve challenges related to group dynamics, project-specific challenges like lack of resources or time, community support, their ability to create support networks and policy (Seyfang *et al.*, 2013b).

4.1.3 Transition Towns

Transition Towns, a grassroots movement that began in the English town of Totnes in 2006, is one of the frequently studied forms of local community action focused on sustainability. The core ideals of the movement have to do with localising and reclaiming production of food, energy and other commodities and, in so doing, strengthening local communities, sparking entrepreneurship and espousing community resilience (TN, 2015). Some of the activities that Transition Towns engage in are community energy, edible gardens and food belts, sustainable transportation, wellness activities and participatory democracy.

Originally founded to fight peak oil and climate change by creating self-sufficient communities (TN, 2015), the goal of the network appears to have shifted over the last decade to building stronger communities and addressing local environmental, health, economic, political and social problems. Case in point, its most recent manifesto notes that "Some people will be interested in broad global issues like climate change. Many more are interested in local issues [...] Making Transition issues locally relevant is a real skill" (TN, 2015, p. 46).

The movement has spread to 1,400 chapters in 50 countries, which receive ideological and operational support from a UK-registered charity called Transition Network (ibid). Over time, the charity has mentored communities on how to start local chapters, created resources and toolkits for them, supported ongoing exchanges among them and has publicized the movement through documentaries, the media and its website. In order to become a recognized chapter of Transition Towns, groups of activists have to demonstrate adoption of a common 12-step program, the culmination of which is an energy descent action plan (Brown *et al.*, 2012). Critical aspects of Transition Towns are that it seeks to distance itself from political debates on climate change, that it is responsive in nature (it responds to existing problems) and that the transition it proposes articulates solutions to multiple lifestyle, environmental and social problems by bridging individual happiness and community well-being (ibid.).

The first survey of Transition Towns was conducted by Seyfang (2009) in the UK, who found that, at that stage of its development, the movement was focused on building communities of activists and managing group dynamics; that its awareness raising strategies

had limited effectiveness, and needed to be complemented by actions that involved communities in practical projects; and that food and gardening were the most popular activities that the movement had organized. In a study published shortly afterwards, Seyfang & Haxeltine (2012) concluded that the movement had been successful at replicating itself, but that many of its chapters struggled to articulate achievable expectations, to maintain momentum and to engage in first-order, experiential learning, as opposed to second-order, critical, learning activities.

Connor & McDonald (2010) criticised the movement for being too prescriptive and not taking into account the local context. A subsequent study in Flanders (Kenis & Mathjis, 2014) found that the local chapters' efforts to portray themselves as being de-politicised undermined their well functioning by calling their credibility into question. Neal (2013), in the meantime, argues that the post-political component of the transition movement may be necessary to replace old class and identity politics that has failed to address social and environmental problems. Furthermore, analysing the Transition Towns chapters in the UK, she concludes that they promote a "re-urban" culture - or ruralist practices - in the communities where they emerge in the form of permaculture associations and other practices that give a sense of sustainability by bringing people closer to a perceived natural environment.

Meanwhile, Feola & Nunes (2013)'s survey of 276 Transition Towns chapters from 23 countries revealed that they largely defined their success in terms of social connectivity and environmental performance, that they tended to overlook external factors influencing transition initiatives, that their success depended more on the local context rather than on their level of connectedness to the global transition movement and that, nevertheless, their level of place attachment was weak and not compensated by the global network.

4.2 Conceptualising the role of stakeholders in energy transitions

Transition studies has emerged as a sub-field of social sciences that seeks to shed light on societal change and the interplay between emerging technologies and established technological regimes (Kemp *et al.*, 2009). According to Markard *et al.* (2012), over a dozen theoretical approaches have been used to study sustainability transitions, but the most common of them are strategic niche innovation (SNM), the multi-level perspective (MLP), transition management (TM) theory and technological innovation systems (TIS). The first two frameworks in particular have been used to articulate the links between individual and collective actors at different levels (local, national, international) and policies and institutions in order to explain what factors, interactions and sets of circumstances contribute to successful transitions. The use of SNM to study grassroots innovations and specifically Transition Towns chapters has been expanded upon in Chapter 4.1.2.

MLP conceives of socio-technical transitions as taking place at three levels -niche, regime and landscape (Geels, 2004). The niche is the smallest level. Based on the MLP perspective, niche innovations emerge from pressures at the landscape level, which could consist of economic issues like inequality or unaddressed environmental problems. As innovations begin to permeate social practices (the socio-technical regime or meso level) and eventually become aligned with them, they begin to challenge the incumbent landscape (Geels, 2004). The framework is hierarchical, with niches being embedded in regimes and regimes in landscapes, though, in theory, the former could emerge from outside a given socio-technical regime (Geels, 2011). The higher the level, the more complex and structured it becomes, therefore the more difficult it is to change.

Actors in MLP are conceived differently depending on the level at which they operate. If, at the niche level, actors can be regime disruptors, at the regime level they tend to crystallise in stable configurations of institutions, practices, and norms. At the landscape level, actors are further limited in their capacity to act by constraints like infrastructure, social values and policies (Kemp & Rotmans, 2009). Some of the main criticisms of MLP are that it fails to account for political relations and social aspects and that, by focusing primarily on the technology, it fails to recognise the agency that different actors have in popularising niches (Lawhon & Murphy, 2011).

While both SNM and MLP largely deal with disruptors to regimes that emerge at the micro level - in niches, several authors have highlighted the importance of intermediary actors that can connect isolated niches among themselves and with the outside world and help niches become more robust (Geels & Deuten, 2006). Hargreaves *et al.* (2013b) argue that the role of intermediaries in sustainability niches has been neglected. Analysing the role of intermediaries in promoting grassroots energy innovation in the UK, they find that intermediary organisations and actors helped to aggregate lessons from individual niches, to establish an institutional infrastructure for community energy - like the Communities and Climate Action Alliance, and to frame and coordinate community energy action on the ground.

Their findings are guided by the MLP theory, specifically by Geels & Deuten (2006), who argue that intermediaries play three key roles in niche development - aggregation, networking and guiding. First, they argue, intermediaries help to extrapolate from context-dependent local knowledge to devise more generalisable knowledge that can be used elsewhere (aggregating). Intermediaries also play the important role of networking, of bringing actors together to share knowledge and collectively solve problems or devise solutions to similar problems that others have grappled with. Lastly, intermediaries use the knowledge they acquire through aggregation and networking to inform subsequent initiatives through a process called guiding.

Similarly, in two studies focused on the role of building professionals in promoting energy efficiency, Parag & Janda (2014) and Janda & Parag (2011) argue that top-down and bottom-up studies of the energy transition fail to account for the role of intermediaries in the process. They volunteer the example of building professionals like developers and consultants, who are neither consumers, nor suppliers of energy or policy makers, and who nevertheless influence the construction sector by intervening upstream to influence the "top" (policymakers), downstream to interact with the "bottom" (consumers, clients) or sideways, to interact with similar professionals or associations. They employ a concept initially introduced by Kinchla & Wolfe (1979) (by way of Parag & Janda (2014)) to study humans' visual processing - that of the **middle-out approach** - to analyse how these intermediaries act upon the energy system. Examples of what constitute top-down, bottom-up and middle-out approaches in cleaning up the supply and reducing the demand of energy, in their conception, can be found in Table 4-3.

		Initiators		
	Target	**Top-down (government)**	**Middle-out (professionals)**	**Bottom-up**
Supply	Low-carbon energy sources	Owned and planned by centralised utilities or national government	Owned and planned by communities or local government	Owned and planned by households and businesses.
Demand	Low-carbon homes	Required by national regulations, supported by economic incentives, informed by labeling	Encouraged by utilities or local governments, provided by professionals, business owners and suppliers.	Requires participation from tenants, occupants and users.

Table 4-2 Top-down, middle-out and bottom-up approaches to supply and demand factors in the energy transition. Adapted from: Parag & Janda (2014)

As can be inferred from Table 4-2, Parag & Janda (2014) see local energy action like community energy, co-ops and municipal energy plans as middle-out approaches to the energy transition. The authors argue that the middle-out represents an "additional, supportive, and maybe more effective way of delivering change. The middle-out could be used as a strategy to initiate change, propose ideas and innovate. Ideas coming from the middle could be better tailored to downstream needs, better communicated upstream, more acceptable by both up and down stream, and with a potential to have an impact on sideways too. As an agent, the middle might be more trusted, have established and accepted information channels, serving to mediate between the top and the bottom. Hence the middle can be harnessed to increase public support for changes. The middle might also have greater agency than the top and bottom to actually implement changes" (Parag & Janda, 2014, p. 9-10).

Lastly, van der Schoor & Scholtens (2015) use an approach that has not been frequently employed in transition studies, namely the actor-network theory (ANT) to study grassroots energy action in the Netherlands. As its name indicates, ANT posits that systems comprise of heterogeneous networks of human and non-human actors (like technology) and that the interactions among them define the 'success" of a project (ibid.). The authors identify two important factors that impact the performance of 13 community energy initiatives in the Netherlands: the networks that initiatives create with outside stakeholders and the level of commitment of local actors, which in turn they measure through three metrics: organisational development, shared vision and level of activities. They find that, in the case studies, the networks were being continuously expanded and developed, that the initiatives were evolving from informal to more formal structures, that grassroots organizations often lacked a shared vision and that the level of activity was on the rise. However, ANT has been frequently criticised for treating artefacts (like technology) as systems actors (van der Schoor & Scholtens, 2015).

4.3 Summary of literature review

Technological advances are disrupting the previously centralised energy system, over which consumers used to have little influence, granting individual consumers and communities a

greater degree of control over energy generation and consumption. However, the studies consulted do not converge on how significant grassroots actors are in promoting sustainability in general and the energy transition in particular. Some authors argue that government-led, top-down approaches should be the main drivers behind the energy transition, whereas others opine that changes within the regime can only be path dependent, and that grassroots action is needed to disrupt entrenched practices.

Much of the literature on grassroots actors and the energy transition has focused on case-based instances of community energy in Europe and, increasingly so, on the Transition Towns movement. In the case of the former, important challenges identified have been access to financing, equity and susceptibility to policy changes. In the latter case, authors have observed that chapters struggle to create links to local communities, and that the formation of a widespread global movement with close ties has not been an effective counterweight to the weak levels of place attachment. The fact that the movement defines itself as being apolitical remains a moot point.

In the literature on socio-technical transitions, it was found that theories that have been historically used to study technological niches, like MLP and SNM, are increasingly being employed to study grassroots innovations and movements like Transition Towns. Two broad categories of actors relevant to this study were identified during the literature review: grassroots or niche actors and intermediary actors, which support the consolidation and expansion of niches. While various theories conceive of the role of stakeholders in transitions differently, a few themes were repeated across the board, including the fact that niches are weak, subject to internal and external pressures and need to ensure that certain basic internal functions take place (setting expectations, learning mechanism, shared visions and goals) in order to become stronger. Externally, various theories have emphasised the importance of networks as support mechanisms for niches.

5 Findings

This chapter summarises the findings from the semi-structured interviews and the Vital Communities survey in the following manner. First, some background on how the town energy committees started in Vermont is provided (Section 5.1). Then, using the typology of factors laid out in Table 2-3 (internal factors and network interactions), the chapter summarises the findings regarding the role of the town energy committees in fostering renewable energy and energy efficiency (RQ1) in Section 5-2. Thirdly, the chapter lays out the challenges that informants identified during the interviews and the Vital Communities survey (Section 5.3) in response to RQ2. Lastly, a brief summary of findings is presented in Section 5.4.

5.1 Background

According to Informant # 16, who started the energy committee movement, he drew inspiration from the recycling and waste committees that were active in Vermont in the 1960s and 1970s to set up the first three energy committees in the early 2000s. The goal of these early organisations was to support towns with devising the energy chapters of their town plans. Town plans are five-year strategy documents that towns are required to prepare and in which municipalities lay out their social, economic, infrastructure and environmental goals (ACCD, 2017). Thus, working with town governments on local plans was part of the mandate of the energy committees in their design stage. Furthermore, the committees were to serve the purpose of informing local communities about the opportunities and programs available to save energy and energy spending (personal communication with Informant # 16).

The energy committee movement picked up in the second half of last decade as a result of a collaboration among several non governmental organisations (NGOs), including the Vermont Natural Resources Council, the New England Grassroots Environment Fund, the Vermont Energy Investment Corporation, the Alliance for Climate Action and the Sustainable Energy Resource Group, which formed a joint program to oversee existing energy committees and encourage other towns to establish their own (personal communication with Informant #1). Dubbed the Vermont Energy & Climate Action Network (VECAN), the new program set out to "strengthen networks of people to plan and implement energy-saving, greenhouse-gas emission reduction strategies at the local level" (VECAN, 2007). The number of energy committees has grown from two dozen to some 110 as of 2017, covering almost half of all the towns and municipalities in the state (VECAN, 2017).

In an early manual on how to start an energy committee, VECAN encouraged committees to ensure that their activities met some basic criteria, which are listed in Table 5-1.

1.	That their projects are aligned with broader municipal projects or initiatives
2.	That they inform local decision-makers with potential new findings or innovations in order to devise policies that are cleaner, greener and save money.
3.	That their solutions are cost-effective and based on an initial survey or audit to identify the areas where the community could save energy.
4.	That they set achievable goals.
5.	That they develop catchy messages and a communications plan to spread them.

6.	That they engage in actions like: • initiating projects and seeking funding for them; • recruiting new members by tapping into other communities (NGOs, chamber of commerce, faith-based communities); • periodically re-evaluating their progress, goals and opportunities; • celebrating their successes and those members that are particularly instrumental in achieving their goals.

Table 5-1 VECAN's recommendations for town energy committees. Source: VECAN (2007)

The types of projects that VECAN recommended energy committees to engage in include, but are not limited to those listed in Table 5-2.

Project area	Examples
Energy efficiency	Weatherising homes, promoting energy efficiency in new developments, promoting sustainable lighting solutions in their communities.
Transportation	Promoting commuter and bike/ walking solutions in their towns as part of state-wide competitions, promoting biodiesel-based vehicles.
Miscellaneous	Recycling and reuse campaigns, municipal greenhouse gas emissions assessments, energy group and bulk buying.
Community education	Outreach activities like movie screenings, awareness raising at town fairs, meetings and other public gatherings, school education programmes, etc.

Table 5-2 Types of projects that energy committees can undertake. Source: VECAN (2007)

As can be inferred from the VECAN guidelines, town energy committees were to play a three-pronged role comprising:

- political consultation and/or lobbying to increase support for clean energy policies and projects;
- community education to raise awareness about clean energy;
- project implementation by rallying stakeholders, seeking financing and other activities.

VECAN further recommends that committees start with a project that can render tangible results early on. The rationale for this recommendation is for the committees to experience early and tangible success, which will encourage them to engage in more diverse and larger projects (personal communication with Informant #1). However, it was found that only seven out of the 18 committees informants interviewed started off with projects that had quantifiable outcomes. All seven were related to energy efficiency and initial energy audits of municipal buildings or public infrastructure; three of them consisted of replacing incandescent streetlights with LEDs. Meanwhile, five other committees started with policy-oriented goals, such as devising the town energy plan, convincing local authorities to install solar photovoltaic installations on public buildings and even lobbying for energy policy change at the state level. One of the committees started off as an advisory body to the town government for the expansion and refurbishment of a district-heating project (personal communication with Informant #13). Yet another committee started off in opposition to a plan to build a utility-scale wind farm on one of the ridgelines in town. Hundreds of residents came together to oppose the project by attending meetings and signing petitions, until the plan was eventually scrapped (personal communication with Informant # 3).

Whether or not committees started off with small and manageable projects was not found to have a straightforward impact on their subsequent performance. For instance, the energy committee in Ripton managed to install energy-saving equipment in 40% of the households in town as part of its first project by partnering up with the state energy efficiency utility, Efficiency Vermont (personal communication with Informant #21). However, the committee then lay dormant for three to four years. Conversely, committees that began with a wide scope - such as the one in Hartland, which started off working on energy policy at the state level - would then move on to specialize in areas like weatherising homes and solar power at the local level in subsequent years (personal communication with Informant #5).

5.2 Internal factors

5.2.1 Organisational development

In its 2007 manual for town energy committees (VECAN, 2007), VECAN recommended a variety of formats under which energy committees could operate (Table 5-3).

Type of set-up	Description
Ad-hoc	This is the most grassroots type of committee that normally serves to accomplish finite tasks.
A subcommittee of an existing municipal committee	In this type of a set-up, the energy committee would work with local commissions to "help legitimize activities and to encourage the adoption of policies that lead to energy-saving and renewable energy opportunities in town plans, bylaws and initiatives"(VECAN, 2007, p.7).
An independent municipal committee or task force appointed by and responding to the city council or select board (town government)	Such committees need to comply with Vermont's Open Meeting Law, which seeks to maintain a minimum level of transparency by asking committees to hold publicly accessible meetings for which the agenda is published in advance and the minutes afterward.

Table 5-3 Types of organisational set-up that energy committees can adopt. Source: VECAN (2007)

Eight of the 18 committees interviewed identified as being ad-hoc groups. One was a registered non-governmental organization (NGO), a format that affords the organisation greater access to financing opportunities (personal communication with Informant #20). Of the remaining nine committees, eight had been appointed by and associated with the town government (select board). Of these eight, one was part of the town environmental conservation commission and another one was part of the (land) planning commission. The remaining committee was a single-person town energy coordinator, which is a volunteer position appointed by the town government.

The informants represented committees that ranged in size from one person to up to 15 core volunteers (and over 60 volunteers at large), corresponding to towns that ranged from 588 to 9,312 people. No direct correlation was found between the size of the town and the size of the committee (Figure 5-1).

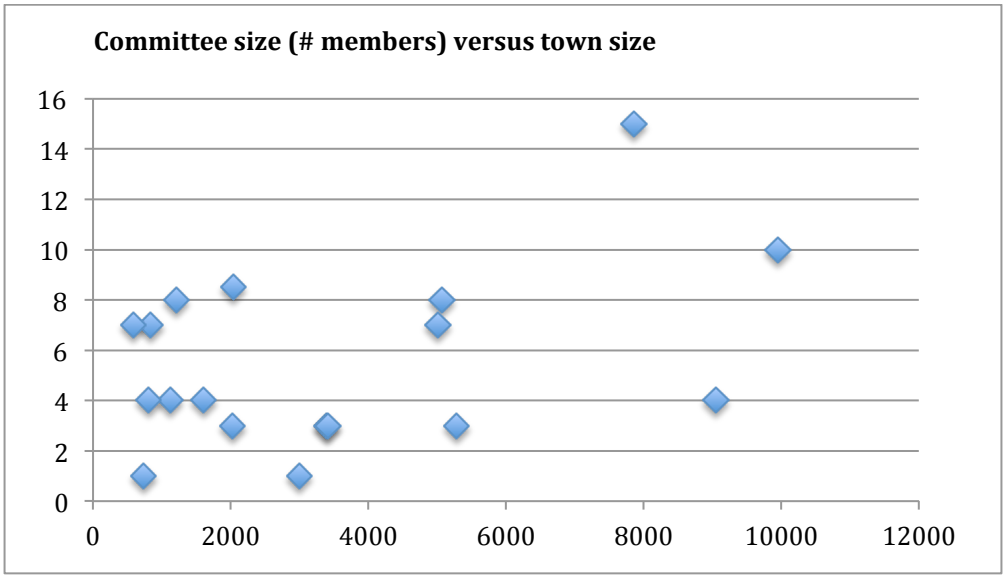

Figure 5-1 Committee size versus town size

VECAN recommends that committees establish relations with town officials even when they are not an officially affiliated town commission. Some of the advantages of being affiliated with the select board or other official structures are having easier access to funding from the town; having more legitimacy - town residents and officials alike are likely to trust official committees more; and greater ability to influence municipal plans and investments (personal communication with Informant #16). Meanwhile, possible disadvantages to being affiliated with official town bodies are the risk of being "fired" if local officials did not agree with or like the committee's work (personal communication with Informant #2); anticipated delays in decision-making and project planning (personal communication with Informant #20); and the burden of "procedure and process" that stems from the requirements to operate as an official town committee (personal communication with Informant #7).

However, it was found that town committees would engage with a variety of stakeholders and achieve levels of success that were independent of their level of official affiliation. For instance, the ad-hoc committees in Kilington and Dorset reported having "great relationships" with town officials (personal communication with Informants #8 and #14) and assisting in municipal solar and energy efficiency projects, whereas other committees reported having difficulty getting traction with municipal projects despite being affiliated with the select board (personal communication with Informant #15).

5.2.2 Shared vision

Energy committees that are officially registered with the town council or select board are required to submit registration documents outlining their vision and mission statements. In addition, officially registered committees are required to hold monthly meetings and publish meeting agendas beforehand and minutes afterwards (VTLEG, 2016b.).

Of the 18 committees interviewed, 15 had at least loosely delineated mission statements and visions, though they did not always adhere to them or use them to inform their activities. Among the reasons given for not having a mission statement or a vision or for choosing not to follow one closely were the fact that the community was too small; that there was not enough civic engagement; that the committee was part of another official body and its

mission was aligned with the mother institution's mission; the need to remain pragmatic and adapt to evolving technologies; and that the reduced number of volunteers did not warrant setting a specific mission or vision. One committee co-chair noted that "My co-chair and I have been working in organisations for a long time, and we strongly felt that, as long as we were on the same page with what we wanted to do, it wasn't worth going through the process [of setting a mission, and vision] with the small number of volunteers we have", though having a strategy would have helped because "when you have a plan, you can put together a bunch of activities that can pay for each other" (personal communication with anonymous Informant #17).

The 15 committees that had set a mission statement, vision and goals defined that mission as reducing their towns' energy consumption, containing energy spending and reducing CO2 emissions associated with energy use. Some towns chose to set a relative mission to benchmark themselves against their town's energy consumption - for example, the state capital of Montpelier set out to become net zero by 2030; or against other towns in Vermont - for example, the committee in the town of Waterbury set out to become the greenest town in the state by 2020.

Meanwhile, two informants believed that, in order for their town and the state of Vermont to transition successfully to cleaner energy sources, an entire shift in mind-sets was necessary, and that their vision was to contribute to said shift (personal communication with Informants #6 and #7). On a personal level, informants listed concern with climate change and their desire to help protect the planet as their primary motivation to start or participate in an energy committee. Concern for the town's budget and reducing energy-related expenses was the second most cited reason for participating in an energy committee.

Only two exceptions to the above-mentioned hierarchy of motivations were identified. Thus, in the case of the Hartford energy committee, the liaison to the select board believed that the committee should first and foremost "do what's morally right for the town, which means saving money. Every dollar that we don't have to collect from people [in taxes] is a moral win. And every dollar we collect that we don't spend on energy, we can spend on projects of arguably greater moral good. We've got projects in town like feeding poor people, emergency services, affordable housing. When you compare the effect we can have on those issues with the effect we can have on global climate change, there's no doubt where the impact is greater" (personal communication with Informant #11).

Furthermore, in the case of the Ripton energy committee, the motivation for the informant's engagement with the energy committee was reconciling the town's interests (i.e.: not cutting down forests to build solar arrays) with the state-wide goals for renewable energy, and finding a socially acceptable solution to site renewable energy projects (personal communication with Informant #21).

5.2.3 Expectation and priority setting

Given the different types of activities energy committees engage in (see Section 5.3.2), setting expectations at the onset of projects was not always possible because the committees did not control all the factors that could influence outcomes. However, even for projects that lend themselves to expectation setting, like community outreach programmes, informants said that they rarely established clear expectations.

Only six informants said that they set expectations before embarking upon projects; five of them did so because they were working on broader campaigns aimed at energy efficiency and

renewable energy organised by the energy efficiency utility Efficiency Vermont and NGO Vital Communities respectively; participating in these campaigns required that organisations underwent preliminary steps like setting targets. For example, the Weybridge energy committee participated in a home efficiency challenge organized by Efficiency Vermont, which aimed at getting 2% of the homes in participating towns weatherised. As a result of its campaigning, awareness efforts and home visits, 5.5% of the homes in their town were weatherised and the committee won a prize for their result (personal communication with Informant #2).

A number of factors influenced the activity of energy committees, making priority setting a fluid process that depends on the personal interests of committee members, the relevant campaigns organised by larger organisations in the state, the activity of other energy committees and the availability of manpower to conduct activities. In five cases, the personal interests of committee members were cited as a reason for the committees to embark on a specific project, even if it did not fall under the umbrella of energy consumption or production. Such examples encompass food composting, landscaping and sustainable agriculture.

In one case, the informant noted that "we go to conferences and meetings and look at what other committees are doing. And we put together a wish list with what we want to do. Like I wish that every home in Vermont got an energy audit and got weatherised" (personal communication with Informant #14). Meanwhile, the VECAN programme coordinator noted that getting committees to have a clear sense of what their priorities should be and what they should spend their limited time and resources on was an issue (personal communication with Informant #1).

5.2.4 Level of commitment

The level of commitment of committee members was gauged based on the overall dynamic of committees and by asking respondents directly how much time they devoted to the energy committee per month.

With regards to the latter question, informants gave answers ranging from one hour up to 32 hours per month, with a mean of five hours per month. However, respondents noted that the time commitment varied depending on the types of projects they were working on at any given point - on some months, they did little, on others they could work up to 20 hours. One informant noted that she had decided to work part-time in order to free up time for the energy committee, because she considered this activity to be more important to society than her paying job (personal communication with Informant #12).

Holding regular meetings is how most of the energy committees said they engaged with other members. Of the 18 committees interviewed, 10 said that their committees held monthly meetings, one that they held fortnightly meetings, one said that they held meetings every two months on average, two were single-person town energy coordinators and the remaining four said that they convened meetings as needed. Convening monthly meetings was a struggle for three of the committees contacted because of the difficulties in aligning members' schedules. Furthermore, some informants found that meetings were not always a productive use of time. "When you think about it, a lot of the work we're doing doesn't really require meetings. I think that sometimes meetings are just a substitute for getting stuff done. Having a meeting of the energy committee doesn't get any solar panels built or energy credits used" (personal communication with Informant #4).

Unless the committees are single-person bodies, energy committees elect a chair that oversees meetings and manages activities. Five committee chairs said that they dedicated more time to the committee compared to other members; two believed that their status as retirees resulted in them doing more work on the committees compared to other members (personal communication with Informant #2 and #4). Two of the committee chairs interviewed said that they did not want to serve in that position, but that they had stepped up because of the importance of the energy transition to them and because no one else would volunteer for the position.

Having a core group of volunteers was deemed to be an important element in maintaining momentum. Six committee representatives noted that, while their numbers varied over time, a core group would keep the committee going at all times. "In a lot of these committees, there's only one person that really cares, and that's exhausting. Having two people that care is like having five people in terms of how much longer you can keep going. We keep each other going. I want to help [my co-chair] stay engaged because I know how much he cares, and likewise, if I am discouraged or busy, he will pick up the slack" (personal communication with Informant #17).

Seven of the informants that were employed- nine of the 20 committee members interviewed had retired - worked in energy-related fields or civil society organisations and used their professional experience and contacts to create synergies between their employers and the town energy committee. Four respondents emphasised the importance of the professional expertise of their members in energy issues or running NGOs to the success of their energy committees. The Waterbury LEAP, the only committee that is also registered as an NGO, credited one of the co-founder's professional experience in running NGOs with the organisation's ability to weather some of the common problems encountered by energy committees, such as difficulties in attracting and retaining volunteers (personal communication with Informant #20). In one case, the energy committee obtained a grant to hire an intern that would help analyse energy consumption and generation data to inform the energy town plan, install an electric vehicle charging station and make the town more walking-friendly (personal communication with Informant #10).

Six of the informants said that their commitment to the cause of climate change permeated other areas of their lives, and that they conflated their work on the energy committee with other activities, such as Transition Towns, the Sierra Club, regional or local planning commissions, parallel sustainability groups and, in one case, a private solar energy business.

The ability to interview three of the eight members of the Craftsbury energy committee represented an opportunity to explore the dynamic and level of commitment in their team. The three members listed aspects like the ability to rely on one another, the presence of a core group throughout the committee's nine-year existence, the leveraging of their individual skills - for example, one of the members is good at graphic design and public relations, while others are knowledgeable about photovoltaic power generation - and the complementarity of their interests and skills with the success of their committee over the years (personal communication with Informant #23).

5.2.5 Learning mechanisms

The town energy committee meetings were identified as the primary form of communication and of sharing impressions about activities - and therefore of sharing lessons learnt. However, only one informant reported running email surveys among participants in their

events in order to derive lessons for future events, and taking notes about suggestions that they thought were pertinent (personal communication with Informant #20).

Otherwise, informants did not identify having formal mechanisms to articulate and communicate conclusions based on previous performance other than making mental notes of what techniques work and which do not. For community engagement, for instance, five informants said that organising stand-alone events was a waste of time because of the low level of attendance. After organising such events early on, they moved to either co-host events with other organisations or to conduct outreach at popular places in town, like the grocery store.

Informants noted that, when they did benchmark their performance at all in order to measure outcomes against goals and inform future projects, they did so by looking at the progress that their town had made overall in adopting renewable energy sources (primarily solar power) and energy conservation and efficiency. Two main tools were cited as sources of reference for the performance of the town in these areas. One was the town plan, which comprises an energy chapter, and which committees would consult to see to what extent the goals set out in the plan had been achieved; and the second was the Vermont Community Energy Dashboard/ Energy Atlas, an online tool developed by a local NGO, which tracks the number of solar and wind installations, heat pumps, biomass, hydropower and energy efficiency projects in every town in the state. The tool also tracks the town's progress toward achieving its share of the state-wide goal of reducing per capita energy consumption by a third by 2050 and deriving 90% of the energy from renewable sources by the same year (EAN, 2017).

5.2.6 Self-assessment

One of the goals of this research project was to gauge whether energy committees have been effective drivers in the energy transition in Vermont. Hard metrics to quantify effectiveness were considered, but eventually discarded because energy committees do not measure their overall impact, and because some of their projects - such as community outreach and policy lobbying - have had unquantifiable results in the timeframe under consideration. Therefore, informants were asked to evaluate their level of satisfaction with their achievement as a proxy measurement for their effectiveness in promoting the transition to clean energy in Vermont.

It was found that 14 of the 18 committees interviewed declared themselves satisfied or partially satisfied with their achievement (see Figure 5-2 below) and only four were either unsatisfied or said that it was too early to evaluate their performance (N.B.: All three informants that formed part of the group interview #23 said that they were partly satisfied with their performance, and were therefore accounted for as one unit). Among the reasons given for being unsatisfied were the fact that the town was far from achieving its energy goals (personal communication with Informant #10), that it was too early to evaluate their effectiveness (personal communication with Informant #6), that they had not received any feedback from the community (Informant #7) and that the community and local government were unreceptive to their efforts (Informant #3).

Conversely, those informants that said they were satisfied with their accomplishments cited reasons like the number and scale of projects they had organised (personal communication with Informant #20), their support of municipal efforts toward clean energy (personal communication with Informant #13), the work that the volunteers on the committee had put in (personal communication with Informants #12, #23 and #9), their contribution to helping the town reduce energy spending in order to free up spending for other projects

(personal communication with Informant #11) and the fact that some of their projects met or exceeded their expectations (personal communication with Informant #2).

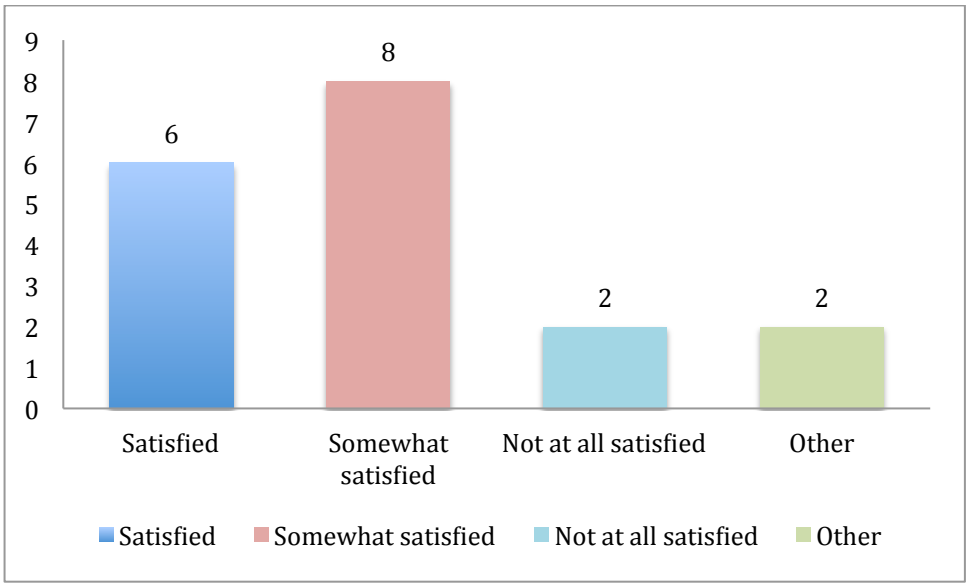

Figure 5-2 Town energy committees' self-reported level of satisfaction with their performance

Most respondents - eight out of 18 - said that they were somewhat satisfied with their achievements, but that they felt that other towns were ahead of them (Informant #14), that they were not entirely unsatisfied with their personal performance (Informant #20), that they were not on track to reaching their town's energy reduction goals (Informant #13), that the community was not as responsive as they would have liked (Informants #12 and #8), that it was difficult reaching the disadvantaged members of the community (Informant #6) an that it was difficult to get other members of the committee engaged (Informant #4).

Some informants noted that their energy committees had also made efforts toward assessing their effectiveness for specific projects that had measurable outcomes. For instance, the Glover energy committee used a creative way to measure the impact of their campaigning as part of a state-wide effort to conserve energy, called Button-up day. Organised by Efficiency Vermont, the initiative is meant to promote energy savings. After advertising and campaigning at the town school, senior centre and municipality, the Glover committee contacted the electric utility that services the town to ask for a baseline consumption anticipated for the day of the event. As a result of their campaigning, the actual electricity consumption was 7% lower compared to the baseline (personal communication with Informant #6). Committees that held repeat events - such as the Waterbury LEAP, which hosts an annual energy fair and solar event - tracked the attendance to their events as a way of benchmarking their success, and reported an increase in the number of attendees from year to year (personal communication with Informant #20).

5.3 Network interactions

All informants listed local officials and town residents as the main groups of local stakeholders with which they engaged (see Figure 5-3 for number of mentions); most (13) respondents reported having worked with local private companies on projects related to the construction of photovoltaic installations, distribution of smart metres, energy efficiency, community outreach and for sponsorships.

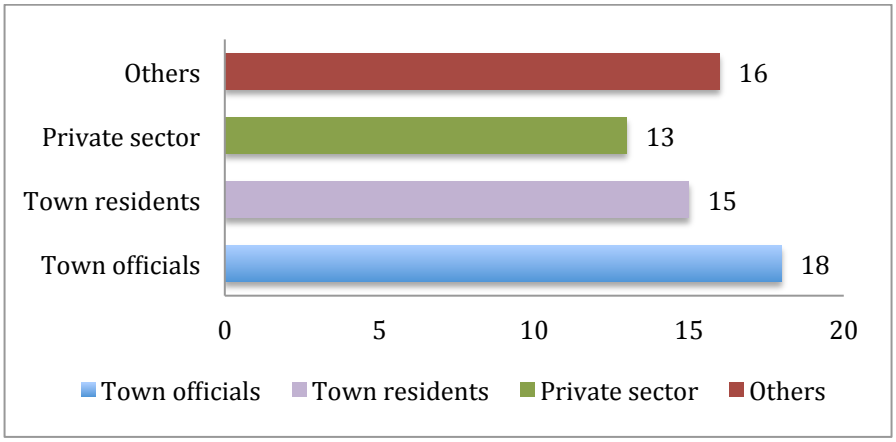

Figure 5-3 Stakeholders that committees engage with based on number of mentions

5.3.1 Directions of intervention

Downstream interventions (town residents)

By and large, informants described the members of their communities as being passively supportive or supportive of their activities, with only three respondents noting that their communities had been unsupportive. However, 13 of the informants said that convincing people to attend their events and to follow up on campaigns or workshops with concrete actions had been a challenge.

Some ways in which committees have sought to spur more community engagement are: the use of visual aids to track progress toward solarisation in town placed in public places (personal communication with Informant #12), the use of online community forums and classified websites to promote events (personal communication with Informants #12 and #23), paid advertising and writing articles for the local paper (personal communication with Informants #2, #12, #13 & #20), holding committee meetings in popular places in town (personal communication with Informants #12 and #23), devising or using a pre-existing town listserv (personal communication with Informants #5 & #12), having a website (personal communication with Informants #12, #13 & #20) and community outreach events organised in collaboration with other organizations.

For some committees, devising creative ways to spark town residents' interest in renewable energy and energy efficiency was the core of their activity. Informant #12 reported experimenting with various online and in-person formats and combining the two (e.g.: uploading sing-up sheets for weatherise campaigns on their website for people who could not come to their in-person events, and posting about it on the town website with a link to the committee's website) in order to reach more people.

While the preferred form of communication with town residents was in person, informants acknowledged that they could only reach a portion of the residents that way and that advertising their events online, in popular venues or by email helped boost the number of participants.

Two of the committees reported that the participants that attend their events tend to be the same - that they are "preaching to the choir" of sustainability-minded people in town - while two others - Waterbury LEAP and Craftsbury - noted that some of their events are attended by participants from out of town.

Furthermore, the ability to engage with low-income or lower-middle income residents was identified as a challenge by two of the committee representatives interviewed. Thus, the Glover committee representative reported that they were seeking to promote a financial scheme that weatherised homes for free for low-income senior citizens. They engaged with some of them through the senior centre in town, by visiting the centre on the days when the centre offered free meals, but nevertheless believed that " it's an obstacle getting to people who need this the most" because "low-income people are so busy trying to survive, that they sometimes don't make use of the opportunities that are there for them" (personal communication with Informant #6).

Meanwhile, Informant #3 found that the predominantly working-class residents of the town were difficult to engage because the discourse on energy in town was dominated by a handful of people who "intimidate others who speak up, so they never speak up again". In two cases, committees reported having confrontations with or being on opposite sides of an argument compared to the majority of the community. Informant #3 noted that residents shut her down when she attempted to convince them to consider smaller-sized wind turbines instead of outright opposing any wind development in the town. Meanwhile, in Weybridge, the committee unsuccessfully opposed the construction of a natural gas pipeline that passed through town for which there was popular support. The result was that "some residents were not pleased" with their opposition and that, when residents decided to turn down plans for a large solar array in town, the committee did not take an official position on the project because "it would have been difficult to weigh in on it without alienating the neighbours" (personal communication with Informant #2).

Upstream interventions (local authorities)

There are three main reasons for energy committees to engage with municipal officials - to address energy demand from public buildings and infrastructure, to leverage the association with local authorities in order to gain more legitimacy and influence over town residents and officials, and to impact policy at the local level. Municipalities are "an arena to engage in and of itself in terms of helping the town reduce its fossil fuel consumption and invest in renewables, and also because they partner up with people in the community. If you can engage effectively with your municipal authorities, that could be a powerful way to reach more people and for the initiative to gain credibility in the eyes of the community" (personal communication with Informant #1)

The main official body with which energy committees said they interacted was the town select board, which is the prevalent form of municipal executive branch in small New England towns. The board typically comprises three to five members that serve part-time in exchange for a stipend or no pay at all; in larger towns, a full-time town manager or town council takes on the responsibilities of the board. The institution oversees the well-functioning of the town, manages town commissions and committees and prepares a draft annual budget that is debated at annual town meetings. The budget dictates the need for local taxation.

In many small towns in Vermont, the local administration has limited staff, who rely on volunteers to support officials in making decisions about plans and projects. According to one informant, "the city manager told us that "somebody has to tell us that [a given issue] matters to them, because then we will make it a priority". Otherwise, town officials have a lot of work to do and won't prioritise projects unless you nudge them" (personal communication with Informant #17); another noted that "some projects - like solar arrays-

don't happen just because the town staff doesn't have time to look into it" (personal communication with Informant #4).

Half of the committees under study function as an advisory body to the select board or town council, meaning that part of their activity is to support the select board in drafting the town energy plan and with projects targeting energy conservation and efficiency related to municipal infrastructure, sustainable transportation as well as, in four cases, clean energy generation (biomass and solar power).

With two exceptions, energy committees reported having close or cordial relations with the town officials, though their relations did not always translate into outcomes that that were deemed desirable for the committees. For instance, in Dorset, the select board had changed the "wording [of the town plan] because they didn't want to assume future responsibility. We wanted to formally adopt the 90% by 2050 goal for our town, but they weren't willing to go along with that. So we had to prod and push our way toward that goal by making tiny changes constantly" (personal communication with Informant #14). Informants noted that select boards were, however, largely supportive of projects that could save energy spending, such as energy efficiency retrofits and streetlight projects.

Several informants complained about how protracted decision-making was at the municipal level, which resulted in either more work for the committees or the committees being forced to find solutions to work around local authorities. For instance, one informant reported that he had taken to installing photovoltaic panels on municipal buildings by securing investment and procuring the equipment himself rather than waiting for the town officials to decide, because it could have taken a long time for the latter to occur.

Nevertheless, only two committees reported coming into conflict with town officials over energy or environmental projects. In one case, which was mentioned above, the select board and town residents favoured a gas pipeline project passing though town, and the committee was unsuccessful at opposing it; in a different case, the local planning commission would get "downright hostile" when the committee would raise the issue of ensuring the protection of wildlife corridors while planning for "sprawl" (personal communication with Informant #3).

Conversely, one informant reported that, at times, the city council relied too much on the energy committee to meet ambitious energy reduction targets. "We'll go to the city council meetings to report on things and they'll ask "How are you guys doing on reaching our 2030 [net zero] goal?" And of course we can't do it all ourselves with 15 really smart volunteers. We need to have more support..." (personal communication with Informant #13).

Seeing how the select boards comprise a limited number of representatives, their personal opinions about clean energy was found to influence the acceptability of committee proposals. One informant noted that, because the town manager was unconvinced by the need for solar energy, their committee was working with officials from nearby towns to install solar arrays there, in the hopes that their example would sway the town manager to consider the prospect locally as well (personal communication with Informant #4). In another case, individual select board members were supportive, but not the board as a whole, making it difficult for the committee to get projects approved (personal communication with Informant #12).

One of the informants who served on an energy committee for nine years and then went on to serve the select board believed that serving on the latter had been more "effective to get the message across" about clean energy (personal communication with Informant #11).

Three of the informants noted that having a full-time energy or sustainability coordinator on staff was necessary in larger towns (personal communication with Informants #11, #16 & #18), because there was only so much that volunteers could achieve.

Only three informants spoke of liaising with officials at the state level in the context of the ease to communicate with state representatives and senators in a small state like Vermont (Informant #2), the importance of energy committees in rallying people to participate in public hearings about the comprehensive energy plan (Informant #1) and of having to package sustainability so as to suit the agenda of the incumbent state governor, who is more interested in job creation and innovation than in fighting climate change (Informant #11).

Sideways interventions (other local organisations)

Aside from town residents and officials, private companies were the main local stakeholders with which energy committees reported working. Out of the 18 committees interviewed, 13 said that they engaged with private companies like energy auditors, solar developers, large local employers and private educational facilities (e.g.: Middlebury College). One of the committee chairs interviewed reported having set up a private business developing photovoltaic installations himself. Other committees would invite private companies to meetings or events where town residents were gathered to answer questions about specific technologies (e.g.: heat pumps, solar power, financing solar power). In one case, an energy committee chair that works for Green Mountain Power, the largest electric utility in the state, said that the company had collaborated with energy committees when it had distributed smart metres in order to dispel people's concerns about privacy and data collection associated with them. (personal communication with Informant #8).

Five of the informants said that they helped their town officials evaluate proposals from solar developers and even installing solar arrays on public land. In Craftsbury, for example, the committee convinced the select board to use the proceeds from a nearby wind farm to build two solar arrays. "We're in the viewshed of a large wind development that Green Mountain Power put up and, as part of that development, any of the towns in the viewshed receives a certain percentage of the profit of the wind farm. Our committee has been trying to convince the town to use that money that we get toward energy projects that make the town more efficient. So a lot of us are lobbying at town meetings -we have to vote on these things. As a result of that, we were able to put up a very large solar array and just finished putting up another one, so the two are now producing about two thirds of the energy requirement for town buildings" (personal communication with Informant #23).

According to a private sector representative, the energy committees represent a dialogue partner for solar developers and similar companies; in towns that do not have energy committees, the dialogue with local officials tends to be more protracted and the process of devising proposals and agreeing on renewable energy projects was made more difficult. "In my work, I am constantly in touch with various towns' energy committees; they are often the local brain trust that understands climate and energy issues best, and that advises local government" (personal communication with Informant #24).

Five of the committees interviewed also reported working with other environmental and energy groups in town, including local climate groups, Transition Towns and the Sierra Club. In one case, the committee and the complementary local climate action group divided the projects they focused on - the climate action group would work on sustainable transportation, while the committee on energy efficiency and renewable energy.

Sideways interventions (other town committees)

All but three of the informants reported seeking to establish communication with the energy committees in other towns, either directly or through VECAN. The most frequently cited form of engagement was by attending the VECAN annual conference dedicated specifically to energy committees to derive inspiration from other committees' activities. Seeing how not all the towns in Vermont have an energy committee, Informant #18 recommended that smaller towns pair up with one another.

According to one informant, reaching out to a nearby committee was helpful when there was insufficient support for the committee locally, and was particularly useful when working on regional issues like commuter routes. "When there aren't that many people coming together to actively participate, partnering with other committees in neighbouring towns is advantageous, especially if there is a geographic reason to do so. Their town is between us and [state capital] Montpelier, which is the primary commuting route from Calais" (personal communication with Informant #7).

Some energy committees, like the ones in Waterbury and Montpelier, have also put together manuals on solar power in Vermont (NZM, n.a.) and lists of tips for other committees to use. The informant in Waterbury also reported assisting other committees with campaigns and projects when they contacted him. Meanwhile, the committee in Crafstbury reported working with VECAN to host presentations and workshops on weatherising homes in neighbouring towns and even working to create a regional energy committee (personal communication with Informant #23).

Sideways interventions (other organisations promoting clean energy in Vermont)

Many informants have credited the wealth of initiatives focused on promoting environmental sustainability in Vermont for supporting energy committees and their activities. Amongst the most frequently cited organizations were Efficiency Vermont, the state energy efficiency utility, which organises a plethora of campaigns and provides incentives promoting energy efficiency; the Energy Action Network (EAN), which helped devise a detailed energy dashboard that indicates the progress towns make toward energy efficiency and renewable energy; Renewable Energy Vermont, a renewable energy industry lobby and NeighborWorks of Western Vermont, an organization promoting sustainable home ownership.

According to one informant, their committee had missed more opportunities than it had taken advantage of by a factor of ten. "There are so many organizations that work with climate in Vermont, and they are staffed with full-time staff whose job is to look for new ideas. So there's a lot going on. But you pick the opportunities that have the biggest potential upside for the town" (personal communication with Informant #11) Another informant noted that, in the beginning, learning about all the organizations that work on energy in Vermont had been a learning curve. "It's been interesting, but it's also a challenge to understand everything that the state is trying to do or offer" (personal communication with Informant #6).

5.3.2 Level of activities

Table 5-4 and Figure 5-5 summarise the type of activities informants described and the sub-sectors of energy that they correspond to. Both the scope and the number of projects varied depending on the stage of development at which the committees were, with older

committees generally, but not always, having more and larger projects. The two committees that comprised of only one member said that their activities were limited to awareness raising and lobbying. Larger committees engaged in more complex and numerous projects.

Sixteen of the informants mentioned working on projects related to thermal efficiency like weatherisation campaigns and energy audits or retrofits on buildings and residences. The same number of committees mentioned working on renewable energy projects, either on concrete solar developments, on solarisation campaigns or by helping the town devise strategies for renewable energy siting and assess proposals for solar arrays to be built on municipal property.

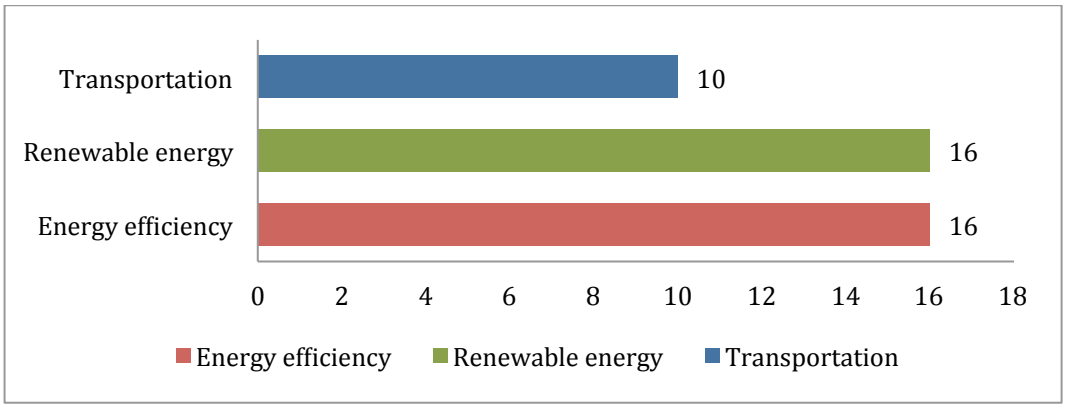

Figure 5-4 Main areas of intervention for energy committees - number of mentions

Only ten of the informants mentioned sustainable transportation actions ranging from campaigns encouraging residents to bike to work or school or to purchase electric vehicles, campaigning against idling vehicles, demonstrations of electric bicycles or vehicles and, in three cases, working to have a charging station for electric vehicles (EVs) installed in town. In general, informants said that sustainable transportation was the most difficult area to tackle, because Vermonters are used to driving long distances in single-occupancy vehicles, and persuading people to change that habit, working with employers to set up commuter routes and even change the infrastructure in towns - for instance, building sidewalks or bike lanes so that people can walk or bike - were both laborious and required significant efforts to persuade residents, town officials and other stakeholders.

Committee	Summary of projects
Weybridge energy committee	Weatherisation campaigns, solarise campaigns, sustainable transportation campaigns.
Pittsford energy committee	Opposition to construction of wind farm, lobbying at town meetings, edible and rain garden landscaping
Rockingham energy committee	Working with town officials and contractors on solar array project.
Hartland energy committee	Solar Hartland campaign, 5 weatherisation campaigns, farm-to-school programs, sustainable transportation (EV) event, town listserv.
Glover energy committee	Energy efficiency campaign, LED light bulb giveaway, community survey, energy conservation workshop.
Calais energy group	Devising energy action plan, sustainable transportation promotional event, net-zero workshop.
Kilington energy committee	Weatherise campaigns, alternative transportation campaigns, solar campaigns, streetlight replacement.
Jericho energy task force	Community outreach and education on weatherisation, heat pumps, solarise campaign, sustainable transportation awareness in local paper.

Bethel energy committee	Town plan, weatherise campaign.
Hartford energy committee	Energy inventory of town buildings, community outreach at festivals and co-hosting of events, weatherize workshops, streetlight replacement project, EV charging station in town, successfully lobbying for full-time sustainability coordinator in town.
Norwich energy committee	Solarise and weatherise campaigns, EV charging station, outreach events at commonly frequented places in town, town listserv
Montpelier energy advisory committee	District heating plant expansion and refurbishment, four different working sub-committees- sustainable transportation, municipal, residential and policy and planning; Net-Zero Montpelier initiative.
Dorset energy committee	Efficiency projects on town buildings, lighting replacement in 30-40 buildings in town, town plan, two solar projects.
Peacham town energy coordinator	Awareness about all-electric future on Facebook, at farmer's market, lobbying for solar array at town school.
Anonymous energy committee	Town energy plan, streetlight replacement projects, insulating town buildings, workshop series, electric vehicle show.
Waterbury LEAP	Repeat energy and solar fairs, multiple energy efficiency and solar projects on municipal land and property, alternative transportation campaigns and events, installation of EV charging station, lighting upgrades in municipal buildings.
Ripton energy committee	Installed energy efficiency equipment in 40% of town homes, town energy plan.
Craftsbury energy committee	Lobbying for and helping with construction of two large solar arrays in town, ongoing weatherisation campaigns, educational campaigns (movie series), workshops on heat pumps, solar.

Table 5-4 Types of activities in which energy committees engage

Three committees reported achieving early success in terms of reducing the town's energy consumption and consequently energy spending with projects to replace incandescent streetlights with LEDs. In one instance, the informant said that replacing the town's streetlights was a watershed moment for the committee that earned them the recognition of town officials.

"At the time, we felt that people weren't paying us much attention. We had to do an inventory of all the streetlights first. For a bunch of volunteers, there was a lot we couldn't do, but an inventory was easy. We drove around and did the inventory. We weren't terribly overlamped, but we recommended [to the electric utility] removing 10 streetlights. Eight of them were busted anyways. It took us 3 months to do the inventory, and Efficiency Vermont [the state energy efficiency utility] was then able to replace incandescent lights with LEDs. That helped save the city thousands of dollars on electricity bills, and all of a sudden city council and the mayor were like "you're the best thing since sliced bread. What else will you come up with next?" They'd done energy efficiency projects before, but for some reason they became full-on supporters. The elected officials now knew who we were and whatever we came up with after that, they paid attention. [...] We never asked the city for any money [...], but after we did the streetlight project, the mayor recommended we get $1,000 a year from the town budget" (personal communication with Informant #17). Informants #5 and #8 reported similar results with streetlight projects that led to significant reductions in the town's spending on this budget item and that gained them sympathy from town officials.

Some informants noted that, the more events they organised related to community outreach, the better known they became and the higher the number of volunteers or supporters they could count on. Informant #20 recounted that the Waterbury LEAP annual energy fair, at its 11th edition in 2017, had grown in size over the years, with the attendance increasing by a factor of seven between the first and last editions. Informant #23 also reported having well-attended events, and working with VECAN to organize workshops and presentations on

energy efficiency, renewable energy and related topics in other neighbouring towns and at a regional level.

5.3.3 Network support

Vital Communities, an NGO that promotes sustainable communities in the Upper Valley region of Vermont and New Hampshire, and its modus operandi provided insights into the type of network support that town energy committees receive.

Five of the energy committees representatives interviewed are located in the Upper Valley region, and all informants from those towns said that participating in the Vital Communities campaigns to solarise and weatherise homes was a success. The reasons cited by informants were that the campaign had been "the most organised we've ever been" (personal communication with Informant #2) and because "they do everything for us" (personal communication with Informant #10). In two years (2014-2015), the Vital Communities solarise campaign resulted in more than 300 photovoltaic installations being built in the 14 participating towns. Meanwhile, the first iteration of the weatherise campaign in 2017 resulted in over 100 home weatherisations in 14 towns, and the NGO is currently working on the second edition of the campaign (personal communication with Informant #18).

Explaining why the campaigns had been so successful, Informant #18, a Vital Communities program manager, said that the key to success had been providing volunteers with structure and clarity to deploy resources efficiently and creating a market for solar installations and home weatherisations.

"We realised that it's not enough for us to do the PR and the volunteers to do outreach, because that only raises awareness, it does not change behaviour. So we decided to bring the industry to the table to actually develop incentives that were very strategically placed where we knew there were barriers to consumers who might not otherwise consider solar. So we asked why that was the case, and found that there was partially an education gap, partially a cost gap and partially a trust gap. So we asked industry to help us increase transparency and trust and decrease the cost of solar in a targeted, short-term way. And we were able to go to the volunteers and tell them that we had contractors that were willing to give their communities discounts, to show up at events and help them promote solar, and Vital Communities would design the materials. All they would have to do is get a volunteer team, get an outreach plan together tailored to their community and be our boots on the ground for five months. [...] The committees did what they do best, which is to connect with their neighbours, check in with them to see how they're doing and make sure there is no one left in town that hasn't heard about this. I did what I do best, which is to create compelling messages. The installers did what they do best, which was to create a compelling market proposition - discounts and good services. And that has generated incredible results" (personal communication with Informant #18).

Furthermore, Vital Communities encouraged participating energy committees to spend a few months preparing for the campaigns (see suggested campaign timeline in Figure 5-5), to define expectations and volunteer roles, to train volunteers and, at the end of a campaign, to report their results. Throughout the campaign, each committee held a bimonthly progress update session with Vital Communities staff.

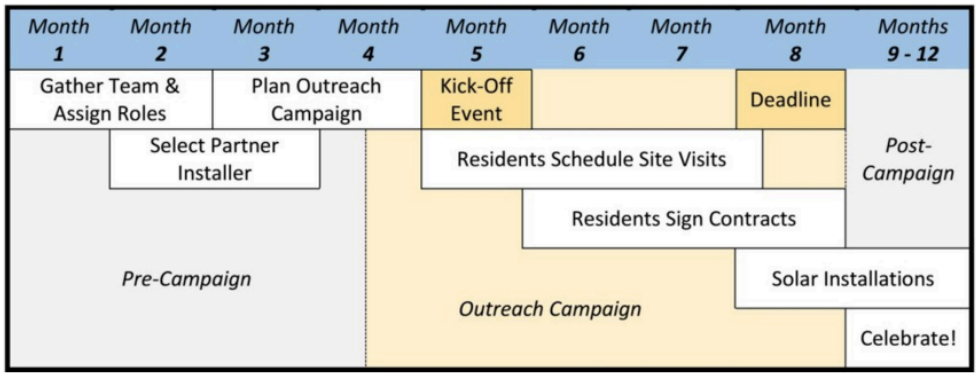

Figure 5-5 Proposed timeline for the Solarise Upper Valley campaign. Source: Vital Communities

The success that Vital Communities has attained by running centralised campaigns in the Upper Valley region, however, appears unlikely to be replicated in the entire state for the time being, because VECAN, which oversees all of the committees, does not have the capacity to design state-wide campaigns itself (personal communication with Informants #16& #18). Nevertheless, Informant #1 noted that VECAN can and does frequently support individual committees with specific issues, such as making sense of proposals for solar arrays from different companies to determine which one is the most advantageous for their town.

Like VECAN, Vital Communities also organizes an annual conference for energy committees, during which committees have the opportunity to showcase their projects to others in attendance. In addition to committees, the events attract private companies and state politicians. "These are political events. [Our solar company] has a table at the [Vital Communities conference] event every year. Besides, you have state officials attending these events. [Vermont senator] Bernie Sanders has attended these events before" (personal communication with Informant #24).

5.4 Challenges

Figure 5-6 summarises the self-reported challenges informants brought up when asked directly about the main challenges that they had faced. Six informants brought up more than one challenge, and two of them three challenges. The most commonly cited challenge that committees encountered was the inability to get enough traction with the residents of their towns, or to get them to act upon the campaigns and outreach initiatives they organised. The second most frequent mention was the inability to get enough members to join the committee or difficulties in maintaining the momentum of the committee with sustained activities over the years.

Policy gridlock at the national, state and local level, more stringent net metering laws over time and a lack of support or inadequate support from town officials was the third most frequent challenge that committees reported. Four informants justified their answer by noting that regulations governing the siting of renewable energy projects like solar arrays had become more restrictive over the years. One informant opined that the restrictions were a symptom of insufficient communication between developers and communities earlier in the process, and energy committees could help to mediate between community preferences and solar developers. "The more you can have the conversation going on, particularly about renewables, the better a place you're in. Solar exploded in Vermont because we had great net

metering laws. And what we saw is that solar is popping up everywhere, which is fantastic. What was missing initially was that people weren't talking about siting. So you had solar arrays on beautiful pastures, and people started to mind that. So we've started to encourage having that dialogue, because there are places where you can put solar where people won't mind it." (personal communication with Informant #8).

Funding, difficulties in engaging the young population in their town, low oil prices and other uncooperative institutions in the town, like the school, completed the list of challenges that were mentioned. With regard to funding, a program manager from the Grassroots Fund, a New England NGO that finances grassroots initiatives, noted that the fund had more financing available in the form of small grants (under $3,500) for community energy activities available, but that they had not received enough applications from energy committees and other groups working with the energy transition (personal communication with Informant #22).

One energy committee chair reported that previous investments made in the expansion and refurbishment of a district heating plant, which was switched from fossil fuels to biomass, had left some of its customers unhappy, because they had anticipated financial savings that did not take place after oil prices dropped in 2014 (personal communication with Informant #13).

According to the VECAN coordinator, "the committees always grapple with limited capacity not only in people power, because they're all volunteer. Getting people to show up and participate in projects and manifest real results can be a challenge, because people have lives. Civic engagement has diminished over time not only in people power but also in the dollars. In transitioning from fossil fuels, you're hamstrung by the financial resources available to you. The financial resources available to energy committees may be more limited than they would want. Capacity -human and financial - is a huge limitation. Also, for a lot of the groups, having a clear sense of what are the priorities that they should focus their limited time on and the partners that could help them advance them is an issue. Measuring and tracking progress - getting a baseline of progress, taking action and measuring that - is a challenge" (personal communication with Informant #1).

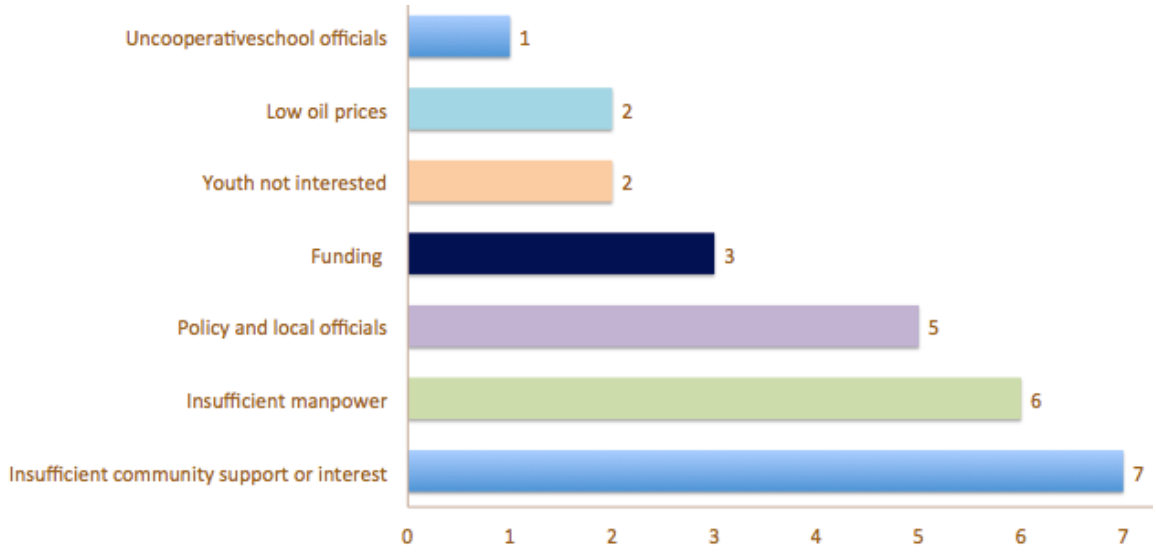

Figure 5-6 Self-reported challenges that town energy committees encountered (# of mentions)

Only answers to the question about top challenges were coded for the data presentation above. However, a review of the entirety of the transcripts also revealed challenges of a more personal nature that were neither expressly identified as challenges, nor coded above. Thus, three of the informants noted that their leadership and communications skills or creativity when it came to generating ideas for projects were a source of personal dissatisfaction. Two informants noted that they based their selection of volunteers on personal criteria -therefore that the group was not open to just anyone- because they wanted the core group of volunteers to be tight-knit and for working styles to be compatible. While some committees struggled to sustain a core number of volunteers, others noted that too many members would have made it difficult to organize meetings and align schedules.

However, community support, which was the most frequently cited challenge in the present research, only appears as the fifth most commonly mentioned challenge in the Vital Communities survey in 2015, eighth in 2016 and fourth in 2017 (see Annex C). Instead, the lack of new members and/ or volunteers, the complexity of the projects on which they were working and volunteer burnout were consistently ranked as the top three challenges by respondents. The design of the survey (respondents had to select the top four challenges from a list of 12 -in 2015 and 2016 - or 13 possibilities in the 2017 survey or could select the option "Other" and list another challenge that was not in the list) could have affected the slight difference in the type of challenges identified, though the fact that the answers were consistent across several years points to the likelihood that volunteer participation and burnout and the high level of complexity of the projects they work on are indeed consistent challenges.

5.5 Summary of findings

Town energy committees are a reflection of the local culture and economy of their towns (personal communication with Informant #1) and of the personalities and interests of their members and of their communities (personal communication with Informant #18), therefore their outcomes depend heavily on circumstantial factors. However, research found that they share some common activities, engage with similar stakeholders and face similar challenges. With regards to the type of activities they perform, most informants spoke about projects related to solar energy and energy efficiency, with modest attempts at promoting sustainable transportation. Their interventions were concentrated on their communities of place, specifically by nudging town officials and residents to adopt the above-mentioned technologies and practices. Informants also mentioned deriving significant support and inspiration from other town energy committees, and particularly from NGOs like VECAN and Vital Communities and the energy efficiency utility Efficiency Vermont. As far as the challenges they face are concerned, community support and volunteer participation and burnout were the main obstacles that informants reported.

6 Analysis and discussion

Reflecting on the findings laid out in Chapter 5, this chapter is organised so as to answer the three research questions in the following manner. Section 6.1 analyses and discusses the data in relation to RQ1 regarding the role of town energy committees in the energy transition. Section 6.2 looks at the challenges that informants have reported and how they hamper their performance (RQ2). Section 6.3 draws on the findings from Chapter 5 and the grey literature made available by respondents to suggest ways to improve the performance of town energy committees (RQ3). Section 6.4 reflects on the limitations and merits of the framework chosen to analyse the town energy committees.

6.1 The town energy committees' impact on the energy transition

Initially founded to support local officials with devising town energy plans, the energy committees have since branched out into a variety of energy-related activities, ranging from community outreach to assessing proposals for solar arrays from private companies and even helping out with the construction of energy generation installations and with retrofitting town buildings. Unlike the Transition Towns movement, which started off fighting peak oil only to become more focused on enhancing community resilience over time (TN, 2015), energy committees have by and large stayed true to their initial scope, that of supporting the transition to clean energy and energy efficiency in Vermont. Furthermore, unlike the Transition Towns chapters, which position themselves as alternative, community-based governance systems, many town energy committees in Vermont work closely with local officials to influence local energy plans and projects.

Based on the classification of the role of actors in sustainability transitions (Seyfang & Smith, 2007; Hargreaves *et al.*, 2013b), the town energy committees were found to operate on a spectrum ranging from grassroots to intermediary actors. Some of their characteristics, such as the fact that they are staffed by unpaid volunteers, place them within the community of grassroots actors. However, some of the committees influence town plans, budgets and projects and, in some cases, support like-minded organisations with energy-related matters, indicating that they operate as intermediary actors.

The intermediary actors in socio-technical regimes have consolidated learning mechanisms (Hargreaves *et al.*, 2013b), which are communicated externally to other stakeholders so as to connect niches among themselves and with the outside world. In so doing, intermediaries help to create a shared framework of institutional support for niches or grassroots groups (ibid.). In the context of Vermont's local energy actors, such organisations include the NGOs Vital Communities and VECAN and energy committees like the ones in Montpelier, Craftsbury and Waterbury, which have prepared lists of tips and manuals for other committees to use and have conducted campaigns outside of their communities of place.

Aggregating and decontextualising learning in order to make it sufficiently abstract so that it applies to different contexts and travels between niches is one of the key roles that intermediaries play in socio-technical systems (Geels & Deuten, 2006). Throughout the course of the research project, informants shared a number of manuals, toolkits and handbooks on how to establish and operate a successful energy committee (for an example, see Annex E), a sign that knowledge aggregation is taking place thanks to intermediaries and despite the weak learning mechanisms encountered at the niche level.

However, in light of the fast-changing policy and technological environments in Vermont, the extent to which tips and handbooks remain valid over time is questionable. This is why another important role of intermediary actors, that of guiding niches (Geels & Deuten, 2006), is all the more pertinent. The NGO Vital Communities and its centrally-run weatherisation and solarisation campaigns are an example of the fact that continuous guidance yields good results. In the absence of such guidance, the level of performance of town energy committees was found to vary widely.

According to Seyfang *et al.* (2014), the manners in which communities build confidence and capacity are elusive and difficult to communicate or copy. Bergmann *et al.* (2010) go even further to suggest that the complexity of socio-technical systems and the high diversity of grassroots organisations make it hard to predict their success or failure. In light of this, it becomes obvious that blueprints of what makes volunteer energy initiatives successful are hard to devise, and therefore that learning transmission is insufficient to ensure the success of town energy committees. Seyfang *et al.* (2014) and Middlemiss & Parrish (2010) speak of a series of soft skills and aspects that are difficult to quantify in words or numbers, and that contribute to the success of grassroots innovations. Among them are tacit knowledge, trust, confidence, the "personal capacity" of the volunteers themselves (skills, emotional intelligence) and the "cultural capacity" of the communities where they operate (history, shared values). The framework chosen for this study does not account for these aspects, but, as will be discussed later in Section 6.2, they were brought up during interviews.

6.1.1 SRQ1.1: With what kind of stakeholders do they engage?

Using the middle-out approach described by Parag & Janda (2014), the upstream, downstream and sideways interventions of town energy committees are represented in Figure 6-1 below. By and large, committees appear to intervene primarily up- and downstream, by interacting with town officials and residents, and to seek support sideways from other committees, NGOs and state-wide organisations like Efficiency Vermont.

Sideways interventions

Informants credited the activity of institutions like VECAN and Efficiency Vermont with paving the way for town energy committees to sustain their activities over the years thanks to the numerous campaigns and projects the former organise. Furthermore, organisations like EAN, Efficiency Vermont and Vital Communities have been quintessential in supporting committees with efforts to benchmark the performance of their towns in the energy transition and with project management for campaigns targeting energy efficiency (Button-up Day, Weatherise Upper Valley) and renewable energy (Solarise Upper Valley). While energy committees also take initiative to organise their own projects, a significant part of their activity is to bring the wealth of energy-related knowledge and activities taking place at the state level to the local level.

Network creation is a key function of sustainable niches (Seyfang & Smith, 2007). In Vermont, it was found that the energy committees came into existence in the midst of an active environment of civil society and public organisations that foster clean energy solutions. Therefore, the networks within which they operate and which support their activity largely preceded them. These organisations also support energy committees with networking events targeted specifically at them, such as the VECAN and Vital Communities annual meetings, which bring together committee members, the private sector and state political representatives. The committees themselves can, but do not have to, make efforts toward network creation. The set-up in Vermont is very similar to that of Transition Towns, in

which a central NGO supports chapters to get started and to network, though the closer proximity of the towns in Vermont naturally makes it easier to network and draw inspiration from one another.

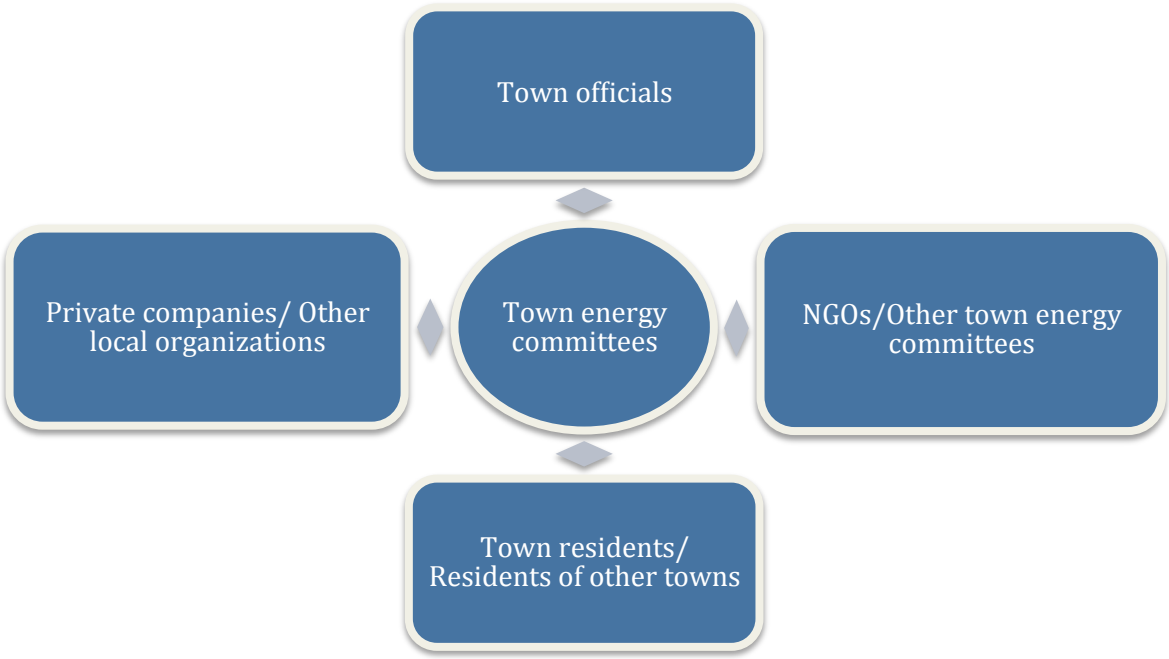

Figure 6-1 The directions of intervention of town energy committees based on the middle-out approach

Upstream interventions

Based on Informant #16's account, the type of executive branch prevalent in small, rural Vermont was a factor that paved the way for the foundation of town energy committees in the first place. Limited resources at the local level have translated into limited capacity and expertise in energy matters; the first town energy committees were therefore meant to fill in the shortages in expertise and capacity, and to help towns manage their energy planning, consumption and generation better. All the respondents said that they engaged with town officials in one way or another; half of them by virtue of being officially affiliated with the town government, though this type of connection did not seem to influence accomplishments related to municipal projects.

Being associated with the town government as an officially registered committee brings a series of advantages, including more sway over projects and plans and more respect from officials and residents. According to Informant #18, environmentally-minded people run the risk of being perceived as tree-hugging hippies and not being taken seriously in some circles. Therefore, becoming an official body sends the message that energy is town business, not a niche interest; and that the committee is willing to work within the tradition of small-town, participatory form of government prevalent in New England (personal communication with Informant #18). Based on this account, being officially affiliated helps town energy committees permeate the socio-technical regime and grants them legitimacy by association with an established form of governance. Conversely, being affiliated with the town government requires performing logistical activities like holding monthly meetings, publishing meeting agendas in advance and minutes afterwards, which represent an extra

demand on the limited time availability of groups of volunteers, detracting some from this form of organisation.

Despite the advantages of working with town governments, unsupportive local officials and delays in decision-making at the local level were cited as the third most common challenge for energy committees, as discussed in Section 5.4. Informant #18 acknowledged that the personalities and personal interests of local officials affect the reception of renewable energy and energy efficiency projects. Since these factors are beyond the control of town energy committees, devising clear-cut ways to avoid resistance from some town officials is not possible. As a solution, Vital Communities recommends that committees work on at least two projects at the same time involving different stakeholders, in order to avoiding getting stuck on one front and giving up altogether.

Downstream interventions

The vast majority of the energy committees' downstream interventions comprised of campaigning for behavioural change surrounding energy consumption, thus seeking to change energy behaviour by changing the understanding of renewable energy and energy efficiency. Some informants emphasised the fact that they used arguments of an economic nature (monetary savings) when conducting such campaigns, in order to dispel public perceptions that energy efficiency and renewable energy are costly.

However, as Informant #18 noted, in her experience, raising awareness alone is insufficient to change behaviour amongst Vermonters. As such, Vital Communities created markets by bringing in private companies to offer discounted or free home energy audits and assessments as part of its weatherisation and solarisation campaigns. Intermediary energy actors studied by Hargreaves *et al.* (2013b) concurred on the need to "marry the community perspective with the private sector interest" because, otherwise, community energy would remain "a niche interest" (p. 876).

Informants reported having a chequered track record when engaging with town residents and, as noted in Section 5.4, insufficient community support was the most frequently cited challenge. Respondents mentioned busy schedules, a lack of interest in energy-related matters and large upfront investments required to weatherise and solarise homes as the main barriers preventing town residents from adopting such technologies and showing interest in the activities they organise.

The author identified several additional factors that could explain the low level of community interest. First, some informants noted that they had not prioritised community outreach, choosing instead to focus on municipal projects, because they had anticipated low levels of community interest from the onset (personal communication with Informants #10, #14 & #17). Secondly, while not enough information was available to draw a general conclusion, anecdotal evidence suggests that residents of towns with higher income levels were more likely to weatherise their homes and build solar installations on their property (personal communication with Informants #2 & #23) compared to residents of towns with lower income levels (personal communication with Informants #3 and #15). Thirdly, those committees that made it their job to get people engaged and that devoted time to organising and troubleshooting outreach campaigns in order to enhance community participation reported greater levels of satisfaction with local community support (personal communication with Informants #12 & #20). Therefore, while it is difficult to generalise, community support does appear to depend on the resources (time) that energy committees

dedicate to community outreach. Fourthly, the success of the Vital Communities campaigns to solarise the Upper Valley indicates that working with the private sector to remove the initial financial barriers to technology adoption makes a difference.

6.1.2 SRQ1.2: What kind of activities do they perform?

Respondents noted that the majority of their effort was spent working within their communities of place to promote energy efficiency (weatherisation of town buildings and residences), solar installations (mostly small-scale ground-based arrays and rooftop photovoltaic panels), and, to a smaller degree, sustainable transportation solutions.

While the majority of informants said that concern with climate change was their primary reason for deciding to start or join an energy committee, a few emphasised the fact that, when seeking to convince town officials or residents to adopt these technologies, they always cited economic reasons - i.e. being green pays dividends and is cost-effective in the long run - as opposed to trying to convince them to fight climate change at the local level (personal communication with informants #11 and #20). Municipal energy efficiency projects, like swapping incandescent streetlights for LEDs, have been particularly effective at generating financial savings and earning town energy committees the support of town officials.

Most informants correctly identified transportation as the energy hotspot in Vermont, but also noted that this area was the most difficult one to tackle because of how entrenched single-occupancy vehicles are and how few alternative modes of transportation exist. To Vermonters, cars equate independence, and eliciting behavioural changes regarding transportation is difficult. Quantifiable progress in this area has been limited as a result, the most noteworthy being the installation of electric vehicle (EV) charging stations in three towns.

Much of the work that energy committees do, however, has intangible results. Informants noted that a sizeable amount of their time is spent working to identify sites that are suitable for solar arrays, analysing proposals from solar developers to ensure that they are in compliance with state legislation, acting as mediators between private companies and the town government and raising awareness about the energy transition and specific technologies among local residents. Furthermore, their work is sometimes important not so much because of what it achieves, but because of what it helps to avert. For instance, dispelling privacy- and data security-related concerns about smart metres among local residents helped to roll out electric utility Green Mountain Power's smart metre program in the state, and now over 90% of Vermont households have such metres (personal communication with Informant N).

The absence of town energy committee's efforts to popularise wind power at the local level was noteworthy in light of the observations in Chapter 3 regarding the backlash against wind installations in Vermont. Only two respondents mentioned wind power - one to speak of a pre-existing wind farm from which the town received a portion of the profits, and another one to explain that the energy committee started as a result of town residents rallying against plans to build a wind farm locally. The reasons why volunteers abstained from campaigning for wind power are self-explanatory. Anecdotal evidence (personal communication with Informants #2& #3) suggests that energy committees are not effective at repealing plans for which there is popular support or at getting traction for plans to which there is popular opposition. Instead of antagonising locals, they choose to work on those technologies and projects that do not raise controversies.

Notwithstanding their efforts toward popularising small-scale solar arrays, the majority of projects organised by energy committees target energy consumer behaviour (demand) rather than supply (engaging with electric utilities to green the power mix). Seeing how Vermont's power mix is already relatively clean compared to the U.S. average at 45% renewable (EIA, 2017), and how electric utilities have strong policy incentives to promote renewable energy, energy efficiency and distributed generation (VTLEG, 2015), this choice appears rational. Instead of overlapping with policy incentives, town energy committees are working to address those areas that are not incentivised by state policies. Furthermore, a significant part of the energy committees' upstream efforts had to do with aligning local energy targets with the (voluntary) state renewable energy and energy efficiency targets. The difficulty associated with this activity has been finding locally acceptable solutions to site energy installations that do not constitute grounds for complaints about aesthetics or environmental conservation.

The informants' responses indicate that energy committees often trade off time spent strategising, setting priorities and expectations and consolidating their learning mechanisms in order to organise as many external activities as possible. The reason for this state of affairs is that volunteer groups rely on limited manpower and financial resources, and have to make choices about how to spend them. In so doing, town energy committees are trading off activities that could strengthen their internal performance for a greater number of external activities. Previous research into community energy action indicates that this tendency is common amongst such initiatives. Thus, according to Seyfang *et al.* (2014), only half of the community energy projects they researched in the UK actively conducted evaluation or monitoring processes.

Of the five areas that previous studies have identified as being important to the performance of grassroots niches - organisational development, shared vision, expectation and priority setting, level of commitment and learning mechanisms - the town energy committees in Vermont were found to perform best in the area of establishing a shared vision. Most informants (15/18) said that they envisioned a low-carbon, cheap and local energy system that would result in CO2 emission reductions and financial savings for their town.

However, none of the informants - not even the one from the state capital of Montpelier, which has set the ambitious target of becoming net zero by 2030 - had devised a plan or strategies on how to make their vision a reality. Informant #13 opined that it was unreasonable to expect that a group of volunteers, even a group like the one she represented, comprising 15 volunteers that had professional experience in the energy sector- could single-handedly deliver on ambitious energy targets. "[City officials] expect from us to do the type of work that you'd have to pay consultancies hundreds of thousands of dollars to do"(personal communication with Informant #13).

In the absence of plans and strategies, most of the projects that committees perform are piecemeal and contingent upon internal resources and the external support and funding they can secure at a given point in time from intermediary actors like Vital Communities or Efficiency Vermont. Town energy committees therefore find themselves in the position of wanting to bring about structural change (decentralise and decarbonise the energy system) with project-based solutions that are not guided by plans or strategies. This incongruence undermines not only their success, but also saps the level of motivation of their members. Faced with ambitious goals that are not substantiated by a clear direction, volunteers are bound to feel demotivated.

In terms of organisational development, it was found that there was a great deal of heterogeneity; some committees had formalised structures - one was registered as an NGO, another had four sub-committees, while others comprised of only one member. The level of organisational development was naturally reflected in the level of activities; the two energy committees that had only one member also reported having the lowest level of activity, while the more populous committees reported having more activities (which were substantiated with evidence in the form of websites, manuals, articles published in the local press and other activities).

Similarly, the level of time commitment varied among informants, ranging from one hour to 32 hours per month. While most respondents appeared genuinely committed to the cause of combating climate change and to helping their towns save money, the differences observed in their actual commitment appeared to be influenced by three main factors: whether they were retired or not (time availability), whether the energy committee had a core number of volunteers and whether the members had professional expertise in energy or civil society. In one exceptional case, an informant said that she had chosen to work part-time just to free up time for the energy committee.

6.1.3 SRQ1.3: How do they evaluate their own performance?

The majority of respondents (14/18) declared themselves satisfied of partly satisfied when asked to evaluate their performance, though many caveats apply regarding the source of satisfaction. Only one respondent declared himself fully satisfied with the results of the committee's activities. The rest cited reasons for satisfaction ranging from the amount of effort they had put in, either personally or as a group, the bonding and learning experience that working on the group had represented, the results of specific projects and the large number and scope of the projects they had organised. At the same time, respondents noted that their towns were not on track to reaching their renewable energy or energy efficiency goals and that they had learned to patiently "keep chipping away" (personal communication with Informant #11).

In light of the types of activities they are pursuing, which aim to change locals' behaviour regarding energy consumption and production, deriving satisfaction from areas other than absolute performance is important for group morale and to avoid volunteer burnout. While this study has not delved into the topic of behavioural failures surrounding energy consumption, changing behaviour is notoriously difficult and time-taking, and an entire sub-field of environmental economics has drawn on research from psychology and other disciplines in pursuit of ways to achieve it (Politt & Shaorzadeh, 2011). Since consumers are not rational actors and a variety of factors influences their energy-related decisions, eliciting behavioural changes is bound to be a protracted and non-linear process. Measuring performance in terms of other people's responses to awareness campaigns and lobbying would therefore likely lead to frustration for town energy committees.

6.1.4 Overview of the role in the energy transition

The town energy committees were found to operate on a spectrum between grassroots activists campaigning for clean energy and energy efficiency in their communities of place and intermediary actors that fill in voids in expertise and capacity in the resource-constrained local administrations in Vermont. While they correctly identified transportation as the biggest energy-related source of environmental impact, respondents reported little progress in this area because the entrenched dependence on single-occupancy vehicles, limited public

transportation options and long commutes have prevented behavioural changes related to transportation.

In a state with progressive energy policy like Vermont, town energy committees complement top-down policy incentives to green the power mix, promote distributed generation and reduce energy consumption with bottom-up and middle-out efforts to address demand-side aspects like energy efficiency and the pervasive use of cars. Most informants have reported working on promoting technologies to which there has been little opposition from local communities, like small-scale solar arrays, electric efficiency projects like swapping incandescent streetlights for LEDs and thermal efficiency projects, such as the weatherisation of town buildings. Energy committees are therefore constrained to working from a place of consensus, and to look for socially and politically acceptable solutions to push forward the energy transition agenda at the local level. Much of the work that town energy committees do has not generated tangible results, but their mediation efforts amongst a number of local stakeholders are important in light of the increased backlash against large-scale renewable energy installations at the local level.

Meanwhile, in pursuing to maximise their external impact with limited manpower and resources, town energy committees have traded off time spent on activities that would strengthen their organisations, such as establishing clear priorities and expectations, measuring and monitoring their performance and devising learning mechanisms, for external, hands-on projects. The plethora of supportive NGOs active in Vermont have come to their aid by providing tools that enable them to benchmark their performance, measure outcomes and communicate learning.

The private sector representative and the Vital Communities program manager interviewed have credited town energy committees with becoming the local energy experts that facilitate the communication of know-how on clean energy programs and technologies existent at the state level to their communities of place. Regarding their role in the energy transition, Informant #18 noted that the "energy committees are not going to bring us 90% by 2050, because they don't have control over the capital mobilisation and state policy, the big levers, but without their groundswell of support to do the kind of work we want to do, which is to build markets and capacity and public-private relationships, it wouldn't be possible without them".

While a majority of informants said that they were satisfied or partly satisfied with the accomplishments of their committee, self-assessment was an inconclusive metric to measure their effectiveness in the energy transition because of the broad range of personal reasons given for and against self-assessed effectiveness, and because much of their impact is intangible. The extent to which energy committees can affect their communities of place was found to be influenced by a variety of external factors, including the town's average income level, the personal opinions and personalities of town officials and even landscape factors, such as low oil prices, which have made it more difficult to make the economic case for energy savings.

6.2 The challenges with which town energy committees grapple

Out of the five categories of challenges and enablers to community energy initiatives that Seyfang *et al.* (2013b) identified (see Table 2-4), three appear to be the most pertinent in the case of the Vermont energy committees - community support, group-related challenges (volunteer participation and burnout) and policy support. Furthermore, the results of the

longitudinal survey by Vital Communities (see Annex D) suggest that volunteer burnout and participation may in fact be a more important obstacle than the current research indicates.

These findings contrast significantly with the challenges encountered by community energy projects in Europe (Yildiz, 2014; Bauwens *et al.*, 2016; DGRV, 2015), which were related mostly with financing and policy support in the form of market-based instruments. The difference stems from the types of activities in which the town energy committees in Vermont engage, which comprise primarily policy and planning support and community outreach, and which do not require large amounts of upfront investment. In those cases where financing was needed for large town projects, it tended to come out of the town budget. One exception to this was identified, where the energy committee chair set up a solar developing company and built two solar installations himself (personal communication with Informant #14).

While informants did not identify financing directly as their leading challenge(s), it was brought up during interviews as an impediment to municipal energy projects and to people weatherising and solarising their homes, as noted in Section 6.1. For weatherising, in particular, one informant noted that it was particularly difficult to get residents interested because initial home energy audits always cost money, whereas solar developers visit homes for free to assess whether they meet the prerequisites for solar installations. "You're basically asking people to pay money [for the energy audit] in order to find out how much more money they have to pay [to weatherise their homes]. So it's hard to convince them. That's why being able to offer discounted energy audits makes a difference" (personal communication with Informant #12).

The challenges reported by informants in Vermont were also different compared to those encountered by Seyfang (2009) in an early survey of Transition Towns in the UK. In that study, the primary challenge that informants faced was growing the movement, followed by project- and network-related challenges. Meanwhile, none of the informants in Vermont expressed an interest in expanding the network of town energy committees outside of state borders, but rather stated that their focus was on making their local communities more sustainable. Conversely, informants did not cite either network or other project-related challenges as important hindrances. Unlike Transition Towns, for which building links to networks was found to be a challenge, networks of like-minded stakeholders have acted as enablers in the case of the town energy committees in Vermont, with actors like VECAN, Efficiency Vermont and Vital Communities providing logistical, know-how and even operational support.

6.2.1 Volunteer burnout and participation

Seyfang & Smith (2007) note that, when it comes to grassroots initiatives, "experience suggests initiatives spend 90% of their time simply surviving, and only 10% developing the activity" (p. 596). A study of eco-villages in the U.S. found a similar situation, with only about 10% of such initiatives surviving (Christian, 2003). This state of affairs has implications for the performance of the initiatives, the authors argue, because a large percentage of them do not become robust enough to withstand volunteer turnover, shifts in policy, variations in financing and other external pressures. Such organisations, more often than not, also engage in piecemeal projects and fail to leave a lasting mark in the form of consolidated learning, and therefore to support the dissemination of the practices that they advocate for into the mainstream.

The abovementioned figures do not appear to faithfully reflect the level of activity of the energy committees in Vermont, for informants generally sought to minimise the time spent on internal organising in order to devote more time to activities involving local stakeholders; but the authors' general observation that the effectiveness of volunteer-based grassroots organisations is often hampered by their reduced ability to sustain themselves also applies in the case of the town energy committees in Vermont.

While only a third of informants listed volunteer burnout and participation as their main challenge when asked specifically what their main challenge was, 13 of the 18 committees under study mentioned at some point during the interview encountering difficulties in recruiting new members, particularly young members, in keeping members engaged and participating in activities and in replacing those that leave. The fact that almost half - nine of 20 informants - were retired[1] goes to show that, in general, the level of participation in energy committees among working-age individuals is lower than that of retired individuals and that time availability is an important factor in determining their commitment level.

This partly explains why committee members have made efforts to professionalise their work either by lobbying for their municipalities to hire full-time sustainability coordinators in larger towns (Hartford), by hiring interns funded from grant money in smaller ones (Bethel) or, in many cases, by having volunteers themselves become increasingly specialised in the field of energy and grassroots engagement, regardless of their previous professional experience. This tendency is not unique to grassroots energy initiatives. In a study of Irish volunteers working in healthcare services, MacNeela (2008) notes that there was increased pressure for volunteers to become professionalised. Middlemiss & Parish (2010) also found that community energy initiatives in the UK credited their high level of professionalism with the strength of their group.

However, hiring full-time sustainability staff is only an option for larger towns where the local tax base is large enough to cover expenses associated with staff wages (personal communication with Informant #16). Meanwhile, in smaller towns, volunteers are likely to remain the only solution to filling voids in expertise and manpower in the local administrations and to conducting outreach projects for town residents for the foreseeable future. Some possible solutions to counteract the problem of volunteer participation that informants have listed are organising outreach events and seeking to recruit volunteers from amongst participants and setting up a committee with a core group of friends and acquaintances, whenever possible, that would keep the organisation going even as other volunteers come and go.

6.2.2 Community support

Communities constitute an obstacle for grassroots energy initiatives if the latter fail to overcome their mistrust of or disinterest in new energy systems (Seyfang *et al.*, 2013b). In the case of the town energy committees in Vermont, slightly more than a third of the informants noted that the town residents were not engaged enough - that they did not attend events to the extent desired or failed to take action on weatherise and solarise campaigns.

In listing insufficient community support as a challenge, informants noted that the problem tended to be passivity, rather than outright hostility and that town residents were simply too

[1] According to USCB (2017), slightly less than a fifth of the population of the state was of retirement age in 2016.

busy, that there were many initiatives taking place in town and that some of the actions that town residents were encouraged to take required upfront investments. The general community attitude toward the energy transition contrasted with the strong convictions that informants reported having regarding the importance of environmental conservation, community development and climate change action.

Some energy committees appear to have developed successful formulas for engaging with residents by leveraging popular town events or places, using a combination of communications tools and channels and revisiting engagement plans to optimise them. In the context of small towns, in-person interactions were deemed preferable, informants also noted that only a limited number of residents could be reached in this manner, and that creating an email list early on or using online forums was necessary in order to expand outreach. While the level of civic engagement varies from town to town, following some of the tried-and-tested tips to set up a successful committee (such as starting off with a big event to gauge community interest and putting together an email distribution list, See Annex D) could help to partly offset this challenge.

6.2.3 Policy support

Informants appeared divided about the level of state policy support for renewable energy and energy efficiency in Vermont, with some noting that state policy had been progressive and supportive of renewable energy, particularly thanks to generous net metering laws, and others complaining about frequent legislative changes, policy gridlock and lack of support from town officials. Only three informants brought up uncertainty in federal policy as a source of concern within the context of challenges they faced; direct questions about this topic were not addressed following preliminary interviews, which indicated that the topic could significantly derail the course of discussion.

Respondents converged on the fact that net metering credits for distributed generation have become less generous over time and contingent upon the placement of such installations on rooftops, parking lots and brownfield sites (VTLEG, 2015). Informants have argued that these stipulations have complicated the process of land planning at the local level and made it more difficult for both municipalities and individuals to build ground-based solar installations.

Seeing how local officials have influence over local funding, plans and the residents, being in open conflict with them hampered those committees that found themselves in that situation. As per the VECAN manual (VECAN, 2007), energy committees have the complicated mandate of proposing impactful projects that are cost effective and also aligned with broader town projects and strategies. In the language of socio-technical regimes, energy committees are tasked with both disrupting established regimes and working in harmony with them and proposing solutions that are appropriate, yet transformative of the regime (Smith *et al.*, 2013).

Working in harmony with the regime and changing it at the same time is not easy, not least because town energy committees have to negotiate around the interests of town officials (ensuring popular support for projects, lowering local taxes, economic benefits for the town and driving their own individual agendas forward). Consequently, most informants said that efforts were made to maintain good relations with town officials, even if the latter were not supportive of their activities.

However, as Trapese (2008) rhetorically asks in a book on Transition Towns, "there's also much talk of win-win situations, creating initiatives that can please very different groups. But,

at some point, someone has to lose. [...] If we are looking for win-win situations, then we are looking for easy victories, which actually may be very little in the way of steps forward" (p. 25). Be that as it may, volunteer groups in Vermont appear to be poorly equipped to take stakeholders with more influence heads on. Instead, seeing how attentive local administrations are to the direction in which the state is going, policy is a more influential lever when it comes to influencing local administrations on controversial issues.

6.2.4 SRQ2.1: How do these challenges affect their performance?

As discussed in Section 6.1, the town energy committees in Vermont have tended to forgo a number of internal organisational processes (expectation and priority setting, establishing learning mechanisms, evaluating performance), in favour of performing more hands-on, external activities. Meanwhile, their external activities are mostly aimed at changing energy behaviour in their communities of place, which is a notoriously protracted and difficult task. Stuck between a rock and a hard place - weak internal processes and difficult external goals, energy committees unsurprisingly display a high level of volunteer demotivation and burnout, which is typical of volunteer groups in general (MacNeela, 2008). This state of affairs inevitably influences their performance; groups with internally weak structures and poorly defined goals scramble to do as much as possible in a piecemeal fashion, but whether or not this modus operandi is sustainable is questionable.

Since local residents and officials are the main groups that town energy committees target through their activities, it is little wonder that insufficient support from these stakeholders were identified as important challenges. Locals' behaviour and decision-making around energy illustrate the fact that town energy committees do not control all the variables that influence energy decisions at the local level, and that their accomplishments result from negotiating with and incorporating other groups of interest.

6.3 How to enhance their effectiveness

As noted in Section 6.1, it is difficult to establish a blueprint for what makes volunteer organisations successful because the cultural capacity of communities and the personal capacity of volunteers themselves vary widely (Middlemiss & Parrish, 2010). However, this section draws on findings, grey literature about volunteer organisations and the academic literature on socio-technical systems to make a series of observations.

The town energy committees in Vermont that reported the highest levels of activities fell in three main categories:

- committees that were run by energy professionals or by people that ran NGOs for a living;
- committees that were steered closely by intermediary actors, like Vital Communities;
- committees that had a core team of volunteers. Additional favourable factors were when the volunteers were part of the same social circle and had more time availability (if they were retired),

Since town energy committees do not control the first two variables, starting off with a core team of volunteers is the only solution within reach to all of them. As recommended by the Waterbury LEAP (See Annex F), energy committees should start off with a large event and make sure to enhance their outreach by either using pre-existing town email lists or servers or creating their own. Secondly, as per Vital Communities' recommendation, town energy

committees should seek to work on at least two activities at a time that involve different groups of stakeholders in order to avoid getting stuck on one front.

Thirdly, in order to avoid volunteer demotivation and burnout, town energy committees should seek to define more concrete mission, vision and goals, and to substantiate those with projects that align with them. Time spent strategising could be a boost for internal motivation. While none of the town energy committee representatives spoke about the local energy organisations in the neighbouring state of New Hampshire, it was found that the organisation that oversees them has put together a toolkit of strategies (NHEnergy, 2017) that require little time commitment to execute (the activity of devising a strategy is estimated to take 20 minutes) and that could provide more direction for these volunteer groups.

Lastly, Vital Communities was found to play a key role not only in aggregating knowledge and networking opportunities, but also in providing ongoing guidance and connecting energy committees with markets for clean energy technologies. While only a part of Vermont falls within its scope (the Upper Valley), other intermediary organisations could step in to provide ongoing support to the town energy committees that are located elsewhere. Private companies like solar developers and energy auditors, in particular, could benefit from reaching out to the town energy committees themselves. Furthermore, since the Vermont state legislature recognises the importance of town energy committees in developing local know-how (VPS, 2016), state resources in the way of making staff available to provide ongoing operational support to town energy efficiency could enhance their effectiveness.

6.4 Reflections on methodology

In light of the findings and analysis in Chapters 5 and 6, two of the metrics selected to measure the impact that town energy committees had on Vermont's energy transition (RQ1) were found to be irrelevant to the case at hand. A summary of the reflections on each metric is included in Table 6-1 below.

	Metric	Finding	Relevance to this study
Internal factors	**Organisational development**	Great deal of heterogeneity, depends on volunteers' personal capacity and cultural capacity of community	Relevant in that the bigger the committee and the more developed, the more activities it organises.
	Shared vision	Majority of informants shared a vision of clean, cheap, local energy.	Relevant. Vision is general, not necessarily substantiated by projects.
	Expectation and priority setting	Only conducted by a third of committees, mostly under supervision of Vital Communities.	Relevant, lack of direction likely contributor to volunteer burnout.
	Level of commitment	Varied depending on personal factors (employment status), strong moral commitment to cause	Relevant but not always a good predictor of outcomes.
	Learning mechanisms	Almost no formal internal learning mechanisms, most learning aggregated through intermediaries.	Irrelevant. Learning aggregated by pre-existing network of intermediaries
	Self-assessment (level of satisfaction with performance)	Failed to capture actual impact or outcome levels, outcomes of activities often have intangible results	Irrelevant.

Network interactions	**Directions of intervention (upstream, downstream, sideways)**	Interventions focused up- and downstream, and support came sideways.	Relevant. Strong networks that preceded energy committees and provide ongoing support.
	Level of activities	Varied strongly, but largely project-based and not aligned with overarching strategies.	Relevant to gauge impact, but outcomes frequently unclear.
	Network support (aggregation of learning, guidance, networking).	Strong network support, particularly so in the Upper Valley region; networks help committees not only through aggregation, guidance and networking, but also to benchmark themselves and their towns and by connecting them to markets.	Relevant.

Table 6-1 Typology of factors used to answer RQ1 and relevance to present case

While this typology was useful in understanding the internal and external functioning of the town energy committees, it failed to capture factors related to the cultural capacity of communities and the personal capacity of volunteers, like values, skills and tacit knowledge, which Middlemiss & Parrish (2010) and Hargreaves *et al.* (2013b) identified as being important to grassroots energy initiatives. Therefore, this typology does not explain how confidence and capacity are built at the local level. Furthermore, self-assessment was found to be an inconclusive metric for effectiveness, as mentioned earlier, because respondents followed their answers with a great diversity of caveats ("I am somewhat satisfied, but...").

Regarding the typology of enablers and challenges to community energy devised by Seyfang *et al.* (2013b) that was used as a backdrop to answer RQ2 - see Table 2-4, one was identified as an unequivocal enabler - networks, three were mentioned as challenges - group-related challenges (volunteer burnout/participation), community support, policy- and one - project-related challenges - was not conclusively determined to be either a challenge, nor an enabler. Vermont informants also brought up landscape-related challenges, like low oil prices, and demographics (the fact that youth in rural communities is in short supply) that are not captured in Seyfang *et al.* (2013b)'s typology. The authors devised the typology based on a literature review of community energy in the UK, and did not purport that it was comprehensive.

The choice of qualitative data collection fulfilled the purpose of constructing a rich account of the complexities related to energy transitions at the local level in Vermont, but did not provide conclusive trends reflecting the factors that facilitate or hamper the activities of town energy committees. A notable exception to this is the importance of the strong networks of intermediary actors that support their activities through ongoing guidance, learning aggregation and networking.

7 Conclusion and recommendations

This thesis set out to study the role of a network of local energy actors in the energy transition in a developed world, rural context - the U.S. state of Vermont. While much of the research on energy transitions to date has focused on cities, rural areas are important because they have been the destination for a significant amount of investment in renewable energy (OECD, n.a.). At the same time, rural areas grapple with an economic downturn that stems from the long-term decline of agriculture as a major source of income, which has led to socio-economic effects like depopulation and a shortage of human and financial capacity at the local level (Bergmann *et al.,* 2008). Rural areas also tend to be less energy efficient on a per capita basis compared to cities, with transportation and heating in buildings being major sources of environmental impact, and to be slower at adopting new technologies (Hui, 2001). Vermont is one of the more progressive states in the U.S. when it comes to clean energy policies, but the proliferation of renewable energy installations, particularly of utility-scale wind farms and solar arrays, in recent years has given rise to community backlash against such technologies (Rowse, 2014).

Using a triangulation approach based on literature review, qualitative data collection and the results of a longitudinal survey conducted by a Vermont-based NGO, this study set out to answer three main research questions related to the role of local actors in the energy transition in Vermont.

RQ1: What role do town energy committees play in the energy transition in Vermont?

The town energy committees were found to play an important role in filling voids in capacity and expertise in local administrations, and in campaigning for energy efficiency, renewable energy (particularly solar power) and sustainable transportation in their communities of place. The level of activities they engage in was found to vary widely depending on the locality where they operate and the capacity of every group, and to range from awareness raising to helping in the construction of municipal energy generation infrastructure. Most of their projects were found to address energy consumer demand, and to complement policy instruments that incentivise renewable energy and energy efficiency on the supply side. Attempts to measure the effectiveness of their performance using a proxy metric were unsuccessful, not least because much of their work has intangible results -mediating among different stakeholders, bringing expertise to the local level and campaigning for behavioural change. In an effort to maximise their external impact, town energy committees tended to trade off time spent on activities that would strengthen their organisations internally, such as setting clear expectations, benchmarking themselves and developing mechanisms to communicate and consolidate learning. In terms of the roles of actors in socio-technical systems, town energy committees were found to operate on a spectrum ranging from grassroots activism to intermediary actors, and to benefit from a strong network of local NGOs that support their activity. Nevertheless, in the absence of clearly defined strategies and goals, town energy committees were found to adopt a project-based approach while pursuing structural changes in energy systems.

RQ2: With what challenges do town energy committees grapple?

The most frequently identified challenges were insufficient support from the stakeholders that town energy committees engage with the most - local residents and officials, as well as

volunteer participation and burnout. The latter problem appears to affect grassroots groups in general; Seyfang & Smith (2007) noted that grassroots groups spend 90% of their time struggling to survive. In larger towns in Vermont, this challenge was addressed by convincing the municipality to hire full-time sustainability employees; smaller towns hired interns funded by grants. Across the spectrum, volunteers sought to specialise themselves in energy issues, and those volunteers that worked in the energy sector or in civil society reported greater levels of success. There is no blueprint as to how to ensure higher levels of community and policy support, because both aspects depend on the cultural characteristics of the towns and on the personal capacity of the volunteers themselves (Middlemiss & Parrish, 2010), but working on several fronts with different stakeholders at the same time and employing tried-and-tested strategies to enhance community engagement can partly offset this challenge. The centrally-run solarisation and weatherisation campaigns organised by a local NGO, Vital Communities, were successful because they removed some of the financial impediments to the adoption of clean energy by linking town energy committees with private companies; and because volunteer groups received ongoing logistical support from NGO employees during the campaigns.

RQ3: How can their effectiveness be enhanced?

The most effective town energy committees had a core group of volunteers that kept them going at all times, who had time availability by virtue of being retired or who were run by energy and civil society professionals. Starting off with a core group of volunteers was identified as an important factor to sustaining the activity of the committees. Therefore, it is recommended that individuals who are thinking of starting an energy committee rally support from other volunteers early in the process. Furthermore, setting clear strategies and plans may be less time-consuming than anticipated, and could improve the sense of direction and motivation of group members. NGOs in Vermont and the neighbouring state of New Hampshire have made available toolkits on how to run an energy committee, addressing their most common challenges including how to set priorities and maintain momentum. However, the utility of toolkits and handbooks -decontextualised learning - over time and across different contexts is limited. When receiving ongoing guidance from intermediary actors like Vital Communities, town energy committees proved to be more successful. Replicating the type of campaigns that the NGO runs all over the state would enhance the effectiveness of local volunteer groups.

The author has refrained from providing generic recommendations to the town energy committees about how to run their groups, because informants with more experience in civil society organisations and better knowledge of the local context are better positioned to give such advice. Furthermore, these actors have already prepared and published a copious amount of grey literature (guides, videos, websites, manuals, handbooks, strategy sheets) to support the activity of town energy committees. Reiterating their advice here in a generic form would add little value for actors whose activity is very context-dependent. However, in light of the findings of this study, a possible topic for future research has emerged, namely to further study the personal capacity of local energy volunteers and the cultural capacity of their communities in order to better understand how trust in regime disruptors - and consequently in new technologies - is established at the local level.

Seeing how much effort, motivation and passion it takes to do the kind of work that town energy committees do with limited resources and while navigating a complex socio-economic landscape, the author hopes that his study will provide insights that local actors find helpful to inform their future activities.

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Appendix:

Annex A: List of informants from on-site visit

Name of institution	Name of informant and position	Informant Code
Vermont Public Service	Anne Margolis, renewable energy development director	Informant A
CleanTechnica	George Harvey, journalist	Informant B
Biomass Energy Resource Center	Adam Sherman, NA	Informant C
Resilient Design Institute	Alex Wilson, founder	Informant D
Vermont Energy & Climate Action Network	Johanna Miller, Program Director	Informant 1 (see Table 3-1)
Brattleboro Bioenergy Park	Bob Spencer, Manager	Informant E
Energy Action Network	Linda McGinnis, Program Director	Informant F
Former public service official and founder of the Headwaters Garden & Learning Centre eco-village	Gwendolyn Hallsmith, NA	Informant G
ISO New England (integrated grid manager for New England)	Eric Johnson, dir., external affairs	Informant H
Green Mountain Power (largest electric utility in the state)	Kirk Shields, dir. dev. & risk	Informant I
Vermont Energy Investment Corporation (VEIC)	Damon Lane, lead analyst	Informant J
Burlington Electric Department (electric utility)	James Gibbons, dir. projects & planning	Informant K
Clean Energy Development Fund	Andrew Perchlik, director	Informant L
Regulatory Assistance Project (RAPonline)	Rick Weston, dir., China program	Informant M
Weybridge Energy Committee	Fran Putnam, chair	Informant 2 (See Table 3-1)
Renewable Energy Vermont	Olivia Campbell, Exec Dir	Informant N
Vermont Energy Co-op (electric utility)	Christine Hallquist, CEO	Informant O

Annex B: Interview questionnaire and protocol

Before the interview: background research on the town and informant were conducted. Short summary of research project, and permission to record the conversation and use the information was solicited.

A. Background and organisational aspects:

1. When was your committee established and when did you join?

2. How many members are there in your committee?

3. What is the official affiliation of the committee?

4. How much time do you dedicate to the town energy committee per month?

5. Why did you decide to join the energy committee?

6. What are your committees' mission and vision?

B. Projects and stakeholder engagement:

7. In its 2007 manual for energy committees, VECAN makes a series of recommendations about the types of projects that committees can conduct. In which areas are you the most active?

8. Can you give examples of some of your main projects in the past?

9. Who are the main stakeholders that you work with?

10. In what ways do you engage with them and what has your experience of working with them been like?

C. Internal dynamics

11. How do you establish your priorities?

12. Do you evaluate and monitor your performance? If so, what were the results of past evaluations?

13. What lessons did you learn that you could apply to future projects and how do you determine the takeaways from past projects?

14. Before embarking upon projects, how do you define the expectations?

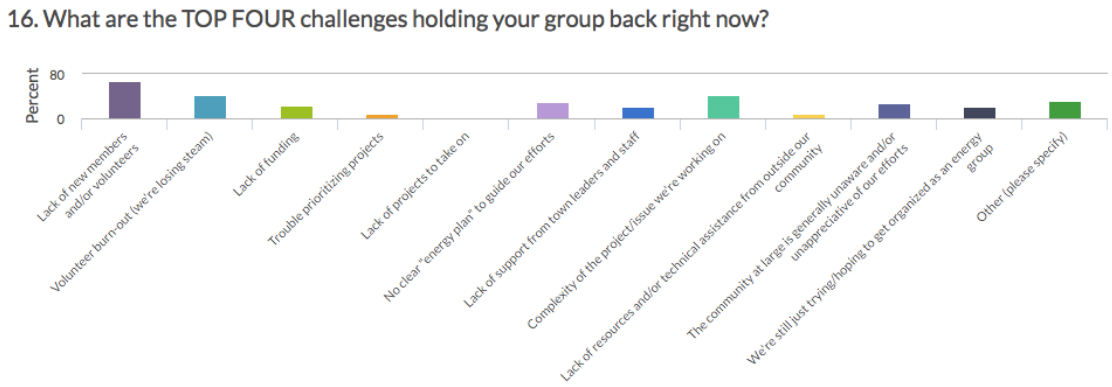
D. Challenges and self-assessment

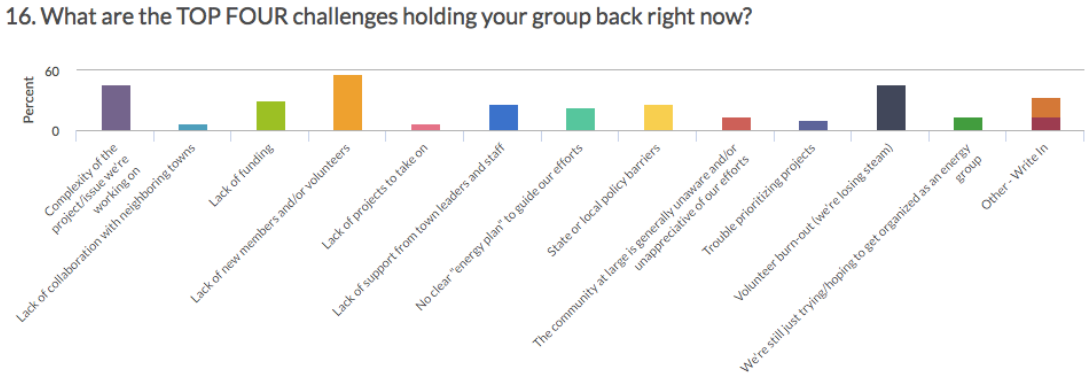
15. What are the main challenges your committee has encountered over the years?

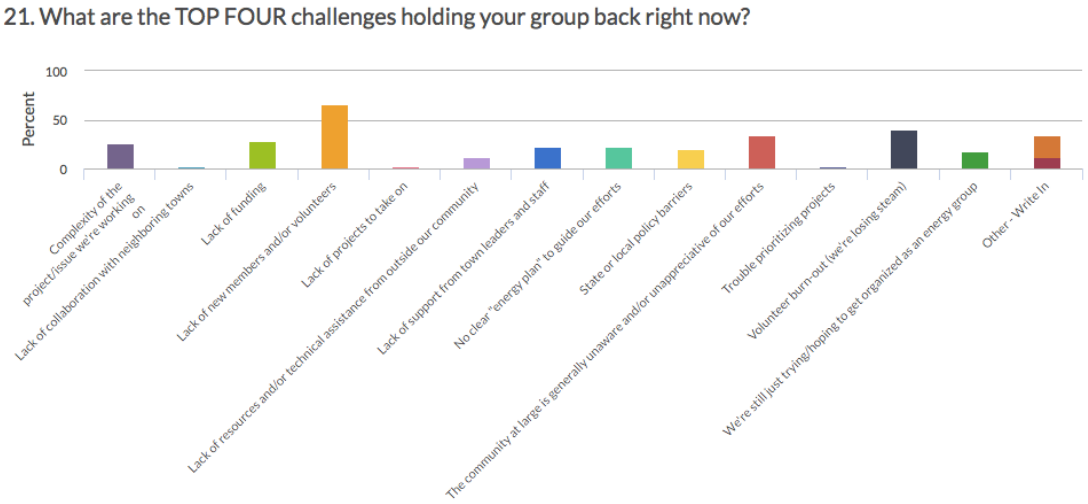
16. How satisfied are you with the performance of your energy committee (satisfied, partly satisfied, not satisfied)? Please explain.

Concluding remarks. Is there anything else you'd like to add that I may have missed?

Annex C: Results of Vital Communities Survey





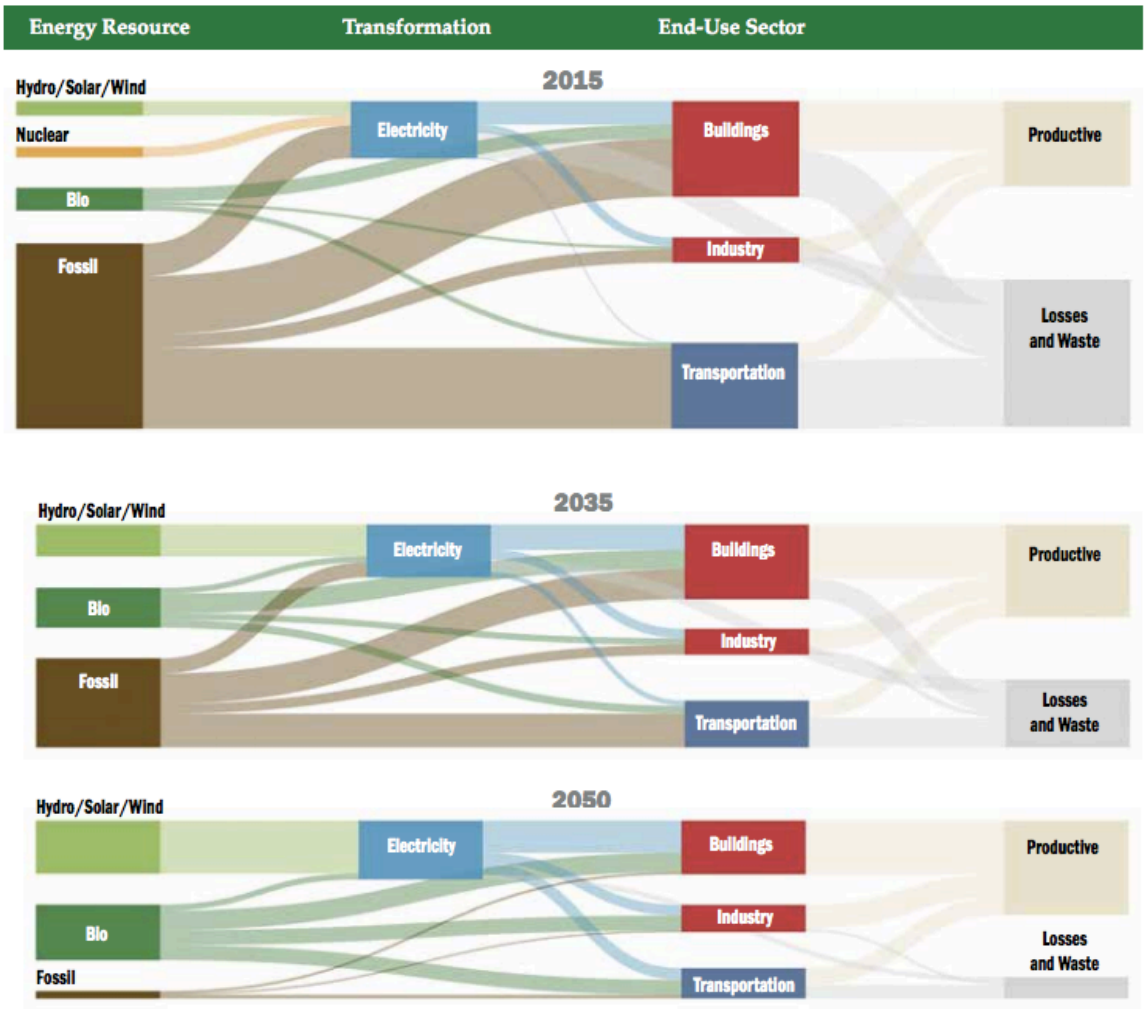


The top four challenges that energy committees faced in 2015, 2016 and 2017. Source: Vital Communities.

Annex D: Coding criteria for RQ2 (challenges committees face)

Coded theme	Types of challenges grouped under this theme
Insufficient community support	No civic spirit, popular opposition, people only come together to oppose things, generating interest in energy is difficult, convincing people is difficult, hard to convince people to do anything.
Insufficient manpower	Hard to keep everyone involved, lack of dedicated staff, lack of volunteers, not enough people power, not enough people to do more, getting people on the committee to be more active.
Policy and local officials	Political gridlock, tougher regulations, select board not supportive.
Funding	Not enough funding, lack of money.
Youth	No young members, no youth.
Oil prices	Oil prices.
Other	School officials unsupportive of anti-idling campaign.

Annex E: Vermont's 2015 energy flow and forecast flows for 2035 and 2050



Source: VPS (2016)

Annex F: Tips on starting and running an energy committee

1. **Organize an event to identify interested folks and help kick things off.**
   In March 2007 we organized a local 'Step It Up' event. 125 people attended, 60 people signed our clipboard saying they wanted to help Waterbury become more energy efficient, and LEAP was born.

2. **Build a strong E-Mail Distribution List**
   E-mail is the best way to connect with a large group of folks. Gather e-mails all the time at local events from 'like-minded' folks. Write e-mails carefully. Make them brief, relevant, and periodic.

3. **Decide on your organization's mission and goals**
   It's critical to decide on a clear mission and structure. What are you trying to accomplish, and who is responsible? It helps to have core group of folks (5+) who can be counted on to show up and help.

4. **Attend as many town events as possible and be visible**
   LEAP has had displays at town fairs, farmers markets, Home & Garden shows, July 4th parades, and other activities. Over time more people began to know about us in town and hear about our work.

5. **Pick a few projects that are tangible, useful and measurable**
   People like to be part of a group that is accomplishing something. Pick a few projects that are tangible, achievable, measurable, and fit your mission. Get them done, and then report success to your members and the town. You will soon find more people want to join your effort.

6. **Run periodic and efficient meetings**
   The quickest way to sap an organization's energy and enthusiasm is to hold long, rambling meetings that never quite come to any decisions. Each meeting should have an agenda. The meeting leader must keep discussion on subject and on time. Start and finish the meeting on time, and clarify 'to do's' at the end. People are much more likely to attend meetings if they know things will get done.

7. **Everybody can benefit from the work of a Town Energy Committee**
   There are projects a Town Energy Committee can conduct that help individuals, businesses, schools, social organizations and the municipality save energy and money. Let them know what you can do for them. The more constituencies involved in your work, the more support you'll receive.

8. **Don't be afraid to ask for ideas and support**
   Vermont is such a sharing, cooperative state. Since 2007 Waterbury LEAP has never had anyone in the environmental and energy community turn down a request for ideas or support. *Just ask!*

9. **Involve town leaders**
   Always invite town leaders (selectboard, planning commission, town manager) to your events, and give them updates on your progress. It really helps to have them on your side.

10. **Pace yourself, and take the long view**
    Don't take on more than you and fellow volunteers can accomplish. You'll burn out. Plan reasonable, achievable goals for the next couple of years. Build on your successes, and celebrate your achievements. Don't fret about what you didn't accomplish. Focus on what you did get done. The planet really needs our help. This is interesting, fun, and very important work. *Go for it!*

Source: Waterbury LEAP

Annex G: List of informants

Informant	Name	Committee/ institution	Interview channel	Date (2017)
1	Johanna Miller	VECAN program coordinator	In-person & telephone	June 8, July 28
2	Fran Putnam	Weybridge energy committee	In-person & written answers	June 14, August 4
3	Trish Lewis	Pittsford energy committee	Written answers	July 24
4	Peter Bergstrom	Rockingham energy committee	Skype interview	July 26, 2017
5	Karl Kemnitzer	Hartland Energy Committee	Telephone interview	July 27
6	Sara Gluckman	Glover energy committee	Telephone interview	July 27
7	Karin McNeill	Calais energy group	Telephone interview	July 27
8	Todd Kowalczyk	Kilington energy committee	Telephone interview	July 28
9	Phyl Newbeck	Jericho energy task force	Telephone interview	July 28
10	Jose Lazo	Bethel energy committee	Telephone interview	July 29
11	Alan Johnson	Hartford energy committee	Telephone interview	July 29
12	Linda Gray	Norwich energy committee	Telephone interview	July 29
13	Kate Stephenson	Montpelier energy advisory committee	Telephone interview	July 30
14	Jim Hand	Dorset energy committee	Telephone interview	July 31
15	Jock Gill	Peacham town energy coordinator	Wire interview	July 31
16	Bob Walker	Founder of energy committees	Telephone interview	July 31
17	Anonymous committee co-chair	Anonymous energy committee	Telephone interview	August 2
18	Sarah Brock	Vital Communities (NGO)	Telephone interview	August 2
19	Jim Sullivan	Bennington County Regional Commission	Telephone interview	August 2
20	Duncan McDougall	Waterbury LEAP	Telephone interview	August 5
21	Warren King	Ripton energy committee	Telephone interview	August 7
22	Leigh Cameron	New England Grassroots Fund	Telephone interview	August 8
23	Amelia Fritz, Mabel Houghton, Lisa Sammet	Craftsbury energy committee chair (Amelia) and members	Telephone interview	August 8
24	Ralph Meima	Green Lantern Capital	Telephone interview	August 18