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Arwen Colell

Alternating Current – Social Innovation in Community Energy

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Diese Buchreihe beschäftigt sich mit den globalen Verteilungskämpfen um knappe Energieressourcen, mit dem Klimawandel und seinen Auswirkungen sowie mit den globalen, nationalen, regionalen und lokalen Herausforderungen der umkämpften Energiewende. Die Beiträge der Reihe zielen auf eine nachhaltige Energie- und Klimapolitik sowie die wirtschaftlichen Interessen, Machtverhältnisse und Pfadabhängigkeiten, die sich dabei als hohe Hindernisse erweisen. Weitere Themen sind die internationale und europäische Liberalisierung der Energiemärkte, die Klimapolitik der Vereinten Nationen (UN), Anpassungsmaßnahmen an den Klimawandel in den Entwicklungs-, Schwellen- und Industrieländern, Strategien zur Dekarbonisierung sowie der Ausstieg aus der Kernenergie und der Umgang mit den nuklearen Hinterlassenschaften.
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This book series focuses on global distribution struggles over scarce energy resources, climate change and its impacts, and the global, national, regional and local challenges associated with contested energy transitions. The contributions to the series explore the opportunities to create sustainable energy and climate policies against the backdrop of the obstacles created by strong economic interests, power relations and path dependencies. The series addresses such matters as the international and European liberalization of energy sectors; sustainability and international climate change policy; climate change adaptation measures in the developing, emerging and industrialized countries; strategies toward decarbonization; the problems of nuclear energy and the nuclear legacy.
The series includes theory-led, empirically guided, quantitative and qualitative international comparative work, investigations of cross-border transformations, governance and multi-level processes, and national "best practice"-examples. The goal of the series is to better understand societal-ecological transformations for low carbon energy systems, energy transitions and climate protection.

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1 Introduction

1.1 A Story of Social Innovation

Standing on the ferry in the spring of 2016, I watch as the island of Samsø grows larger on the horizon. I am visiting an exception. As I set foot on the small island in the Kattegat, ten years have passed since the local community achieved a 100% shift to renewable energies, offsetting any remaining fossil fuel consumption with additional renewable capacities. I am visiting an exception that should be the rule. Energy system change is an old idea. Internationally, the academic and political debate on shifting the fuel base away from fossil and towards renewable resources dates back, at least, to the oil price shocks and growing environmental awareness of the 1970s (Lovins 1979 (1977)). Yet, the challenge prevails. The most recent report of the United Nations' Intergovernmental Panel on Climate Change concluded that just a decade remains to limit global warming to 1.5 °C and avoid the direst consequences of climate change (IPCC 2018). Energy consumption accounts for over 80 percent of greenhouse gas emissions (UBA 2016). Providing warmth in winter or light in darkness, energy is inextricably linked to people's everyday lives. How to breathe new life into the old idea of energy system change? Could we all become Samsø—and should we?

Shifting human life systems such as energy infrastructure to perform sustainably requires fundamental change. Increasingly, scientists are emphasizing the socio-cultural parameters underpinning and driving this change. Social scientists use the term 'imaginaries' to describe the values, institutions and narratives people use to imagine their social situation and its prospects. Sheila Jasanoff and

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Sang-Hyun Kim apply this concept to socio-technical systems to explain the connotations of public purposes and common welfare within visions for scientific and technological progress (Jasanoff and Kim 2015). Providing new solutions also includes providing new ideas for their meaning and legitimacy, and related knowledge resources (Göpel 2016, p. 161). New ideas and solutions may shift power relations and improve the capabilities of individuals and communities involved (Nicholls and Ziegler 2017(2015)). Social innovations focus attention on the ideational and material capabilities of individuals and communities to assume power in decision-making and implementation. Against this backdrop, this book provides answers on how social innovations in community energy can explain energy system change: How do social innovations in community energy explain energy system change?

Answers are based on the qualitative analysis of five cases of community energy, the Elektrizitätswerke Schönau (EWS) and olegeno in Germany, the Renewable Energy Island of Samsø in Denmark, and Fintry Development Trust (FDT) and Green Energy Mull (GEM) in Scotland. These five cases provide examples of renewable energy projects majority-owned and managed by citizens, and providing diverse energy services including production, distribution, retail, as well as reduced and efficient consumption. While all three countries include targets for renewable energy generation in their respective climate change mitigation strategies, different policy approaches were chosen to attain them. The analysis included data obtained in semi-structured interviews and workshops, as well as documents and reports provided by projects, national strategy and policy documents. Data were processed with methods of situational analysis (Clarke 2003).

Stories of energy system change often tell tales of civil society engagement. The German 'Energiewende', the shift of the energy sector to a renewable resource base has resulted in a roughly 40% share of renewable energies in electricity generation to date. Citizens' financial and organizational investments account for the lion's share of this (trend:research and Leuphana Universität Lüneburg 2013). Often, this is attributed to the technological features of renewable energy generation, well-suited to small scale, decentralized production units. But renewable energy implementation shows that scalability and centralization of renewable energy production are not only possible but openly desired pathways of technology development by energy utilities and policy makers alike (Grashof 2019). Parameters of technological innovation alone do not explain civil society engagement. Also, citizen-owned projects across the country and beyond the German case share organizational purposes of accountability and legitimacy, and paradigmatic features such as sustainability or civil society control. But they do not necessarily share policy parameters fostering investment or organization, such as the German feed-in tarif frequently invoked when seeking an explanation for the excitement of citizens with photovoltaics (PV) and wind turbines.

What drives citizens to implement system alternatives to energy infrastructures, if it is not technological or economic opportunity? What role is there for political strategy? And what happens within these projects that are implementing alternatives to conventional energy system structures? The academic literature provides many and diverse answers to these questions. A unifying theme in the political economy, political science and sociology literature is the recent call of scholars to recognize people as social beings and their socio-cultural belief systems in explanatory approaches to processes of change (Göpel 2016, p. 158). Stories of social innovation provide additional depth to such approaches by including the study of power dynamics. Social innovation approaches specifically focus on the ability of individuals and communities to alter power relations by developing and implementing new solutions and processes (Nicholls and Ziegler 2017(2015); Ziegler 2017). To understand the relationship between social innovations and energy system change in community settings, this study combines the analysis of social innovations with resource mobilization theory (McCarthy and Zald 1977, 2001, 2017 (1987); Walker and McCarthy 2010).

This study offers empirical, theoretical and methodological contributions to social innovations research. Empirically, it compares community energy cases in five different, international locations, with respect to patterns of resource mobilization and innovation biographies of community engagement. Innovation biographies of community energy develop in distinct ways and create corresponding energy system alternatives. Projects mobilize similar types of resources in response to development stages or challenges. But what can become a resource within these types is closely tied to innovation biographies. This also adds to the understanding of resource mobilization in community setting with respect to the relationship of material and non-material resource types. Theoretically, this study refines concepts of power in social innovation by combining theories of social innovation and framing. It will be argued that processes of framing and frame resonance can account for the interventions to power relations required to implement social innovations. Methodically, this study provides diverse examples of using situational analysis mapping to visualize power relations and processes of framing and frame resonance in community energy projects. Such maps provide a way "into the data" of qualitative case studies (Clarke 2003, p. 570), while offering visualizations that increase and improve traceability and transparency of qualitative analyses in academic and trans-disciplinary contexts.

The story of social innovation in community energy is told in five sections. Section I, to which this introduction provides the first part, continues to introduce the five cases included in this qualitative case study, and the three countries wherein the cases are located. Section II will discuss previous research on community energy actors (2.1) and relate the study of community energy projects to concepts of power (2.2). It then introduces the theoretical framework of this research project, drawing on concepts of social innovation and innovation biographies, as well as resource mobilization theory (2.3–5). An introduction to methods of data collection and analysis (chapter 3) concludes this section. Section III begins the empirical analysis by presenting the innovation biographies of community energy projects in Schönau (chapter 4), on Samsø and Mull (chapter 5), in Fintry and in Oldenburg (chapter 6). It characterizes project development in each case with respect to the actors, institutions and narratives, as well as the technologies involved in project implementation. Section IV continues the empirical analysis by assessing mobilization of material and non-material resources across cases. Patterns of resource mobilization are explained during project emergence and establishment (chapter 7) and project maintenance (chapter 8), as well as in response to challenges (chapter 9). Section V summarizes key findings of the analysis (chapter 10) and discusses these in reference to the literature on community energy projects, framing and social innovation (chapter 11). Chapter 12 presents relevant conclusions and briefly indicates future prospects for the study of social innovations.

This dissertation carries a conversation with the literature on civil society engagement in energy systems. It attempts to bridge conventional readings of community engagement in energy sector change as a means of increasing acceptance for technological innovations, and recent studies on the role of narratives and symbolic resources. By integrating material and non-material resource dimensions in the study of project development across national borders, this project seeks a more balanced understanding of the kinds of social innovations that occur in community led energy system change, and the conditions of their development. The urgency of profound change to the networked infrastructures of human life to remain within its planetary boundaries is undisputed. Maja Göpel speaks of paradigms, people, purpose, process, and planet in building a model of transformations literacy that could kindle the 'great mindshift' required in sustainability transformations (Göpel 2016). Against this backdrop, the understanding of social innovations as an intervention to established power grids, physically and in decision-making, can also contribute to an on-going debate on societal transformations.

1.2 Case Stories

1.2.1 EWS: "The World's Most Democratically Legitimized Electricity Provider"[1]

The story of Elektrizitätswerke Schönau eG (EWS) began with parents' despair in the face of the 1986 nuclear incident of Chernobyl. Seeking independence of nuclear power, these parents mobilized the village of Schönau in the German Black Forest to reduce local consumption and began implementing small scale renewable energy generation (FUSS 2007). In the vertically integrated and not yet liberalized energy market of the early 1990s, the only way to gain control of the village's power sources was through ownership and operation of the local distribution grid, governed by municipally awarded concessions. The local utility, Kraftübertragungswerke Rheinfelden (KWR), refused cooperation with villagers to bring down consumption and phase out nuclear energy. Instead, KWR sought to prematurely prolong the concessionary contract with the municipality by 20 years in 1991, offering a 100,000 Deutsche Mark (DEM)[2] reward to the local council in the process. EWS offered 100.000 DEM should the council refuse. The council ruled in favor of KWR, which EWS fought with a referendum. The initiative succeeded. The municipality could not renew the contract prior to its formal expiration date in 1994, giving villagers enough time to build their own offer for grid operations.

In 1995, a new local council awarded the concession to EWS forcing KWR to sell all assets of the local distribution grid. The utility fought this decision with a second referendum in 1996. An emotional electoral campaign saw a utility seeking to discredit the cooperative as ignorants and dilettantes, and a community energy initiative becoming the symbolic Gaulish village of a national alliance for renewable energies and against nuclear power. In a highly contested vote, the utility was ultimately defeated and the concessionary decision of the council reinforced through local vote (coining the above quoted statement of the most democratically legitimized energy provider). EWS commenced operations as local distribution system operator (DSO) and energy utility on July 1, 1997. The establishment of EWS occurred in an energy sector dominated by a utility with close ties to, and strong support of, the municipal authority. This was set in a non-liberalized, vertically integrated market structure, characterized by trust

[1] Elektrizitaetswerke Schönau 2018.

[2] ca. 88,000 EUR today, including inflation.

in technical expertise over citizen participation in utility management, centralization as opposed to decentralization, and still marginalized support for renewable energies in public debate.

Following market liberalization in 1999, EWS began national retail operations. It has since grown to one of Germany's four largest independent providers of renewably sourced electricity (with 200.000 customers in early 2019, EWS 2/27/2019), the only one of which to be owned by citizens. Previously a partnership under the civil code (Gesellschaft bürgerlichen Rechts, GbR), EWS was legally transferred to a citizen owned cooperative in 2009. Under the law, each member has one vote in the General Assembly regardless of the amount of shares they hold (Genossenschaftsgesetz (GenG 2017) BGBl. I S. 2230, § 43). The General Assembly elects a board which then chooses the management, and also decides on strategic cornerstones of operations (ibid.). On Dec 31, 2016, the cooperative had 5.135 members holding 385.485 shares and 38.548.600 EUR in business assets (EWS 2017, p. 65). Retail is immediately connected to extending renewable capacity with a fixed investment in new generating capacity of 0,5 Cent per kilowatt hour (kWh) of electricity or kilowatt hour per cubic meter (kWh/m^3) of natural gas, the so-called Sonnencent (sun cent). The company requires all electricity to be sourced renewably from providers without connections to nuclear or fossil fuel generation. 70% must be sourced from 'new installations' (Neuanlagen), not older than six years at the time of procurement (EWS 2017, pp. 69–70). The cooperative engages in multiple initiatives to reduce energy consumption and increase energy efficiency. At an average consumption of 2.330 kWh p.a. per household, its customers undercut the national average of ca. 3.500 kWh per household significantly (EWS 2017, p. 61).

Locally, EWS has advanced to one of the principal businesses in its town regarding employees and business tax volume. It gained regional prominence and recognition as an energy utility, also by connecting to regional utilities. For example, EWS holds a 40% share in the retail operations of the utility of Stuttgart, the capital of Baden-Wurttemberg (EWS 2017, p. 41). The local energy landscape has changed, EWS advancing to an incumbent position. With a large local market share and the role of a significant local employer, the cooperative has economic potential to realize its political goals and a strong negotiating position vis-à-vis the municipality. Federal regulatory reform enabled EWS to offer energy services at a national level. This reinforced its role as a symbol of a national movement for decentralized renewably sourced energy systems and against nuclear power, connecting political support and customer relations.

1.2.2 olegeno eG: "To be the Alternative."[3]

olegeno was the result of a window of opportunity in administrative processes. In the fall of 2010, the city council of Oldenburg began discussing the expiration of the current concession governing local electricity and gas grid operations. It decided not to investigate potential alternatives, and opened the application process on July 1, 2011. Applicants had to declare themselves within three months. The Energierat (Energy Council) of Oldenburg, a group of local citizens, had been monitoring and consulting to the city in energy-related questions for decades. It saw an opportunity to regain control of the technical, political and financial assets connected to the local power grids through administrative process. The Energierat had been a critical voice for transformation and participation in the previous concessionary process 20 years earlier. It now opened public debate with a view of establishing a "broad, civic alliance" to work on a new configuration of concessionary contracts in "the interest of consumers and the municipality" (olegeno 2019a). As with EWS, nuclear devastation lent urgency to the cause of energy system transformation, with news of the nuclear incident of Fukushima, Japan, reinvigorating members of the Energierat to seek new ways of energy system change locally.

The Energierat commissioned a local law firm to conduct an indicative calculation of municipally owned grid operations, as well as different models of cooperation as alternatives to renewing contracts with the local incumbent, EWE AG.[4] It also reached out to other communities and municipalities to exchange experience and build momentum on the question of grid operations and management. The Energierat was advised to not be discouraged by financial demands of buying back the grid, one supporter recalls a meeting in May 2011, underscoring instead how locals were "democratically legitimized" to engage in energy politics (Djordjevic 2011). Results of the law firm in August 2011 highlighted that operating local power grids in a municipal model would not only make economic sense but held high potential for a redesign of electricity and gas infrastructures and was a cornerstone of the local Energiewende (olegeno 2018a). When the council remained unconvinced, the Energierat decided to take matters into its own hands. On September 28, 2011, olegeno eG was established as a citizen owned

[3] [sic!] I9: 113.

[4] EWE was formally the abbreviation of Energieversorgung Weser-Ems; the company now operates exclusively under the name of EWE AG.

cooperative just in time to formally apply for the concession—the only challenger to EWE AG.[5] Twenty years and extensive market liberalization regulation had passed since the formation of EWS. Still, the establishment of olegeno as a competitive bidder for the electricity and gas grid concessions occurred in conditions strikingly similar. Again, a local incumbent had strong ties to the local municipality that held both market and symbolic power. Oldenburg was the primary seat of EWE holdings at the time, translating to significant tax income and relevance as a local employer. EWE's position as a major local employer also held symbolic power, as many locals had direct or indirect ties to the company and its subcontractors. Again, both the municipality and the local utility refused citizen attempts to negotiate alternative configurations of local energy services. Again, citizens chose immediate (economic) action as a response to their political interests: The formation of a citizen-owned energy company to realize their political goals for the local energy system.

In the fall of 2011, the newly elected majority of social democrats and green party in the city council decided to commission an independent investigation into grid operations in its coalition agreement (olegeno 2019a). Concessionary applications were set on hold in the meantime. Despite more favorable reviews in this investigation regarding both the political potential of municipal management or the leasing model and its economic implications, the council rejected the investigation's recommendations with a majority of the votes of Social, Christian and Liberal democrats (olegeno 2019a). Indicative bids were requested of the two applicants in June 2013, olegeno submitted a legally binding offer in November 2013 (olegeno 2013). Upon reviewing both offers, the consulting law firm recommended EWE, stating that olegeno had failed to prove its capacity sufficiently. In January 2014, the city council voted in favor of EWE's offer with two political factions withholding their votes in protest of an intransparent assessment process and the re-concessioning of EWE for twenty years without adaptations to the concessionary contract (olegeno 2019a). Following the concessionary decision in 2014, the cooperative entered an extended period of reorganization around their central goal; local energy system change lead by citizens. The cooperative currently has ca. 300 members and holds assets of approximately 42.000 EUR. The cooperative offers renewably sourced electricity and natural gas tariffs to local customers (olegeno 2019e, 2019d) and engages in local renewable energy generation, especially for renting tenants (olegeno 2019f, 2019c), increased energy efficiency and reduced consumption (olegeno 2019b).

[5] While initially a third party had declared interest in operations, they dropped out of the application process in early 2012 before entering the period of indicative bids.

1.2.3 Samsø: The Danish Renewable Energy Island

The ‘Renewable Energy Island’ (REI) of Samsø grew out of a pride of local potatoes. In 1997, the national government announced a competition for a ‘lighthouse region’ that would implement a 100% energy system change to renewable sources, bringing to life Denmark’s commitment of the Kyoto Protocol to reduce greenhouse gas emissions by 21%. The 4.000 islanders on Samsø did not think the government was talking to them. At approximately 12% self-sufficiency in energy, Samsø was ‘no greener’ than the rest of Denmark (Papazu 2018). Famous for its successful agriculture—the island’s famous Spring potatoes are nicknamed Samsø Gold—and abundant marine nature, Samsø, instead, took pride in its farming tradition and summer beauty. But nestled in the Kattegat, Samsø is also part of ‘Udkantsdanmark’—the ‘Danish outskirts’—the rural periphery of the country characterized by aging communities, and the steady loss of institutions and jobs (Papazu 2018, p. 6). A shared sense of vulnerability of community life drove the island’s mayor and the local representative in the national parliament to commission the island’s candidature and a master plan that would transfer the local energy system to 100% renewables within 10 years (Papazu 2018, p. 6). Samsø won. The competition provided funding for two employees to bring the 10-year master plan to life, one engineer and one communicator.

By 2007, the island’s energy system was transformed (Hermansen 2007). Eleven onshore wind turbines, each at 1 Megawatt (MW) production, cover 100% of the island’s electricity demand. Diverse ownership schemes were devised based on the principle of “if you can see the wind turbines, you should at least have the possibility to own a share in it” (I24: 170), resulting in nine turbines being owned by local farmers or small associations of farmers and two turbines cooperatively owned by many local shareholders. Another ten windmills were erected offshore. The 23 MW of electricity generated are equal to the island’s fossil fuel demand in transportation (offsetting respective emissions) and are fed into the national grid through an underground connection to the mainland. Samsø Municipality is the largest investor, owning five offshore turbines, with another three turbines owned by private investors, one cooperatively owned by local shareholders and one owned by a professional investment fund. Both on and off shore, the turbines generate income via the Danish feed-in tariff. Four district heating plants were set up, three fueled by biomass boilers running on locally grown straw and one a combination of solar heat and locally grown wood pellets. Two are commercially run by the regional energy utility NRGi (Denmark’s fourth largest energy utility, cooperatively owned and based in Jutland, NRGi 2018), one collectively owned by consumers and one owned by a locally based company. District heating covers approximately two thirds of island homes. Another 250 homes outside district heating service have invested in solar heating, heat pumps or wood burners. In 2007, islanders sported a negative balance on carbon dioxide emissions (Hermansen 2007).

The transformation of energy generating systems was deeply social in its connections to patterns of ownership and behavior on the island, the creation of local jobs and investment opportunities, and narratives of community life. Changes in heating and electricity infrastructure, for example, require an immediate participation of essentially every island home. The primary task of Søren Hermansen, hired in January 1998 and the project's lead manager and spokesperson to date, was therefore to turn a top down decision into a bottom up endeavor that would ensure widespread participation (interview, May 2016: 34–38). Hermansen was employed to moderate, whereas a second colleague with a background in engineering brought technical expertise. In local public debates, islanders determined the technological and, more controversially and ultimately importantly, organizational changes they were willing to adopt. The master plan included a multitude of potential projects that far exceeded the required technical improvements to achieve 100% renewables (Samsø Energiselskab 1997). Projects of the plan could therefore be dropped if need be without jeopardizing the overall REI target. The technological choices of the first ten years fell in favor of domestically well-established renewable energy solutions, most notably wind energy and district heating, with diverse configurations of individual and joint local ownership and investment (Hermansen 2007). Overall, transition costs amount to approximately 58 million EUR, 70% of which were raised by personal investments of 3700 local citizens. Diverse and extensive infrastructure projects have increased demand for local craftsmen and created numerous jobs in what was a struggling local economy. Tourism and educational work connected to the island's successful energy system transformation add value to the local economy. Samsø becoming Denmark's 'Renewable Energy Island' reinvigorated the sense of locals that they could secure the future of their community (Papazu 2018).

Samsø Energy Academy, the umbrella organization that has succeeded the Energy and Environment Office, besides engaging in international communication and educational work, continues to work on local transformation processes with a view of becoming a fossil free island by 2030 (Kristensen 2015). A new gas fueled ferry entered operations in 2014. In 1999, the municipality leased four electric vehicles, and islanders today have the highest per capita rate of electric cars in Denmark. Driving electric or on biogas are set to enable fossil free transportation, with a local biogas plant planned on the island. In addition, the Academy spurs community action for transformative strategizing more generally, for example in workshops planning a circular local economy (Flemming 2013).

1.2.4 Fintry Development Trust: 'Doing Good Stuff in Fintry'[6]

Scotland's community wind energy pioneers were born as 'FREE' (Fintry Renewable Energy Enterprise). Established by four energy enthusiasts of the village in 2003, FREE's aim was to turn Fintry, about an hour's drive outside of Glasgow, into a carbon neutral community. Although Scottish wind energy was in its infancy at the time, the potential of the sector had caught attention of professional project developers. Beyond significant fossil fuel resources, Scotland holds importance in the UK energy strategy for its renewable energy potential, its wind energy installations accounting for the lion's share of wind resources in the United Kingdom (60%, or 2.5 GW in 2011, Department for Business, Energy & Industrial Strategy 2012, updated 2018). But community owned wind energy installations were not yet established in Scotland. By coincidence, a commercial project developer planned a nearby wind farm, and the village entered negotiations. FREE founders initially envisioned a turbine outside the village, directly supplying local electricity demands. When it became clear that it would not be technically, or indeed economically, advisable to "run a cable down from the hill" (I19: 33), an alternative was devised to use revenues of a community owned wind turbine within the windfarm to fund energy efficiency in the village. While not physically linked to production in their consumption, the "emotional resonance and identification" with nearby installations, founders hoped, would create the necessary incentive for community members to actively engage in local energy system change including changes in installations and behavior at home (FDT 2018a).

Negotiations were completed in 2006, and a contract between FREE and the windfarm developer was signed. FREE did not become an owner of one of the ten turbines planned in the hills outside the village, but instead paid for installation of one turbine in return for guaranteed revenues under the UK feed-in tariff (FIT) over a period of twenty years. FREE founders had sought charitable status early on, but the authorities had refused the organization because of its commercial relations to the windfarm developer. Yet, founders felt strongly about charitable status, and the assurance that money generated by the wind turbine would indeed benefit the entire community. In 2007, Fintry Development Trust (FDT) was therefore established as a community-owned and oriented, charitable organization with FREE as its commercial arm. Membership of the Trust is restricted to locals, with some 150 villagers currently engaged. The Trust manages turbine

[6]Slogan of Fintry Development Trust, fintrydt.org.uk/

revenues, and disseminates these the community in its diverse projects. The board of directors is comprised of seven voluntary members, one of them part of the four founding members of FREE. The board of directors includes one member of the Fintry Community Council as an informal agreement between the Trust and the Council. Project planning is overseen by the board, and discussed by members in Annual General Meetings (AGM). The Trust currently has two paid staff members developing and implementing community projects, and resides in the local community sports club.

The steady flow of income generated by the wind turbine has financed implementation of diverse local projects. While residential energy system were the focus point in the first years, the Development Trust providing free loft and cavity wall insulation to all local residents, activities then branched out to include community institutions such as the Sports Club and the school, as well as educational events. It has ventured beyond the energy sector, implementing sustainability projects in the community such as planting an orchard. In 2010, the Trust hired its first staff member, professionalizing and institutionalizing energy advisory services to villagers. As recognition of the Development Trust grew, additional grant money could successfully be acquired that supported on-going advisory and educational efforts of staff and enabled extended project work (FDT 2018e). Past years have seen increasing attention to heating, with the Trust establishing a district heating system for a residential neighborhood suffering from fuel poverty[7] in 2015, and a project to balance local green energy production and community energy use, ‘SMART Fintry’ (Smith 2018). Its on-going advisory and educational work in the community and with schools and universities remains free of charge (FDT 2018e, 2018d). Extensive online publications on its activities include minutes from board meetings (dating back to 2009) and annual general meetings (dating back to 2007, FDT 2018b, 2018c).

The first to have successfully negotiated a community wind project, FDT today is an important advisor and role model to communities seeking to establish own projects, as well as to professional project developers seeking advice on community participation and acceptance. The Trust has gained national (and international) recognition, including political authorities (FDT 2018e). The Scottish government has committed to 100% renewables in the electricity sector by 2020, its energy targets reaching beyond this to decarbonization of the economy by 2050 (Scottish Government 2017). To this end, Development Trusts have become an

[7] Scottish government defines fuel poverty based on heating which should not account for more than 10% of the household income (Scottish Government 2017b). Poor energy efficiency is among the primary causes. On the incorporation of other energy sources and usages in this definition, see Simcock et al. 2016.

important community vehicle to realize energy related projects oriented towards community benefit (van Veelen 2018, p. 659).

1.2.5 Green Energy Mull: "Every Cloud Really Does Have a Silver Lining"[8]

Mull and Iona Community Trust (MICT), established in 1997 as a community oriented, charitable organization to "support local projects aimed at improving the social amenities, and physical and economic infrastructure of the islands" of Mull and Iona[9] (MICT 2018a), had nothing at all to do with energy upon its founding. Mull is the second largest island of the Inner Hebrides, famous as much for their abundant and diverse wildlife as for their strong winds. Unsurprisingly, the Outer and Inner Hebrides hold some of Europe's largest wind and marine power resources. But high costs of construction in the harsh Atlantic Ocean and strong local concerns over the preservation of unique ecosystems often proved important impediments to renewable energy developments in the area (Carrell 2008a, 2008b). At the same time, communities in the Hebrides remind the reader of 'Udkantsdanmark'—remote and often harsh living conditions, poor wages and few jobs, aging communities and high fuel poverty (73% in 2015, Bunting 2015). Following Scotland's Land Reform Act of 2003 (Scottish Parliament 3/25/2003), many communities in the Hebrides bought back the land from previous private owners, and began exploring the potential for community owned renewable energy generation (Bunting 2015). While often small, community energy projects increasingly gain recognition as sustainable, local energy alternatives as well as significant sources of community income. A community owned project on the Isle of Lewis includes 'just' 2.7 MW or three turbines onshore compared to 28 turbines planned offshore by professional developers in 2008 and abandoned following extensive local protest, but could generate community revenues of up to £1mio annually (ibid.).

On Mull, islanders began actively considering renewable energy generation in 2010 following both the interest of local residents in alternative energies and the potential for income this provided to the Community Trust in the face of reduced grant funds following the financial crisis of previous years (I20: 7–14). Islanders

[8] I20.

[9] Iona is a very small island located immediately to the South West of Mull. Accessible by ferry from Mull, the island is closely tied to its larger neighbor—for example through the establishment of a joint community trust.

quickly ruled out wind energy, mostly for fear of endangering wildlife—among others, Mull is famous for the Golden Eagle and the White Tailed Sea Eagle. The community finally decided on a 400 kW river-run-off hydropower system near the village of Garmony. Construction began in March 2014. 'Garmony Hydro' began operations in June 2015, once the underground cable connecting to the mainland and enabling energy exports under the UK Feed-In Tariff (FIT) was completed. Set to generate just over 1 gigaWatthour (gWh) annually in conservative estimates, the Garmony Hydro scheme should create an annual income of around £200.000 to the community. Garmony Hydro is a rather modest exploration regarding its size of 500 kW. This even speaks from the installation itself, which nestled into the hills will soon be overgrown, vanishing into the soft moorlands abundant on the island. Garmony Hydro is owned and operated by Green Energy Mull (GEM), a Community Benefit Society. While Moray Finch, a co-initiator of Garmony Hydro and General Manager of MICT, chairs the board of directors, GEM stands independent from MICT and directorship is tied to investment. Funds were raised via community shares, reaching just under £500.000 in March 2015 (significantly exceeding the required £330,000, Finch 2015). Over 200 predominantly local shareholders invested, although non-locals could also invest. Net profits of GEM can be distributed among investors. In 2017, GEM bestowed £25.000 upon The Waterfall Fund', an independent charity established in 2016 which will distribute the money as grants to community projects on the islands (The Waterfall Fund 2018). Dedicated to "supporting transformational change to our islands" (The Waterfall Fund 2018), grants are bound by their community reference not by topic. Projects funded include a Gaelish choir, supplies for first responders, or fencing for a local orchard (The Waterfall Fund 2019). While GEM is organizationally independent of MICT, this indicates its embeddedness in the Trust's strategy of alleviating the diverse vulnerabilities of community life on a remote island.

During planning, grid connection of Garmony Hydro to the mainland (a prerequisite of FIT exports) was uncertain due to transmission constraints (wherein only connections below 50 or 100 kW may proceed rapidly), that despite British plans for Scottish generating capacities affect almost 60% of the Scottish land area (ACCESS 2015). Although grid connection was ultimately resolved, MICT entered a project partnership to explore alternative local system configurations for renewable generation in 2015. ACCESS (Assisting Communities to Connect to Electric Sustainable Sources) seeks to develop a model demonstrating real time balancing of local renewable generation and demand, as well as a corresponding system of local heat tariffs to commercialize services (ACCESS 2015). Project partners beyond MICT include Community Energy Scotland (the Scottish national association of community energy), SSE Ltd. (the UK's largest provider of renewable energy), VCharge (who designed the smart appliances set to balance Garmony Hydro generation and distributed demand), and Element Energy (working on commercial roll-out and system integration for other communities across Scotland). ACCESS exemplifies a fundamental strategic conflict of energy system change in Scotland and the UK: Remote large scale generation in the North servicing large scale demand in the British South, as opposed to small scale, community oriented developments, sensitive to siting conflicts and adjacent to consumption (John Muir Trust 10/30/2015, 11/2/2015).

1.3 Country Stories

1.3.1 The German 'Energiewende'

Germany's energy system prior to market reform in the late 1990s was organized in regional monopolies, the state holding majority shares in all electricity providers either directly or indirectly (Mez 2003, p. 201). With high turnovers and blurred ownership lines between state and non-state actors on municipal, regional and federal levels, the energy sector wielded considerable economic and political power (Lauber and Mez 2004, p. 604). Following the 1970s oil crises, Germany relied heavily on coal and nuclear resources in electricity generation (Lauber and Mez 2004, p. 615; Jacobsson and Lauber 2006, p. 261). In 1998, the German Energy Industry Law (Energiewirtschaftsgesetz EnWG, Federal Republic of Germany 7/7/2005) was reorganized following the EU single electricity market directive of 1996. In 2000, the Erneuerbare Energien Gesetz (Renewable Energy Law REL, Federal Republic of Germany 3/29/2000), EEG for short, was introduced. Germany's energy system fundamentally changed.

Market liberalization resulted in a sequence of mergers creating four major energy utilities, dominating the energy market since: E.ON, RWE, Vattenfall and EnBW (Kungl 2014, pp. 12–13). Majority ownership of these utilities is private, except for Vattenfall, which is a full subsidiary of the state owned Swedish Vattenfall AB. Accounting for 82% of electricity production capacity in 2003 and generating approximately 90% of the country's electricity (Kungl 2014, p. 14), these utilities particularly dominate the coal and nuclear based power generation. Reorganization of ownership was not limited to the electricity sector but revealed a strong political preference of private ownership in utility management generally (Héritier 2002). Historically, concepts of 'territoriality' strongly shaped German