



McLean, Kirstie (2018) *Organisational response to biomass district heating in West Whiteburn: a case study*. [MSc]

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Deposited: 13 December 2018

University of Glasgow
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**Organisational response to biomass district heating in West
Whitlawburn, a case study.**

**Presented in partial fulfilment of the requirements for the degree of
M.Sc. Housing Studies**

August 2018

word count: 14,838

Abstract

Increasing numbers of Registered Social Landlords are choosing to install district heating systems to supply energy to their housing stock for numerous reasons including reducing costs and levels of fuel poverty amongst their tenants, reducing carbon emissions and meeting energy efficiency targets imposed by the government.

This research uses a case study approach to examine the experience of West Whitlawburn Housing Co-operative, a small registered social landlord who has installed a district heating system, to determine to what extent the aims of the project were realised, how key decisions were made, what unexpected challenges arose and how the project affected the Co-operatives relationship with tenants.

Results are compared with existing research in this subject area to establish to what extent they are generalizable and recommendations for further research are made. This study is intended to contribute new knowledge about the experience of registered social landlords moving into the realm of energy provision.

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Acknowledgement

Firstly I would like to thank my supervisor, Nigel Sprigings, for the guidance and encouragement given throughout the process of writing this dissertation.

I would also like to thank the staff and committee of West Whitlawburn Housing Co-operative, not only for participating in this piece of research but for their on-going support over the last year.

Abbreviations

DH	District Heating
DHS	District Heating System
ECO	Energy Company Obligation
EE	Energy Efficiency
EESHS	Energy Efficiency Standards for Social Housing
ERDF	European Regional Development Funding
ESCO	Energy Services Company
LA	Local Authority
NPM	New Public Management
RE	Renewable Energy
RSL	Registered Social Landlord
SC	Standing Charge
SHQS	Scottish Housing Quality Standards
UC	Universal Credit
WHF	Warm Homes Fund
WWHC	West Whitlawburn Housing Co-operative

Chapter 1. Introduction

District Heating Systems (DHSs) are becoming increasingly common in the UK and in recent years, growing numbers of Registered Social Landlords (RSLs) have chosen to supply their housing stock with this form of heating for a wide variety of reasons.

There is a large body of research into various aspects of energy efficiency (EE) both within social housing and more generally, which mainly focuses on end users affected by fuel poverty or on the technical considerations of EE from an engineering or carbon reduction point of view. Recently, studies into renewable energy (RE) interventions in social housing from a social-technical perspective have become more prominent but few focus on biomass DHSs. There is an opportunity to contribute to a gap in existing knowledge by researching the experience of organisations who have installed a biomass DHS and how the organisation was affected by this change.

1.1 Aims & Objectives

The aim of this dissertation is to examine the experience of West Whitlawburn Housing Co-operative (WWHC), a small community based RSL who have installed a biomass DHS to provide heating and hot water to the majority of their properties. The study will focus on the organisational response to implementing the biomass DHS from a socio-technical perspective and investigate the following objectives:

- What options were considered and how were decisions made?
- What expectations were in place for the project and to what extent were they met?
- What challenges arose and what were the consequences of the challenges identified?
- What was the impact on the relationship between WWHC and tenants?

- To what extent is WWHC's experience generalizable to existing research into RSLs who have implemented a DHS?

1.2 Overview

Improving the EE of housing stock and reducing carbon emissions is high on national and international agendas as “advanced capitalist societies depend fundamentally on coal, oil and gas, but this dependence is producing increasingly severe societal risks from climate change” (Webb & Hawkey, 2017, P8). Transforming fossil fuel dependent energy systems into something more sustainable is extremely challenging but important for urban resilience at a time when globally, the demand for energy is increasing along with energy prices, while science has demonstrated the negative environmental impact of carbon emissions (Hawkey et al, 2013, P.22).

The UK Government's Carbon Plan 2011 set an ambitious carbon reduction target of reducing greenhouse gas emissions to close to zero for all buildings by 2050 (DECC, 2011 cited in Webb, 2015, P1). Current UK climate change policy has identified a number of RE technologies expected to contribute to reaching this target including electric heat pumps, combined heat and power generators, thermal treatment of waste and biomass boilers (Webb & Hawkey, 2017, P9). As of 2015, only 2% of heating was supplied by DHSs (Webb, 2015, P1) but government calculations predict that heat networks, including biomass DH could supply between 20% and 43% of heat from 2030 to 2050 (DECC 2013, cited in Webb & Hawkey, 2017, P9).

Another motivating factor in the decision to move to RE heating solutions is the alleviation of fuel poverty, a significant problem throughout the UK with those most affected being low income households, elderly households and “hard to heat homes” (Walker, 2008a, P4514). Improved EE is a more effective and sustainable solution than attempting to increase household income to cover higher fuel costs (ibid).

The Energy Efficiency Standard for Social Housing (EESH) was introduced in 2014 to supplement the minimum EE standards set in the Scottish Housing

Quality Standards (SHQS) 2004. EESSH requires that RSLs achieve a minimum EE rating, based on the current heating system and dwelling type of their stock and suggests that “for the minority of properties where social landlords cannot achieve the minimum EE rating using only reasonable measures then additional measures are likely to be required. Landlords are encouraged to be creative and innovative in their approaches” and DH is suggested as a potential solution (Scottish Government, 2014, P10).

1.3 Background

WWHC is a fully mutual, tenant-controlled housing co-operative and RSL situated in the Whitlawburn area of Cambuslang on the outskirts of Glasgow and within the South Lanarkshire local authority area. The co-operative owns and manages 644 properties, consisting of six multi storey blocks with a total of 432 flats, 111 low rise flats and 100 houses and flats constructed in 2010, all of which are socially rented.

The Scottish House Condition Survey Local Authority Analysis indicates that for the period 2014 to 2016, 25% of households across all tenure types in South Lanarkshire were in fuel poverty and 33% of social housing tenants in South Lanarkshire were in fuel poverty. The household type experiencing highest levels of fuel poverty was older households at 38% and the least was family households at 10% for all tenures (Scottish Government, 2018a). The Scottish Index of Multiple Deprivations, which measures overall levels of poverty identifies West Whitlawburn as within the 5% most deprived data zones in greater Glasgow (Scottish Government, 2018b).

Installation of the biomass DHS started in 2014, working in partnership with utility company Npower, to replace electric storage and panel heating in the multi storey and low rise properties which had reached the end of its lifespan and followed on from upgrades to the building fabric, windows and roofs which also contributed to improving EE. Gas central heating is forbidden in multi storey properties and not a possible option for the low rise properties as they were constructed using Bison and Reema system built techniques.

The main physical components of the project were the construction of the energy centre and fuel store, construction of the district heating network and installation of the internal heating system in each property. The biomass boiler provides a renewable heating source by burning woodchip to generate hot water which is delivered through 2.6 km of pipework to heat interface units in each property which provide heating and hot water to end users. Each flat is separately metered using smart meters so tenants pay for their actual usage and can control the temperature with a room thermostat and thermostatic radiator valves.

1.4 Conclusion

The information above has provided an overview of the EE concerns facing the social housing sector and the UK as a whole, as well as background information about WWHC, an organisation involved in the physical regeneration of a community which is facing considerable levels of fuel poverty. It has also given justification for the aims and objectives of this research.

The remainder of this dissertation will take the following structure; chapter two will review existing literature ranging from the overarching policy position and role of RSLs to an overview of the practical challenges of DH. Chapter three will discuss the chosen methodology, sample and recruitment of participants, ethics and limitations of the research. The fourth chapter provides an analysis of the data and discussion of the findings, linking them to the literature and research questions. Chapter five is the final chapter and will summarise the research, review whether the aims and objectives of the study have been met and suggest topics for future research in this area.

Chapter 2. Literature Review

2.1 The changing role of social housing

DH is not traditionally a business area that housing providers operate in, however, changes to the way housing organisations have been governed over the last four decades resulting from the influences of New Public Management (NPM), managerialism and modernization have altered their role in society and the services they provide (Mullins & Murie, 2006, p130). Housing providers were traditionally seen as a public sector response to housing provision for those most in need and their core activities were “directly providing, distributing, and managing a publicly funded and provided housing stock” (Mullins et al, 2001, P601). The rise of NPM was very influential in the realm of public administration and was associated with moving towards privatisation and away from services being provided directly by government institutions and the reduction of government growth in terms of public spending (Hood, 1991, P3). During the 1980’s NPM brought private sector management assumptions and practices into the public services (Mullins & Murie, 2006, p131) and managerialism moved the focus of housing organisations away from housing professionals and towards managers, with an onus on productivity and organisational change (Mullins & Murie, 2006, p132).

Modernization introduced broadly defined partnership arrangements to the social housing sector and the resulting response has been “both sophisticated and far more diverse than generally imagined” (Mullins et al, 2001, P601). Modernization also initiated more ‘boundary spanning’ activities across traditional public service sector areas, for example, between housing, health and employment (Mullins et al, 2001, P602). The development of a DHSs could be considered a boundary spanning activity for RSLs as it involves working closely with actors from the energy sector, as well as other partners, to expand into energy provision. More generic forms of managerialism and strategic management have come to be seen as key to organizations’ effectiveness in an environment which necessitates more risk taking and entrepreneurialism (ibid). Developing

DH brings risk to the organisation but can also be an opportunity to establish a new revenue stream and improve services for tenants.

The move away from direct provision of traditional core activities has meant that “the ‘social’ dimension of social housing has come to be less associated with the inevitability of public sector funding and public sector management [and] more on the social purposes which underpin provision” (Mullins et al, 2001, P601). Furthermore, in recent years RSLs “have developed their own strategic awareness and practices as a component of their organizational development” (Greer & Hoggett cited in Mullins et al, 2001, P607). The strategic role of housing organizations must take into account the influence they want to have on the environment they operate in as well as the structure of that environment (Mullins et al, 2001, P607). For example, the strategic role of an RSL would take into account the changes it wishes to make by moving into the energy market as well as outside factors that have encouraged them to move into this arena.

Without the changes brought by NPM, managerialism and modernization, it is unlikely that housing providers would consider installing DH as traditionally it would have been outside of their role in society.

2.2 Neoliberalism and the UK energy market

Neoliberalism is “the belief that freely adopted market mechanisms [are] the optimal way of organising all exchanges of goods and services” at both national and international levels, with a focus on minimal state involvement in markets (Thorsen & Lie, 2006, P15). Free markets and trade are believed to lead to more efficient allocation of resources and increase liberty and wellbeing of individuals by “set[ting] free the creative potential and the entrepreneurial spirit which is built into the spontaneous order of any human society” (ibid).

Originally, energy distribution grids were started by local entrepreneurs then expanded and joined together over time. In most countries they were nationalised due to their “natural monopoly and the essential social services they provide” (Van Der Horst, 2008, P.173), however, as a result of the

Conservative Government's belief in neoliberalism, the UK energy market has been fully privatised (Hawkey et al, 2016, P32).

Neoliberalism has affected the energy industry by “stripping out excessive investment and optimising economic efficiency [...] through competition, choice and flexibility” (ibid). The intention of the single competitive market for energy was to secure the lowest prices for consumers and to facilitate integration with the globalised energy market to benefit from capital investment and supply (ibid).

At present, the majority of supply and generation is controlled by a small number of large corporations (Webb, 2015, P2), referred to as the ‘Big Six’, these companies have a market share of over 90% (OVO Energy, cited in Rodrigues et al, 2016, P.2). The Big Six are often criticised for having “possible tacit coordination and being driven by profitability over customer service” (ibid).

Since the early 1990s, around the same time energy markets were being privatised and deregulated, “the threats of human-induced climate change began to influence the political agenda, resulting in growing state support for RE” (Van Der Horst, 2008, P.173). Competitive energy suppliers have had limited success in addressing climate change issues, as actors with power interests in transnational oil, gas and coal industries contest the need for radical transformation of the energy market, while global economic development accelerates energy consumption, expanding their customer base (Hawkey at al, 2016, P4). This is set against international commitments to reduce carbon emissions which are “under ambitions in relation to reduce[ing] carbon dioxide emissions [and] in relation to the risks of dangerous climate change” (UNEP 2013 cited in Hawkey at al, 2016, P4).

Neoliberalism has affected the character of the UK energy market to the extent that some organisations are favouring DH and other forms of RE to bring control back to communities and address price increases.

2.3 Policy level challenges

The need to reduce carbon emissions and improve EE is a priority of the UK government. However, the development of DHSs in the UK is relatively new in comparison with other European countries and takes place within a liberalised energy market where the capacity for development of larger scale systems has been weakened by short term and changeable support initiatives, price signals and coordination via market contracts (Hawkey & Webb, 2014, P.1238). Changes to grant schemes and tax initiatives have resulted in uncertainty and perceived risk for both the private sector and government (ibid).

Despite promoting DH and community based RE, in 2011 the UK Government announced that it “[does] not believe that decentralised and community energy systems can lead to significant replacement of larger-scale infrastructure” (DECC, 2011b, Hawkey et al, 2012, P.23). However, the government expects local authorities to reduce regional carbon emissions so some have chosen to develop DH networks as part of “an array of niche solutions to myriad challenges” (Hawkey et al, 2012, P.23). There are a limited number of specialist DH contractors in the UK and some activity from large national energy suppliers but this only accounts for a small part of their business (Hawkey, 2012, P24). Taking this into account, along with failed attempts in the past to widely establish DH in the UK, it is uncertain whether DH will meet government targets and timescales for RE (Hawkey, 2012, P20).

Webb highlights that previous policies to support DH based on technical-economic modelling have had limited success, indicating the uptake of these technologies “is not solely a matter of formal efficiencies, but is governed by the political and social dynamics of retro fitting [DH] into a centralised energy system and established settings where it is largely absent” (Webb, 2015, P2). DH in the UK has weakly developed networks and institutions, evident from the “lack of dedicated regulation, intermittent and unpredictable grant funding, under-developed technical standards, and knowledge held as intellectual property of consultants and contractors” (Hawkey, 2012 cited in Hawkey et al, 2012, P.24).

At strategic level, local contexts and knowledge must connect with government policy and financial and energy markets. “The technology offers long term benefits to the UK, but faces significant short to medium term barriers, arising from economic risk, regulatory uncertainty and energy system lock-in to large scale technologies and networks” (Hawkey et al, 2013, P.29). As the provision of DH has historically been limited in the UK, knowledge of the political and economic governance institutions most likely to facilitate the development of this type of system in a liberalised market is also limited (Hawkey & Webb, 2014, P.1230).

2.4 Community and Social Capital

Over time there has been a shift in government discourse on sustainable energy policy which initially focused on large energy companies and businesses and how they could reduce emissions, meet targets, generate RE and reduce demand. Laterally, community energy has moved from the peripheries of strategies for meeting national energy policy objectives to “the idea that projects should be led by and for the community” (Walker et al., 2007 cited in Bird, 2014, P211). Increased attention has lead academics, practitioners and government to call for access to new financial and professional services to aid the scaling up of community energy (Bird, 2014, P218).

Since 2000, the UK Government has introduced support and funding to develop community based RE for “its contribution to economic regeneration, social cohesion and public understanding and support for renewable energy” (DTI, 2000, 2006 cited in Walker, 2008b, P.4401). A growing number of community RE initiatives have addressed concerns over security of supply, energy wastage and overuse, cost and inequality and lack of trust towards large energy companies (Bird, 2014, P208).

It has been demonstrated that community energy initiatives have the potential to help meet carbon reduction targets and to reduce energy costs for customers. Communities, including those represented by RSLs, can set up local energy companies to manage local energy production and distribution (Rodrigues et al, 2016, P.6).

Both grass roots activists and government believe that a community approach can “change the experience and outcomes of the sustainable technology implementation” (Walker et al, 2010, P2655) however the definition of ‘community’ in relation to renewable energy has not been tightly defined. The Government’s definition of a community project was “legalistic and related solely to the ‘not-for-profit’ status of community groups that enabled public funding to be used without contravening EU rules on state aid to the private-sector” (Walker et al, 2010, P2657). Others have a “far richer and more prosaic view” of how RE should be defined and what it should constitute or involve (ibid).

The community orientated nature of DH mean its setting is likely to be “the urban and regional scale, where economy, ecology and politics intersect in the intensive end-use of energy in public, commercial and domestic sectors” (Hodson and Marvin; Monstadt cited in Hawkey & Webb, 2014, P.1228). DH lies between domestic and commercial scale from both a carbon reduction and economic perspective (Van Der Horst, 2008, P.173) which could affect whether or not the identified potential for DH will be realised or whether it will “continue to suffer from the relative neglect of being caught between large scale supply-side projects and infrastructure, and householder-level demand-side measures” (Hawkey at al, 2013, P.23).

Social capital has been repeatedly identified as an important element in the introduction of more ‘disruptive’ technologies such as DH (Hawkey et al, 2013, P24). Research indicates that social capital which is “the potential of a social system to learn effectively through interaction” (ibid) could be essential for community energy projects while the OECD expand on this definition as “the networks, norms, values and understandings that facilitate co-operation within or among groups” (2001 cited in Hawkey at al, 2012, P.24). This means that for DH projects, social capital is likely to play a part in the mobilisation of technical, legal, financial and commercial resources needed for the project to go ahead. “The process of engaging local social capital with non-local networks, in customised combination with legislative, policy or public finance measures, is expected to create the means to legitimising investment and configuring

effective local solutions” (Hawkey at al, 2012, P.24). Where social capital is weak and the community is not supportive, RE developments in social housing contexts can struggle to become established (McCabe at al, 2018b, P111).

2.5 A collective actor problem

Developing DH can be viewed as a collective actor problem as “collaboration and long-term interdependence between heat suppliers, distributors, retailers and users are necessary to securing the envisaged benefits from carbon, energy and cost saving” (Webb & Hawkey, 2017, P9). As there are likely to be multiple actors involved in gathering information, recruiting subscribers, then designing and constructing the network followed by operating and maintaining it (Hawkey at al, 2013, P.24), ensuring that actors have a shared vision and understanding of objectives, governance, business models and shares of risks and rewards is important (ibid).

Managing the many relationships involved in solving a collective actor problem is therefore challenging. As there is no established UK model for the development of heat networks, identifying the actors required can be a challenge in itself as new projects are experimenting with different forms of organisation (Ambrose et al, 2016, P145). Actors can receive different benefits from their involvement, for example, external organisations involved in the project can make political or financial gains while RSLs received the burden of additional organisational roles (McCabe at al, 2018b, P111).

Dewick & Miozzo identify the importance of inter-organisational relationships in the introduction and diffusion of RE within the Scottish social housing sector, highlighting that “innovations are developed through many coordinated and contributing organisations” (2004, P324). Although this is not specific to the implementation of DH, it is relevant as this has been shown to be a collective actor problem with many different parties involved. If relationships between actors are poor, the ability of social and technical systems to co-evolve is hindered and the introduction of sustainable technology is obstructed.

2.6 Socio- technical theory

Socio-technical theory is increasingly used in research to understand what happens when RSLs introduce DH and how users engage with this technological innovation (McCabe et al, 2018a, P555). Socio-technical systems fulfil functions within society and consist of technology, regulation, user practices, markets, cultural meaning, infrastructure and networks of maintenance and supply (Green at al, 2004, P19). This can be applied to heat networks which are “the outcome of the construction and stabilisation of a broad collection of human (social) and non-human (technical) elements” (Ambrose et al, 2016, P145). Summerston expands on this by describing a socio-technical analysis of energy systems as “a way of analysing the ‘organised complexity’ of modern societies, formatted through the specialist expertise, institutions and material technologies as well as embodied cultural norms and values” (1992 cited in Hawkey et al, 2016, P23). Establishing DHSs can be considered a socio-technical innovation to produce a long-term, stable and dependent relationship between heat suppliers, investors, network operators and heat users in a defined geographical area (Summerton, 1992 cited in Hawkey & Webb, 2014, P.1230).

The introduction of a RE innovation can be disruptive as “when innovations meet institutions, two social forces collide, one accounting for the stability of social systems and the other for change” (Hargadon & Douglas, 2001, P476). If managed successfully, an innovation can lead to a new system being established as social and technical systems are interdependent and evolve together (Hawkey et al, 2016, P39).

The opportunity to reduce costs for tenants combined with scale of implementation means that RSLs are uniquely positioned to introduce RE innovations (McCabe et al, 2018b, P549). Research by Van Der Horst identified that RE projects are often initiated by third sector organisations who have refurbished or replaced old heating systems (2008, P.175) which highlights the growing opportunity for RSL to expand their business activities into energy provision, thus introducing a technical innovation to an established social system.

2.7 Energy Service Companies

Energy service companies (ESCOs) are enterprises which install and operate energy systems (Van Der Horst, 2008, P.176) and are designed to manage local production and supply while providing a structure than can allow communities to run projects, manage the energy generated and exercise control over pricing (Hannon and Bolton, 2015 cited in Rodrigues et al, 2016, P.4). The number of ESCOs in the UK increased from around 20 in 2009 to between 30 and 50 in 2014 (Bertoldi, 2014 cited in Rodrigues et al, 2016, P.4).

Motivations for using an ESCO structure include ensuring “clarity in business governance, without determining the particular combinations of social and finance capital, knowledge and expertise [and giving] latitude to actors to develop locally-viable multi-organisation models” (Hawkey at al, 2012, P.30). It was also found to enable greater transparency of finances, accountability and compliance with trading regulations (ibid). However, it brings the possibility of reputational risk to RSLs in being both a landlord and energy supplier as “it was thought that the commercial and more charitable roles sat uneasily together and could negatively affect tenants’ perception of their [landlord]” (Changeworks, 2017b, P41).

2.8 Practical considerations

2.8.1 Motivations for installing a DH system

Research by Changeworks identified the main motivations behind RSLs installing DHSs as providing lower cost heating, delivering sustainability benefits, creating business opportunities by opening up new revenue streams and meeting technical and strategic objectives such as regeneration and connecting to larger scale heat networks in the area (2017b, P7). In some cases, the main motivation for installing RE technology is the economic saving potential and for others, environmentally sustainable technology is the primary motivation (McCabe et al, 2018a, P553). Improving thermal comfort and living conditions for tenants was also a common motivation (ibid). “Supporting energy efficiency and carbon reduction as part of efforts to mitigate climate change, whilst simultaneously

tackling fuel poverty, continue to be strong drivers for change in the social housing sector” (Changeworks, 2017b, P5). However, realising these objectives brings a number of practical considerations and challenges.

2.8.2 Financial risk

Installing DH incurs high upfront costs and subsequent costs for system use including heat generation and distribution are relatively low (Walker, 2008a, P4515). Sunk costs are recovered by charging above marginal-cost charges for heat meaning business models require a number of years to break even. Financial viability can be increased by maximising heat delivered and situating the system in an area of high demand and with a diverse user profile and large anchor loads (Hawkey et al, 2013, P.23). “The temporal dislocation between sunk costs and subsequent revenues means that judgements of economic viability of particular system configurations are highly sensitive to the cash flow discount rate adopted” (ibid). This impacts on the risks perceived by the organisation developing and financing the DH system as well as their objectives for the project (ibid).

Financial risk, perceived or real, can be a barrier, but also an opportunity, as it can lead to potential rewards for landlords, providing “financial incentives and security that [...] decentralised generation can yield” (McCabe et al, 2018a, P555). Financial risk can be reduced with the introduction of third party financing, however, this can lead to other barriers relating to conflicting incentives and motives of the various actors involved (McCabe et al, 2018a, P553).

Where DH systems were installed by both Aberdeen and Woking councils who decided to retain control over the revenues as well as the risks, it was difficult to reconcile finance capital concerns such as instability and short term availability of capital with social capital as it became weakened, leading to less trust, cohesion and innovation in governance (Hawkey at al, 2013, P.30).

2.8.3 Metering and billing

Metering and billing issues are “extremely prevalent” (Grant-Mccolm & Stewart, 2017, P2), with the management of standing charges (SCs) being one of the most common. A SC is a fixed daily charge that covers operational and maintenance costs of the system with each customer receiving the same SC, regardless of their usage (Grant-Mccolm & Stewart, 2017, P38). This affects low energy users disproportionately as the element of SC in their bill seems high when compared with their usage (ibid). This leads Changeworks (2017b, P9) to suggest that “standing charges were invariably a contentious issue and were also often poorly understood by residents”.

Some systems are able to supply heat at a unit price comparable to gas and cheaper than the ‘Economy’ rate for electric storage heaters but others are higher once SCs are factored in. Some RSLs reported having to include a SC where heat sales were inadequate, otherwise the scheme would be unable to cover its costs (Changeworks, 2017b, P9) and in some cases this meant the financial benefit of installing DH was reduced or lost (Changeworks, 2017b, P5). Many RSLs reported schemes running at a loss and felt their role was to provide affordable warmth to tenants rather than have a system that could break even (ibid). Changeworks recommends that systems should be designed and set up in such a way that high SCs are not required and that heat monitoring should be in place that is accessible to both the organisation and system users. Billing should be transparent and residential control systems must be carefully managed (2017b, P5). As this involves new challenges and skillsets, the majority of RSLs surveyed by Changeworks outsourced some or all of their operations to a third party (2017b, P40).

2.8.4 Customer protection

DH policy is still being developed and an area where this is particularly significant for RSLs is regulation protecting consumers. DH is not currently regulated so consumers do not have the same protection as gas or electricity customers (Changeworks, 2017a, P5) and the majority of suppliers surveyed by Changeworks did not intend to join Heat Trust Scheme, a voluntary scheme

designed to protect DH consumers (2017a, P3). Changeworks identify a need for greater consumer protection and suggest DH customers may need a higher level of regulation than gas customers as the technology is so new to the UK (2017a, P10).

2.8.5 Resident engagement and understanding

Social barriers to the uptake of RE are common meaning tenant attitudes towards sustainable energy innovations are an important success factor (McCabe et al, 2018a, P555). Energy saving behaviours and habits of social housing tenants can be amenable to the introduction of RE but “without suitable training and engagement this behaviour can also reduce the efficacy of the system” (McCabe et al, 2018a, P553). Residents can become disengaged if they are not provided with clear and sufficient information on how to use the system or if control mechanisms are overly complex (McCabe et al, 2018a, P554) and based on a systematic review of 67 studies, McCabe et al found that “the literature was overwhelmingly dominated by the importance of understanding residents, engaging them appropriately and maintaining that engagement” (2018a, P555).

2.8.6 Trust, communication and flexibility

It is necessary to engage and work with all stakeholders at an early stage to generate buy-in and support for the project and have strong relationships and good communication between all actors involved (Changeworks, 2017b, P5) as projects are more likely to be successful where the RSL is able to build long-term, trustful relationships with external contractors and partners (McCabe et al, 2018a, P553). Lack of inter-organisational co-operation due to different motivations between RSLs and others involved can be problematic as can “inappropriate management protocols and systems, [...] as well as the inadequate partitioning or provision of staffing roles, [which] could lead to the ineffectiveness of the installation” (McCabe et al, 2018a, P554). RSLs must have a strong adaptive capacity to withstand the disruptive nature of this type of project (McCabe et al, 2018a, P555) and must have sufficient in-house skills to provide oversight and scrutiny at each stage of the project (Changeworks, 2017b, P5).

It is also particularly important to maintain a good relationship with tenants as “it was found that many of the important motivational, success and hindering factors related to the unique relationship between tenant and housing that social housing arrangements produce” (McCabe et al, 2018a, P555). In order to preserve trust it was essential for tenants to feel that they were being treated fairly and with transparency, especially with regards to billing and standing charges (Changeworks, 2017b, P41).

2.9 Research Question

A review of existing literature demonstrates the influence that neoliberalism has had on both social housing and energy supply at a macro level and issues relating to DH have been identified within research relating to policy, community scale, decarbonisation of the energy supply and reduction of fuel poverty. The nature of DH as collective actor problem and importance of community involvement and social capital are clear and the increasing number of RSLs becoming ESCOs and what this means for them in terms of business activity as well as more general challenges for RSLs installing a DHS have been investigated.

Ambrose uses socio-technical theory to understand the interaction between the innovation of a biomass DHS and the social system of a RSL and the impact on the landlord’s relationship with tenants (McCabe et al, 2018a, P555). This is done in the context of two case studies of DHSs owned and managed by RSLs in London, concluding that “the ability of both the organisation and the end user to adapt to and accommodate the innovation will determine the extent to which the intended benefits of biomass fuelled district heating are realised” (Ambrose, 2014, P35).

This study will investigate the implementation of a biomass DHS by WWHC to determine to what extent the findings of Ambrose’s research are generalizable to this particular case. It will investigate what options were considered before commencement, how decisions were made, what expectations were in place and to what extent these were met. It will also investigate what challenges arose and the consequences of decisions made during the project, especially in relation to WWHC’s relationship with tenants, from a socio- technical

perspective. The study will also establish whether the motivations, challenges and success factors experienced by WWHC are consistent with those identified in this review of relevant literature.

Chapter 3. Methods

3.1 Introduction

This dissertation will investigate WWHC's experience of installing a biomass DHS to determine why key decisions were made, what challenges arose, how the project affected the organisation and whether WWHC's experience is generalizable to existing research in this area. There are several ways these questions could have been answered, for example, using a quantitative approach to gather and analyse statistical data relating to the project, a qualitative approach where importance is placed on the unique views and experiences of those involved or mixed methods, which combines both qualitative and quantitative approaches. All of these methods are commonly used in social research, dependent on the type of data required.

A qualitative approach using interviews and questionnaires to form a case study was chosen to investigate the impact of introducing a DHS on the culture of WWHC. The research question does not call for numerical data, but instead for in depth accounts from individuals about how they have experienced this socio-technical innovation and its effect on the organisation and their jobs. Further explanation of the approach used and justifications for this choice are detailed in this chapter.

3.2 Research methods

Housing research, a component of social science research, must have a specific purpose, be grounded in research theories and draw from existing knowledge to address the research question through analysing representative data which has been collected systematically (Robertson, 2008, P24).

Quantitative research represents a scientific approach linked with the positivist tradition (Creswell, 1994 cited in Creswell, 2003, P3) often by deducing a hypothesis that is subject to empirical scrutiny (Bryman, 2012, P24). Unbiased, numerical data is collected with controlled variables to examine the relationship between the world and how it is observed (Braun & Clarke, 2013, P29) through

methods including experiments and surveys based on predetermined instruments (Creswell, 2003, P18). The ability to be able to replicate the study, validity and reliability are important (Creswell, 2003, P7).

Qualitative research is linked with the traditions of constructivism and interpretivism where individuals seek understanding of the world and develop varied and multiple meanings from their experiences (Creswell, 2003, P3) allowing theory to be induced by “drawing generalizable inferences out of observations” (Bryman, 2012, P26). Broad, general and open questions are used to capture the complexity of participants’ views with “uniqueness of people and society as objects of study” (Becker & Bryman, 2004, P96).

Qualitative research is linked with phenomenology as an epistemological position (Becker & Bryman, 2004, P96) and is distinctive because it focuses on understanding the beliefs, experiences and values of participants, from their perspective. The emphasis is on context and details of the setting to facilitate understanding of events influenced by that particular situation. Qualitative research is typically relatively unstructured, allowing for flexibility and change of direction if required (Becker & Bryman, 2004, P92) and it is acknowledged that the researcher’s background also affects their interpretation of the data (Cresswell, 2003, P8).

Qualitative and quantitative methods can also be combined to form a mixed methods approach. Rationales for this include triangulation of data to increase credibility or addressing different research questions within a project (Becker & Bryman, 2004, P99).

Qualitative approaches are wide ranging and include phenomenology which is useful for understanding how subjects experience a particular phenomenon; grounded theory which uses data gathered in the field to develop a theory and ethnography which uses primarily observations and interviews of a cultural or social group to describe and understand it (Cresswell, 1998, P6). A case study approach, which is useful for analysing a single case in depth using multiple sources of data, was chosen to investigate the consequences of WWHC

introducing DH and induce theory which can be compared with Ambrose's findings to establish whether they are generalizable (ibid).

3.3 Sample and recruitment of participants

Purposeful sampling was used for questionnaires by inviting all staff to complete an online questionnaire by email, encouraging a wide range of responses.

Stratified purposeful sampling was used for interviews to select participants at different levels and with different roles within the organisation to target all sub groups and to facilitate possible comparisons (Cresswell, 1998, P119). First, all staff were emailing asking if they would be interested in participating, then individual staff and committee members were approached.

3.4 Interviews & questionnaires

Self-completion questionnaires were issued to all staff as it would be impractical to carry out face to face questionnaires within the time frame. As the participants were professionals working in an office environment, it was assumed that all were capable of completing a simple questionnaire without an interviewer bring present. The questionnaire responses helped inform the questions asked during interviews which were carried out at WWHC offices, the participants' place of work, to gain a better understanding of their perspective on the project.

A semi- structured interview was used so that interviewees could miss questions, focus on areas of interest and answer questions in any order, which also allowed for flexibility to ask questions not included in the interview guide based on the responses given to other questions (Bryman, 2012, P470). Emphasis was on how the interviewee understood and framed issues and events and what they deemed to be important (ibid).

A pilot questionnaire and interview was carried out to ensure that the questions were clear and understandable and following the pilot interview, questions were adjusted and documents relating to the project were consulted to help inform interview questions. The questionnaire took participants up to 15 minutes to

complete and the majority of interviews lasted between 15 and 40 minutes with 16 questionnaires and 13 interviews completed in total.

3.5 Ethics

This study was assessed and approved by the University of Glasgow School of Social & Political Sciences Ethics Forum before commencement. Participants were given a participant information sheet explaining how their confidentiality would be protected and that their choice would not affect their experience of work, allowing them to make an informed decision over whether or not to take part. For interviews, participants were asked to sign a consent form before proceeding and consent was implied by choosing to complete the questionnaire.

The sample was de-identified by giving each transcribed interview or questionnaire a code and data was stored separately from participant's names. Participants were referred to by a pseudonym when writing up the findings of the research. The main ethical issue was confidentiality because if participants revealed information which made their role within the organisation clear, combined with the relatively small sample size, it may be possible to identify them despite a pseudonym being used meaning that there was some risk that full confidentiality could not be guaranteed. All participants were made aware of this and care was taken when writing the findings to protect sensitive information.

3.6 Analysis of data

The data was coded using emergent codes, first with open coding to separate the data into categories, then with axial coding to determine the relationships between the categories, allowing codes to be grouped together into themes and reduced to a more manageable number (Blaikie, 2000, P239). For strong research the codes must be clear and applied consistently so the data was reviewed several times (David & Sutton, 2011, P340). The table below shows the final codes and the themes that they relate to.

Codes	Themes
purpose role of committee planning stage control over costs	design & establishment
installation staff morale relationship with tenants flexibility	contract & installation
metering and billing tenant education project outcomes lessons learned	subsequent running

Table 1- Codes & themes

3.7 Limitations of interviews & questionnaires

The original intention was to capture a wide range of views of WWHC employees through questionnaire responses then use that data to inform interview questions for people directly involved in the project. In practice, the mixture of job roles of questionnaire and interview participants were similar but questionnaires still provided additional data and a basis for interview questions. Another possible limitation was the ability of the interviewer to make the interviewee feel relaxed and ask the right questions and also how well respondents answer the questions asked. It was felt that questions were asked and answered sufficiently well than there was no negative effect on the data.

3.8 Limitations of research & conclusion

Ambrose (2014) carried out interviews with both residents and staff of two RSLs in London so it could have been beneficial to extend the case study to other RSLs who have installed DHSs in Scotland to facilitate comparison. Furthermore, due to the scope of this piece of research as a post graduate dissertation, there was insufficient time and resources to interview both staff and tenants, so only staff were interviewed, however, they had an understanding of how tenants adapted to the system through their interactions with them.

Case studies are generally considered to have weak external validity meaning the findings of that case cannot be assumed to be generalizable to others (Bryman, 2012, P70) and qualitative research in general is “not an appropriate

means of arriving at statistical descriptions of a large population” (Babbie, 2005, P298). As the research investigates whether the findings of an existing study are generalizable to this case and how consistent this case is with issues raised in the literature, these limitations should not negatively affect the chosen methods appropriateness to address the research questions.

The following chapter will analyse and interpret the data collected using the methods described above to examine how the findings relate to the research questions and existing literature which was reviewed in chapter two.

Chapter 4. Results & Discussion

4.1 Design & Establishment

4.1.1 Purpose

Participants were asked the reasons for and objectives behind the installation of the DHS. Views were varied and included outcomes relating to tenants such as reducing fuel poverty, reducing heating and hot water costs, to provide a reliable system that could be controlled easily and because the existing system was no longer fit for purpose. Other reasons included reducing carbon emissions, improving EE, because funding was available and to meet government standards such as EESSH and SHQS.

The staff member who led on the project confirmed that the main objective was to reduce fuel poverty and poverty overall in the area which is one of the organisational aims of WWHC, with all other benefits being additional and that when the project commenced, SHQS was in place but EESSH did not yet exist. Npower's main objective was reducing carbon emissions to meet carbon savings targets to receive ECO funding from the government.

The objectives and additional benefits are largely in keeping with the motivations identified in the literature for installing DHSs with the exception of creating new business opportunities by opening up new revenue streams, to connect to large scale heat networks in the area or for regeneration which were not identified as motivations for WWHC (Literature Review 2.8.1, P13).

A funding package of £7 million was put together comprising of European Regional Development Funding (ERDF), Warm Homes Loan (WHL) from the Scottish Government and ECO funding provided through Npower. Staff involved in securing funding found the process to be slow and bureaucratic and complicated by changes to the various funding schemes on offer, particularly securing the ERDF which took two years.

4.1.2 Role of Committee

As WWHC is a fully mutual co-operative, the management committee is made up entirely of tenants, many of whom have the heating system installed in their homes. The role of the committee was to oversee the project, ensuring it was right for WWHC and for tenants and approve all major decisions. The committee was kept informed of all aspects of the project including interactions with other parties involved and how staff were handling problems and also provided valuable input and approval to senior staff when policies relating to energy services such as setting the SC were being developed. Committee felt that the project had been challenging but they had learned a lot from being involved.

4.1.3 Planning Stage

Consultants were appointed to carry out a feasibility study to determine the best type of RE solution for WWHC and recommended a biomass DHS but “rather than have a capital investment it may be a better solution to negotiate with an ESCO. They would build, own and operate the plant, bill tenants and be responsible for maintenance. The negotiation would be a low cost fuel for the cooperative and tenants” (Thain, 2009, P6). It was recommended that WWHC did not take on the role of the energy provider to reduce financial risk (ibid).

WWHC decided not to follow this advice, deeming the risk involved to be manageable, noting that often in social housing ‘status quo’ options were chosen due to RSLs being risk averse. WWHC wanted to consider innovative solutions rather than immediately choosing the most conventional option to ensure the best outcome and several participants felt that the project boosted the reputation of WWHC by showing social entrepreneurship especially compared to LAs who are less likely to take on this type of project.

“The historic bureaucracies of municipal authorities mean they can’t be as slick or move with the same pace and agility in relation to financial markets and technical developments happening on the ground. They are slow, but smaller, locally controlled organisations can move at pace and be brave and ground breaking.” Interviewee 10

“Sometimes you see the likes of Local Authorities can have the attitude “if it’s not broke, don’t fix it” so it means they fall behind and if they do need to make the jump, it’s a massive, massive jump whereas we’re keeping up with technology and I think the tenants see that, we’re forward thinking so I think it’s positive.” Interviewee 2

This relates to the changing role of RSLs over recent decades, breaking away from what would traditionally be considered their core activities for example, partnership working, one of the characteristics of modernisation identified in the literature was at the core of the project. It could also be considered to be boundary spanning as the social system of WWHC has been linked with technical knowledge from the private sector. This necessitates a more entrepreneurial approach associated with managerialism and strategic management which WWHC staff view as a strength allowing the organisation to contribute to the environment it operates in and adhering to its strategic view of being a social housing provider and community based organisation (Literature Review 2.1, P5).

4.1.4 Control over costs

WWHC decided to keep all operations in-house and carried out an options appraisal to determine how best to incorporate this new role into the organisation. Setting up a stand-alone energy co-operative and a private company limited by shares were both considered but it was decided that keeping the existing organisational structure as a charitable housing co-operative and including the ESCO role as part of core activities would be possible under WWHC’s charitable rules: “to provide for the relief of those in need by reason of age, ill health, financial hardship or other disadvantage through the provision, construction, improvement and management of houses for occupation by members of the Co-operative” (SFHA, 2013, P1). A staff member involved in this process explained that organisations determine which activities are suitable and in keeping with the delivery of charitable objects and in this case, staff and committee were confident that the object was being satisfied by meeting tenants’ needs in terms of heating provision, lower costs and alleviating fuel poverty.

WWHC’s decision to choose this structure, effectively becoming an ESCO themselves, was not considered to pose a risk to WWHC’s reputation as the

literature suggests can happen due to tenants' dubiety about the charitable and commercial roles of the organisation fitting together well (Literature Review 2.7, P13). This may be due to the community based nature of WWHC and not for profit set up. The experience of WWHC appears to differ from that of Woking and Aberdeen Councils who found that keeping control of the financial risks involved led to weakened trust and social capital (Literature Review 2.8.2, P14). Although problems with the installation posed a challenge to relationships and social capital (Results & Discussion, 4.2.3, P33), the data does not suggest that taking on extra financial risk had a negative effect in this area.

Having the ability to control the tariff and SC costs was an important and positive aspect of keeping energy services as part of WWHCs core activities rather than outsourcing it. Prices are set to cover the running costs of the system, ensure funds are available for future maintenance and to repay the WHF loan. The not for profit set up was perceived to be in keeping with WWHC's ethos of community control.

“I think one of the big things is control, that local control, the co-op managed by local tenants for local tenants where it's not profit first, it's people first, it's our tenants that are first. When you're dealing with the big energy companies their main motivation always has to be their shareholders whereas our main motivation is our tenants, giving them a good service and good value for money” Interviewee 12

The ability to keep prices low was seen as particularly important amid current austerity measures, welfare reforms and the introduction of UC, which are causing financial struggle for many tenants. WWHC now has control over a large amount of tenant's household income as they control both rents and heating costs. WWHC are confident that the system has reduced costs, with savings estimated at 14% compared with electric heating but as few tenants have records of historical electricity bills for comparison and cost data was not collected before the DHS was installed, savings are difficult to quantify fully.

The main objective of the project was to reduce fuel poverty and it could be argued that taking control over more of tenants' household income meets that objective, although it is difficult to measure exact savings. As part of WWHC strategic plan and values as a co-operative, the organisation feels it is providing

the best quality service available at the lowest price, offering a different heating supply model to the Big 6 providers at a time when they are introducing steep price increases which tenants have been partially protected from as the SC and tariff charges for the DH system have remained stable since installation.

“The biggest benefit is cost control. Other RSLs with DH don’t have that control, they’re relying on energy companies who set tariffs, ok they might apply discount formulas but it’s very much linked to their tariffs and prices will increase as they increase.” Interviewee 1

“It’s non- profit, not like the Big 6 there to make millions of pounds, we’ve not had a price increase over the last 4 years and large suppliers have so this is very advantageous to our tenants.” Interviewee 6

Furthermore, having another party involved would be likely to increase costs which would then have to be passed on to tenants, diminishing the opportunity to reduce fuel poverty, despite this being the main driver of some of the funding available.

Many interviewees felt that retaining control of energy services allowed for the provision of better customer service as tenants could easily call or visit the office if they had a problem, avoiding call centres. As many tenants already know WWHC staff on first name terms and staff know the backgrounds of tenants, this increased transparency, accountability to tenants, scope for flexibility and problems were addressed quickly.

“If a tenant phones with a query we can help straight away, they don’t have to go through an operator and wait for a long time to speak to a voice at the end of the phone that doesn’t understand. We might have more empathy and know more about the background of the tenants so in that respect, it’s better for tenants.” Interviewee 4

“I would always say it should remain in the hands of your own organisation so that you control the finances and if people are needing help you’re here to help them rather than them being placed in a queue and someone getting back to them two or three weeks later and then they’re sitting without heating and hot water.” Interviewee 6

These benefits are consistent with the advantages of using an ESCO structure identified in the literature (Literature Review 2.7, P13). Most participants felt that there were no downsides to WWHC becoming an energy provider other than increased workload which was perceived as worthwhile for the benefits received.

A potential challenge raised was resourcing physical maintenance of the system which has been minimal so far but costs are likely to increase in future as the system begins to age and possible financial uncertainty for the whole housing sector such as the introduction of UC must also be taken into account.

Overall, none of the participants expressed that the decision to retain energy services within core operations of WWHC was a poor one.

4.2 Contract & Installation

4.2.1 Installation

Npower were the principle contractor of the project, a role which, as a large utility provider, they were not used to. Initially, the majority of the work including tenant contact and programming work in homes was done by Npower's sub-contractors. Staff felt that the project may have gone more smoothly if WWHC had more control over this aspect of the project from the outset. Participants felt that Npower exercised poor management of their sub-contractors and delivery from sub-contractors was poor, which were problems that could have been avoided had there been better management and on-site supervision.

One of the most prominent issues raised by participants was early stage problems with the project and the effects these had going forward. Despite the involvement of DH experts, there were issues with the design of the system and the workmanship which led to the contract being extended for several extra years and extra visits required to tenants' homes to rectify problems. This has resulted in an ongoing defects period with the project yet to be fully handed over from Npower to WWHC leading to strained relations between WWHC and

other parties involved, low staff morale, significant extra work load for staff and discontent from tenants due to issues with the effectiveness of the system. The design and installation problems led to system inefficiencies which meant that tenants' homes did not reach the temperatures expected, tenants were overcharged and it was difficult to manage tenants' expectations when the project end date was repeatedly postponed.

Strong relationships and good communication were identified in the literature as important factors in the success of DH projects but relations between WWHC and the other organisations involved became strained (Literature Review 2.8.6, P16). As is common with collective actor problems, managing the relationships between actors involved was challenging, especially as WWHC was there to represent the interests of tenants and other actors from the private sector had their own aims and objectives (Literature Review 2.5, P11).

A team was put in place by WWHC to work specifically on identifying issues with the system and how they could be resolved, organising access to tenants' homes, liaising with contractors and investigating billing issues. This was an additional resource which resulted in staff members being taken away from other areas and extra costs incurred. Technical issues identified were incorrect radiator sizes, incorrect positioning of thermostats and incorrect positioning of the bypass radiator and numerous visits to tenants' homes were required to rectify these problems, causing a lot of disruption. Tenants received payments for inconvenience and a refund as they had been overcharged.

“All the technical issues, number of revisits that we've had, for staff and tenants that's been one of the biggest challenges, just the number of times we've been in and out of people's houses looking at defects, faults and design flaws, that's been a huge issue”
Interviewee 8

“Sometimes I just wish we had it running a lot smoother, we've gone back into the tenants' houses in my eyes, too many times for wee things that should have been caught” Interviewee 4

Although this was very disruptive, it was felt that it was the right thing to do to ensure the system was working to a high standard and all issues were fully resolved.

4.2.2 Staff morale

WWHC had successfully completed numerous development projects in the past and staff were used to projects going well so the problems with this project had a huge impact on staff morale.

“We’ve never had problems like this with our contracts, this has been the most difficult ever. We’ve had problems with contracts before, sorted them out and that’s the end of it but with this project we’ve sorted out one lot of problems and others have arisen which have been no fault of our own and wasn’t something we could have anticipated.” Interviewee 7

The problems were caused by contract and design issues which were the responsibility of other actors involved in the project but WWHC staff had to deal with complaints from tenants which was difficult for staff who reported reactions ranging from frustration to ill health. As the project progressed and issues were resolved, this alleviated the pressure on staff and tasks relating to the DHS began to feel like a normal part of their job.

“Other development projects have had small issues but these were bigger, more widespread problems that needed a longer-term plan to sort out. It was not an easy process for the staff that were working on it and also staff who weren’t working on it would have to hear about it and have to deal with negative feedback” Interviewee 9

Overall, participants felt that everyone involved had coped well with the transition to providing energy services, especially considering the unpredictability and frequency of problems occurring with the project.

4.2.3 Relationship with tenants

Participants felt that the issues described in section 2.1 had a negative impact on WWHC’s relationship with tenants as so many were unhappy which resulted in the biggest turn out at an AGM in the co-ops history. Staff felt that tenants’ patience had been tried by the number of visits required and that criticisms the organisation received were fair, but also that tenants were aware staff were working hard to resolve the problems and cited the goodwill of tenants for continually allowing access despite this being hugely inconvenient.

“Tenant patience was snapping, tenants were disgruntled, they couldn’t believe we had put a project in place that wasn’t like many previous projects which ran smoothly and to time and budget. It was a shock to many tenants that we had failed them and it was a shock to ourselves.” Interviewee 10

Staff felt that a lot of work had been done to regain tenants’ confidence and restore the reputation of the organisation and that the majority of tenants were now happy with the system, despite the difficult transition. Although all participants felt that relationships with tenants had improved greatly, staff who had been involved in the project on a front line basis were more reserved and expressed higher levels of frustration with the project than those in other roles, who were more likely to express that they felt all issues had been resolved.

A reoccurring theme was the ‘goodwill’ of tenants towards WWHC which staff felt had been build up over the years by providing a high standard of service, building good relationships with tenants and from successful development projects which had been completed in the past.

“We used goodwill we’ve build up over the years, [tenants] know the co-op can deliver on these things and when something goes wrong it’s an unusual thing, normally development projects run smoothly and people are happy quickly.” Interviewee 11

The concept of ‘goodwill’ from tenants is similar to the concept of social capital which has been identified in the literature as important for the success of RE innovations in social housing contexts. The OECD definition of social capital references “the networks norms, values and understandings that facilitate co-operation within or among groups” (Literature Review 2.4, P9). In this case, the trust, levels of expectation from tenants of a high standard of service and confidence in WWHC as a landlord have been important factors in tenants giving the flexibility and patience required to overcome the problems faced at the installation stage. Although this part of the project was clearly difficult for tenants and staff alike, WWHC managed to overcome the challenges and damage to their relationship with tenants. Without this goodwill or social capital, the project would have been much more likely to fail as it is essential to have the support of the community (ibid).

Although the project strained WWHC's relationship with tenants, staff and committee felt it had enhanced the co-op's reputation externally, especially amongst other RSL and reported hearing good feedback from peers.

"I think our reputation as a housing provider and community anchor has been enhanced, the good that we do for tenants and how far we're willing to go to ensure that our tenants get the services that they deserve and what they need." Interviewee 12

Staff felt that WWHC had done well as a small organisation to take on such a large project and noted that this had been reflected externally through winning awards for renewable energy projects and positive publicity and felt the project was an aspirational example others would want to follow.

4.2.4 Flexibility

Every participant felt that flexibility was very important for the success of the project.

"Flexibility is important, especially with it being innovative, you sometimes go into things thinking something is modern, it's new technology, it's all going to work like a dream but sometimes being one of the first to try something, you get all the issues, you're the ones who are finding the problems and dealing with the problems, but I think it has worked really well." Interviewee 12

"I think if you didn't have flexibility it would never have worked because WWHC put a lot of time, effort and man hours into it that we didn't have to do, but if we hadn't put the time and effort into it we would never have got to where we are today because they would have papered over the cracks and we might not have discovered them for years to come. But through the work of staff finding faults and getting to understand things, we found the bigger picture." Interviewee 6

"If we were an organisation that didn't care about it and had a director that said 'that's their problem, not ours' I think we would be in a different set of circumstances where we wouldn't be as far advanced as we are today" Interviewee 6

Tenants were flexible by allowing access and waiting longer than expected for the system to be functioning optimally and staff were flexible in terms of their job roles, workload and willingness to take on challenges in a new and unfamiliar area, but felt that it was part of their role to adapt.

“I think overall, we’ve all just accepted it as another part of our job and we just get on with it.” Interviewee 4

“For staff, it’s a different hat we have to wear but we wear different hats all the time. I think we’ve just taken that in our stride, we change and adapt all the time and we’ve just done that. Adaptability is absolutely important but that’s the times we move in, you just need to be able to change and adapt to whatever gets thrown at you” Interviewee 7

Ambrose found that “the ability of both the organisation and the end user to adapt to and accommodate the innovation will determine the extent to which the intended benefits of biomass fuelled district heating are realised” (2014, P35). WWHC is consistent with the findings of Ambrose’s research into understanding the interaction between the innovation of a biomass DH system and the social system of a RSL as participants expressed that flexibility was essential for the success of the project, extending to both the organisation and tenants.

4.3 Subsequent running of system

4.3.1 Metering and billing

The project has brought new responsibilities to WWHC as staff now have to deal with metering and billing for the DHS. Having only electricity was the norm in multi storey properties so tenants needed support with adjusting to having two different meters and bills. The most controversial aspect of this has been the SC which is present on all fuel charges but is visible as a daily charge displayed on smart meters in tenants’ homes so users are very conscious of it compared with their electricity bills.

“I think the whole billing side of it is a bigger challenge than we’d anticipated. I think we’d thought that when we were doing the pre-paid cards that tenants would just pay and that there wouldn’t be a high volume of billing queries and people asking for more information. I don’t think we’d anticipated that tenants being able to see their standing charge would create as much tenant contact and discussion as it has done.” Interviewee 7

Staff felt they had to promote awareness of SCs and how they work and explain to tenants that credit should be topped up regularly to cover the SC. This is very much consistent with the literature on SCs which suggests that they are often poorly understood by residents and can be problematic (Literature Review 2.8.3, P15). Some tenants felt the standing charge is high and the system is too expensive but if they choose not to use heating and hot water or are unable to afford it, the SC is still applied and it was difficult for some tenants to understand that having two bills and two SCs did not mean that the system was costing more than the previous one.

“Don’t underestimate [...] the amount of time it takes to explain to tenants that actually you’re not paying more, you’re paying two places instead of one. The minute people see two different bills they assume it’s more but actually when you add it together it’s not.”

Interviewee 7

Other concerns raised in relation to metering and billing include the physical tools used to measure usage. The smart meters in the properties can easily break and need to be replaced and sometimes the smart meter loses signal which requires a visit to rectify. Initially, an engineer from the company who provides the smart meters would be called out to fix the issue which could take only a few minutes but incurred a charge of between £129 and £172 for each visit. Two members of the property team then received training on how to fix this problem, which has saved money but added to their workload. A report of jobs raised between 2015 and 2017 showed an average cost for smart meter replacements and repairs as £325 inclusive of VAT with 25 job lines raised within the two-year period. This is an example of the type of issues an organisation can come across unexpectedly, affecting budgets and workload, as there is little existing information with this level of detail for RSLs taking on the responsibilities of metering and billing.

Another impact of WWHC becoming an energy provider is staff having to deal with tenants who have debt on their heating account which can be addressed by arranging for debt to be gradually repaid each time a tenant tops up their heating or giving assistance through WWHC’s own welfare fund.

“It’s another thing we have to deal with that we didn’t before, making decisions about whether it is reasonable to add debt to the meter. When we come across people living with no heat, we used to be able to pass it to a third party but it’s now something we have to deal with.” Interviewee 7

Staff members who come into contact with tenants in rent arrears or who have debt problems felt that this new responsibility made their job more complex and time consuming as they are no longer able to signpost tenants to another organisation to receive help and advice about fuel debts and noted that it has had an impact on their job.

“It can make things more difficult. It can feel like you’re giving with one hand and taking with the other. They pay that debt and because they’ve done that it’s almost like a reward, we’ll give them money for heating and/or food. You’re having to deal with the whole thing now whereas in the past you could deal with just your part of it. It’s more holistic now.” Interviewee 8

This is an example of how staff working in parts of the organisation that do not deal directly with heating enquires have been affected by the introduction of the DHS in a way that was less anticipated and has added layers of complexity to job roles that were previously more clearly defined.

4.3.2 Tenant Education

A reoccurring theme for the success of the project was the importance of educating tenants on how to use the system effectively. A lot of support was required initially on how to work the thermostat resulting in staff visiting many tenants’ homes to provide demonstrations which reduced over time as tenants got used to the system and staff got better at providing information. This process took longer than some staff anticipated, particularly in raising tenants’ confidence in the system to the point where they could troubleshoot minor issues for themselves, adjust the thermostat to suit their heating needs and understand their bills and usage.

“That side has been more difficult for tenants to adjust to and we didn’t anticipate that it would take as much time and I don’t think we had anticipated that so many tenants would struggle with that. We knew that there would be a core of them but there’s been people who

you thought would take it in their stride but haven't really and have needed several visits to sort out." Interviewee 7

Budgeting was identified as an area of improvement for tenants who are encouraged to build up credit over the summer months to offset higher costs during winter as staff noticed an increase in the amount of billing and operation queries received when tenants started using their heating more.

McCabe et al's 2018 systematic review of 67 RE interventions found that a strong theme in the literature was the importance of the engagement and understanding of residents because if they do not understand how to work the system properly, it can become less effective, potentially diminishing the positive effects of installation altogether (Literature Review 2.8.5, P16). Tenant education has been a considerable challenge for WWHC and something that may have been underestimated before commencement of the project. Keeping residents engaged links back to the concepts of social capital and tenant goodwill as WWHC must draw on its relationship with tenants to influence them into being open to learning about the system.

This also relates to the importance of flexibility as staff have to dedicate time to educating tenants and explaining how to work the system and tenants must have the flexibility and willingness to engage with a system they are unfamiliar with and invest time in learning how to operate it properly. This is important for the success of a socio-technical innovation as the user interface is the point where the social structure meets with the technical innovation and this interaction can determine whether the project will be successful and form a new system or whether it will be too disruptive and ultimately unsuccessful (Literature review 1.7).

4.3.3 Project outcomes

Participants identified many successes and benefits of the project including price stability, with prices remaining static since 2014, better efficiency and reliability compared to the old system, better user controls and carbon reductions calculated by Npower at 16000 tonnes saved per annum.

A survey of 50 tenants completed after remedial work was carried out in 2015 found that 96% of respondents felt the system was heating their home adequately and 96% felt their water was always hot enough. Around half felt the system had been working better following the remedial work and the other half felt it was the same indicating that tenants are happy with the system.

Participants felt that the project had contributed to addressing levels of fuel poverty in the area and all properties meet EESSH in advance of the deadline. If a new electric heating system had been installed to meet EESSH this could still mean high bills for tenants and exposure to electricity market volatility.

A questionnaire conducted with staff from across the organisation indicated that the majority felt the project had been successful and the remainder of respondents felt been partially successful (Figure 1).

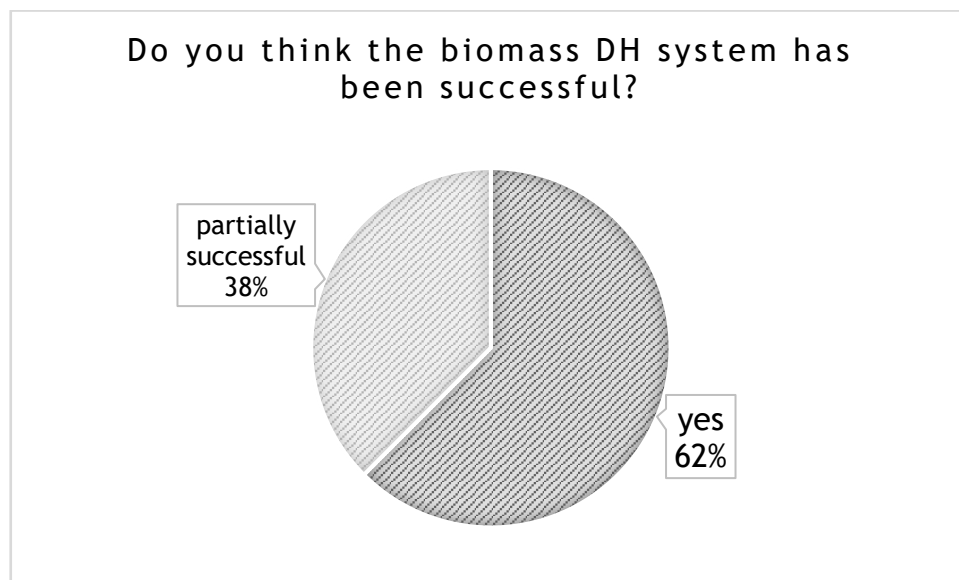


Figure 1- Pie chart showing staff perception of the success of the project

The main reasons given for the project being partially successful related to the amount of disruption caused by problems with the installation, setbacks prolonging the project and tenants having problems understanding the new system and learning to use it effectively.

The majority of the respondents felt the project had led to unexpected challenges for WWHC (Figure 2) which again related to the problems at the

installation stage and resultant strain on relationships with tenants and are summarised in this response:

“The continuous extension of the completion date for the project has been very difficult and there has been a staffing cost attached to this. The numerous revisits due to problems has been very difficult for tenants and staff. As a result of the delays, revisits etc the relationship with the main and sub contractors has been very difficult and at times stressful. I think the contract has had an emotional toll on staff and tenants are frustrated it has taken so many visits to resolve the problems.” Response 4

Staff had quite mixed responses to this question, ranging from very positive to expressing some doubts, although no one felt that the project been unsuccessful overall.

“An argument could be made that the huge disruption to tenants outweighs the benefits. It has had a negative effect on the Co-op's reputation, and on staff morale. The energy emission reductions haven't been realised due to the system not working properly.” Response 10

“The system is working tremendously well now, after considerable teething problems. The costs are far cheaper for tenants than previously and we are saving a considerable tonnage of carbon each year.” Response 11

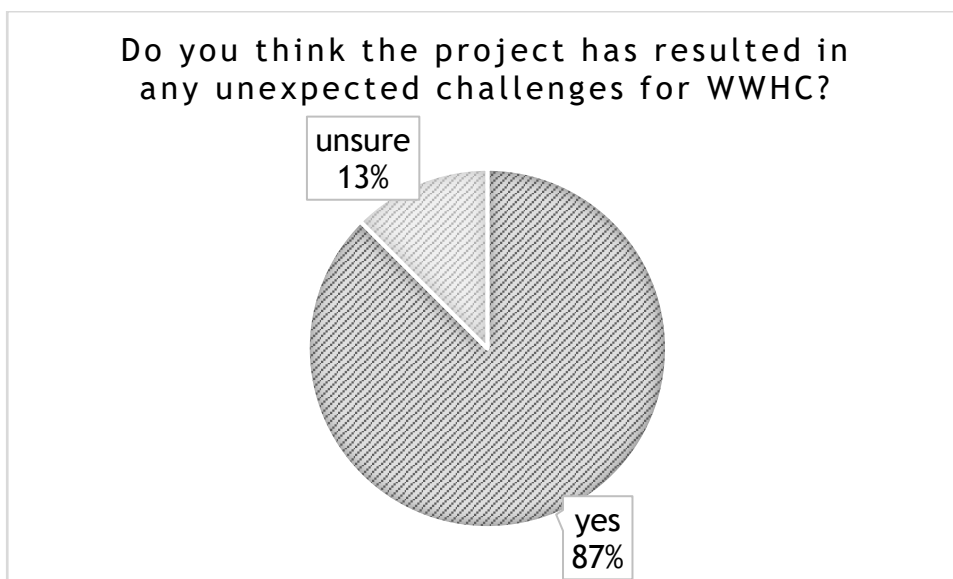


Figure 2- Pie chart showing staff perception of unexpected challenges arising from the project.

The majority of respondents felt that the introduction of the DHS had an impact on their job or team and included staff from property services, tenancy services and directors, with a mixed response from corporate services and concierge (Figure 3).

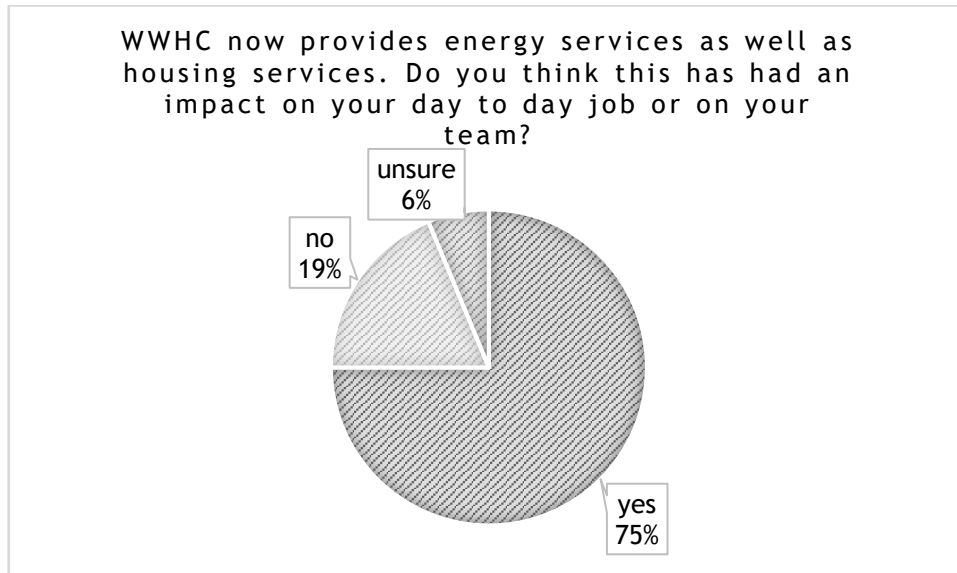


Figure 3- Pie chart showing staff perception of impact the project has had on their job role.

As a result of the large impact the project has had in terms of time and resources, the property section now has two additional members of staff and staff felt that a lot of flexibility was required within their job role during the project, with longer standing staff members reporting that their job had changed very much over the course of the project. Other participants mentioned that before the project commenced, they did not think it would have much impact on their job as additional tasks would mainly fall within the property section but later discovered that this was not the case and this was perhaps something that was underestimated initially.

Several participants felt that the project had an impact on other services provided by WWHC due to the organisational focus, time and resources taken up by the project resulting in reduced opportunity for other projects or more core activities to be developed. Some activities were put on hold including replacing windows in the low rise properties and some kitchen and bathroom upgrades.

The way in which changes were managed and the ability of staff to support each other and work together were identified as success factors in managing the

challenges of the project which mitigated the impact on other services to some extent.

“Nothing seems to suffer, even when we were dealing with a problem because everyone seems to pull together and help out” Interviewee 2

Several participants mentioned that the project had been a steep learning curve for staff.

“You always learn more from projects that don’t go well, you don’t tend to learn much from projects that do go well so there’s been a huge learning curve and knowledge and experience gained for the staff” Interviewee 1

Participants expressed that they had gained valuable experience from being involved in the project in terms of their professional development, skills and knowledge.

4.3.4 Lessons learned

Many participants said they would encourage someone from another housing organisation who was considering a similar scheme to go ahead but identified lessons and advice they would share based on mistakes and challenges that arose for WWHC. The key lessons are summarised in table 2.

Visit existing projects and get advice from those involved.

Ensure the design is right and is signed off properly. Make sure at the outset that the design is fully costed and under written to avoid financial problems.

Research the background and track record of your principle contractor and any sub-contractors involved. Market scrutiny is important but difficult as the number of players in the market is limited.

Once the project is completed ensure any outstanding issues are dealt with by contractors.

Get a good independent consultant involved from conception stage to scrutinise the design and proposals. WWHC noted that they had various experts involved directly or through the principle contractor and at times their views were contradictory.

Proper management structures must be in place such as a project manager and clerk of works so that someone is answering to you on a daily basis.

Make sure you have adequate resources in place in terms of staff numbers to deliver the project.

Consider how the project will impact on the whole organisation. Get the whole organisation involved as early as possible so they have an awareness of how the system works and the process involved.

No matter how good the system is, it will be impossible to please everybody due to different needs, different usage and different standards.

Be prepared that it will be a big change and hard work for the whole organisation.

Table 2- Lessons learned from the project.

4.4 Summary

WWHC chose to install the biomass DHS after considering a number of RE options as well as the possibility of replacing the existing electric storage heating with a more modern version. Staff and committee felt that it was important to consider something innovative but a large factor in the decision was the availability of funding. The option to outsource ESCO duties to another party does not appear to have been given much consideration as WWHC felt strongly that it was important for them to retain control. A number of different options were considered for integrating the ESCO activities into the existing organisation and it was decided that this should become a core activity of the charitable housing co-operative.

The main objective of the project was to reduce fuel poverty for tenants and overall, the data suggests that staff and committee feel this objective has been met although there is difficulty in measuring to what extent. WWHC now has control over a large proportion of tenants' bills, potentially giving them the ability to reduce poverty by keeping tenants' outgoings as low as possible.

The project brought many unexpected challenges, difficult working relations with other actors involved and the project was extended for several years past the planned completion date. As this was not anticipated and there were few

other RSLs who had completed similar projects at that time to learn from, it led to a strain on social capital until the problems were resolved.

“You’re walking into that with your eyes closed because you don’t quite know what you don’t know.” Interviewee 11

This had a large impact on staff morale, however, now that many of the issues have been resolved, staff mostly seem to view the project as successful.

“Looking back, there was a point I wouldn’t have done it again but I would now and I’m glad we did.” Interviewee 9

Overall, despite the difficulties with the project, prolonged challenges and tenant discontent, there was a sense from participants that now things are more settled, they are proud of what has been achieved and felt that the project was worthwhile for its ability to improve quality of life for residents of West Whitlawburn.

“Sometimes we feel great about everything we’ve done, other times, like the earlier times it did have a big impact, people were getting tired, it was never ending, no light at the end of the tunnel and now you can see we’ve made a huge impact, I think for the better.”
Interviewee 4

Chapter 5. Conclusion

This dissertation has researched WWHC's experience of installing and running a biomass DHS in the form of a case study, using interviews of staff and committee members, supplemented by a questionnaire.

Socio-technical theory was used to understand the introduction of innovative energy efficient technology to the rigid social system of a community of tenants who were very used to the existing heating system and the consequences of this change.

5.1 What options were considered and how were decisions made?

One of the main decisions made was to choose a biomass DH system in the first place as a more conventional option could have been chosen, however funding was available for biomass DHSs and senior staff and committee were keen to use an innovative solution. As summarised in section 4.4 (P42) the main decisions revolved around how to incorporate this new activity into the existing structure of WWHC and to what extent the organisation wanted to take on more risk to the business in order to be able to exercise more control. Decisions were ultimately made by the management committee with support from senior staff involved in the project.

5.2 What expectations were in place for the project and to what extent were they met?

The project was expected to reduce fuel poverty for residents and be completed within two years of commencement. WWHC feel heating costs for tenants and fuel poverty have been reduced although it is difficult to measure to what extent, however as WWHC now have control over a large proportion of tenants' household bills, combined with their values as a co-operative and strategic aims, it could be argued that this has been achieved. It has also been shown that improved EE is the most efficient way to address fuel poverty (Introduction, 1.2, P2) and Npower have calculated that 16,000 tonnes of carbon have been saved

per year as a result of the project, indicating a potential reduction in fuel poverty.

The project has also delivered other benefits including price stability for tenants with prices remaining static for four years, a more reliable and easy to control system, lower costs for tenants and all properties are fully compliant with the terms of EESSH. Expectations surrounding the timescale and smooth running of the project were not met due to challenges outlined below.

5.3 What challenges arose and what were the consequences of the challenges identified?

Complexities of the collective actor problem described in section 4.2.1 resulted in problems with the project that Npower and contractors were responsible for but WWHC had to deal with, delaying the project end date by several years and causing extra work, delays, low staff morale, weakened social capital and tenants overcharged for their usage.

Further challenges included WWHC's new responsibility for metering and billing and educating tenants on how to work the system effectively, leading to changes to job roles and to the organisation overall.

5.4 What was the impact on the relationship between WWHC and tenants?

WWHC experienced a negative impact on its relationship with tenants for a period of time, which historical good relationships helped to improve. Staff and tenants were very flexible and existing trust between WWHC and tenants combined with hard work from staff meant that issues could be overcome. This links to Ambrose's finding that "the ability of both the organisation and the end user to adapt to and accommodate the innovation will determine the extent to which the intended benefits of biomass fuelled district heating are realised" (2014, P35) which is consistent with WWHC's experience as it identified flexibility and social capital as essential for the success of the project in the face of unexpected challenging circumstances. It also relates to McCabe et al's

finding that “success and hindering factors related to the unique relationship between tenant and housing that social housing arrangements produce” as the ability to rebuild trust and repair social capital was based on the positive nature of long term relationships between WWHC and tenants (Literature Review 2.8.6, P17).

5.5 To what extent is WWHC’s experience generalizable to existing research into RSLs who have implemented a DHS?

Similarities between the literature and the results have been highlighted throughout chapter four indicating that WWHC’s experience is largely in keeping with the literature. There were some differences and interesting details specific to the unique experience of WWHC such as the process behind deciding how to incorporate energy services into the existing charitable housing co-operative structure (Results & Discussion 4.1.4, P27) and their positive view of taking on risk in order to gain control (ibid). Also the specific impact the project had on job roles and budgets such as repairing problems with smart meters (Results & Discussion, 4.3.1, P36) and not fully appreciating the effect that the project would have on every section of the organisation (Results & Discussion, 4.3.3, P41).

NPM, managerialism and modernization have changed the way in which RSLs operate as well as their role in society, encouraging some to move into new areas like the provision of DH and WWHC fits with this trend. The effect of neoliberalism on the UK energy market was intended by the Conservative Government to bring consumer choice and competitive pricing but some feel large energy providers do not address environmental concerns well due to their business interests and costs for customers are high while customer service can be poor. This is reflected in the benefits identified by WWHC in keeping control over the system which include the provision of good customer service and protecting tenants from large price increases and volatility in the electricity market. The combination of these two phenomenon has led RSL like WWHC to become energy providers in order to take control over generation and situate it

within the community as part of their strategic role as a provider of a social service.

The literature highlights an increasing focus on community with regards to energy policy and the belief that community should be involved and lead projects which can address climate change, cost and inequality concerns. This can be done through an ESCO structure which also brings challenges to the organisation and increased risk and responsibilities for the benefits received and this is consistent with WWHC and the decisions it has made.

5.6 Recommendations for further research

The issue of consumer protection (Literature Review 2.8.4, P15) was not explored in this study as tenants were not interviewed. This is a potential area for further research which could be carried out from a customer perspective with cost data collected before and after installation for comparison.

A longitudinal study could be conducted to follow the experience of a RSL implementing a DH system from conception stage to after completion which would allow real time data to be collected instead of asking participants to look back and reflect on their experiences. Further research could be carried out to examine in what specific ways actors need to be flexible to ensure the success of installing DHSs as a socio-technical innovation. An ethnography study could be conducted to focus on relationships between different parties in the collective actor problem and provide a more in depth focus on the impact on staff and organisational relationships adding to knowledge on the subject from a sociological perspective. These pieces of research would be useful for practitioners and add to existing knowledge in the field.

5.7 Conclusion

This study has contributed new knowledge by researching the experience of WWHC in developing and implementing a biomass DHS and the data gathered through the case study approach has sufficiently answered the research questions allowing the aims and objectives of the study to be met. The

limitations of the research have been highlighted in chapter three and areas of further research have been identified which could supplement the findings of this dissertation and prove useful to practitioners as growing numbers of RSLs pursue similar projects in the future and could help to inform policy development in this area.

Appendices

Appendix 1. Interview Topic Guide

Please explain your role in the heating project.

What other options were considered before commencement of the project?

How were key decisions made?

What expectations were in place for the project?

What do you think have been the most successful aspects of the project?

What do you think have been the main challenges of the project? (What made these challenging?)

How well do you think a) Tenants
b) Staff

have coped with the transition to of WWHC becoming an energy provider as well as a housing provider?

Do you think flexibility is important for projects like this?

Do you think the project had an impact on staff morale at any point?

What advice would you give to someone from another housing organisation who was considering a similar project?

What do you think are the benefits & downsides of WWHC keeping control of energy services?

Has there been an impact on other services provided by the co-op, especially frontline?

What effect has this project had on the reputation of WWHC and its relationship with tenants?

Any other comments?

Appendix 2 Questionnaire

Why was the biomass district heating system installed?

What were the goals of the project?

Do you think the district heating project has been successful?
(Yes/no/partially successful)

Please give reasons for your answer

Do you think the project has resulted in any unexpected challenges for WWHC?
(Yes/no/unsure)

Please give reasons for your answer

WWHC now provides energy services as well as housing services. Do you feel that this has had an impact on your day to day job or on your team?
(Yes/no/unsure)

Please give reasons for your answer



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Sciences

Appendix 3 Participant Information Sheet

Study title: **Organisational response to biomass district heating in West Whitlawburn, a case study.**

Researcher details: **[Name], employee of West Whitlawburn Housing Co-operative currently undertaking a MSc Housing Studies at Glasgow University.**

Supervisor:

You are being invited to take part in a research study. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part. Thank you for taking the time to read this.

What is the purpose of the study? The study will investigate the reasons behind the installation of the biomass district heating system by West Whitlawburn Housing Co-op, why key decisions were made and what was hoped would be achieved from the project. By speaking to members of staff and committee members from the co-op I hope to find out what part of the project have been particularly successful or challenging.

Why have I been chosen? You have been chosen because you work at West Whitlawburn Housing Co-op or are on the management committee and were either involved in the project at planning stage, have experience of working for the co-op since the project started, or both.

Do I have to take part? No, you do not need to take part if you do not want to. You can choose to withdraw from the study at any time without giving a reason.

What will happen to me if I take part? An interview will be carried out at West Whitlawburn Housing Co-op's offices at a time that is suitable for you. The interview will include questions about the district heating system such as the impact it has had on your day to day job, how well you think it has met its goals and how important decisions were made when the project was at planning stage. The interview will be digitally recorded then transcribed. At the end of the study the recordings and transcriptions will be destroyed.

Will my taking part in this study be kept confidential? Yes, your identity will be kept confidential and your responses to the questions asked will be denoted using a pseudonym or numerical code i.e. interviewee 1, 2 etc.

Depending on what you say in the interview, it may be difficult to guarantee full confidentiality, as if you discuss information which is very specific to your job role, it could be possible to identify you from this information, despite a pseudonym being used. Care will be taken when writing up findings to ensure that confidentiality is protected as much as possible.

This research is being carried out by an employee of West Whitlawburn Housing Co-operative and colleague so it is important to highlight that your decision concerning whether or not to take part in the interview will in no way affect your working relationship, general experience of work or lead to a breach of confidentiality.

Please note that assurances on confidentiality will be strictly adhered to unless evidence of wrongdoing or potential harm is uncovered. In such cases the University may be obliged to contact relevant statutory bodies/agencies.

What will happen to the results of the research study? The research results will be written up and included in my final dissertation submission, a copy of which will be held at Glasgow University and West Whitlawburn Housing Co-operative. If you would like a summary of the results, this can also be provided.

Who has reviewed the study?

University of Glasgow School of Social & Political Sciences Ethics Forum

Contact for Further Information

If you have any concerns regarding the conduct of this research project, you can contact the School of Social & Political Sciences Postgraduate Ethics Administrator:



College of Social Sciences

Appendix 4 Consent Form

Title of Project: Organisational response to biomass district heating in West Whitlawburn, a case study.

Name of Researcher:
Supervisor:

I confirm that I have read and understood the Participant Information Sheet for the above study and have had the opportunity to ask questions.

I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason.

I consent to interviews being audio-recorded.

I acknowledge that participants will be referred to by pseudonym.

I agree to take part in the above study.

Name of Participant

Signature

Date

Name of Researcher

Signature

Date

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