Understanding the obstacles to a coherent EU energy efficiency policy:

The case of implementing the Energy Efficiency Directive in Sweden

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ABSTRACT

As decarbonising the energy sector increasingly comes forth as a central task for the EU, it is becoming imperative to understand obstacles to a coherent EU energy efficiency policy. This study uses qualitative methods and builds on sociotechnical systems theory and historical institutionalism to explore such barriers in Sweden. The research suggests the EU must engage in local institutional contexts to ensure effective implementation of energy efficiency policies in its diverse Member States. EU policies have to holistically address technological, economic, and social path dependences and engage with domestic stakeholders and consumers if an energy transition is to occur.

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List of Abbreviations

EC – European Commission

EED – Energy Efficiency Directive

EU – European Union

HI – Historical Institutionalism

IMCS – Individual metering and charging systems

MAB – Multi-apartment building

STS – Sociotechnical system

STT – Sociotechnical transition

1. Introduction

1.1 Relevance

An extensive transformation of the European Union's (EU) energy sector is required in order to meet the ambitious target of decarbonising Europe's economy by 2050. Crucial to this transformation is improving energy efficiency in the residential sector (Filippini et al., 2014). Currently, the residential sector accounts for 40% of the EU's energy consumption and 36% of CO2 emissions (EC, 2019). There is a plethora of energy efficiency measures that have the potential to reduce energy consumption in the residential sector, among which smart metering systems occupy a prominent place. Nevertheless, the energy sector remains characterised by an "energy efficiency gap", that is, a gap between "actual and optimal levels of energy efficiency" (Economidou et al., 2020, p.1).

A central instrument for enhancing energy efficiency in the EU's residential sector is the Energy Efficiency Directive 2012/27/EU (EED). The Directive was adopted with the explicit aim of contributing to the EU target of reducing energy consumption with 32.5% by 2030 (relative to earlier projections). As a key measure, the Directive requires the instalment of individual metering and charging systems (IMCS) for heating and hot water in multi-apartment buildings (MABs) in the EU Member States. Although formalised in the EED in 2012, the use of IMCS has been a component of the EU's energy policy since the late 1970s.

The introduction of IMCS for heating entails a complex sociotechnical transformation of the heating infrastructure of Member States, that has not gone unchallenged. Particularly in Sweden, where a different system of allocating costs for heating in MABs has been used for a long time, the requirement of IMCS has faced widespread opposition (Nordstrand et al., 2019a&b). EU energy efficiency policies are often framed in terms of technological fixes targeting the quality of buildings or the behaviour of residents. However, little attention is usually paid to the fact that such "fixes" are embedded in social and political contexts with implications for the effectiveness of technological solutions (Remling, 2018; Wittmayer et al., 2020). Considering the socio-political embeddedness of technological systems is of particular importance in the EU, where common energy policies are to be applied in the significantly diverse institutional contexts of the Unions' 27 Member States.

Through the case study of the implementation of the IMCS requirement in Sweden, this essay seeks to explore how national sociotechnical and institutional settings, in which new

technologies must be integrated, condition the coherence and effectiveness of EU energy policies and specifically policies targeting technological systems (Verbong and Geels, 2007). Gaining insights into this dimension of EU energy policy is all the more relevant now, as the EU moves further towards a green energy regime through the recently announced European Green Deal, envisaging among others a potential third revision of the EED to overcome current regulatory and non-regulatory barriers to its implementation (EC, 2021).

1.2 Research Question and Aims

Research Question: *What are the obstacles to a coherent EU energy efficiency policy, especially in the hugely impactful residential sector? What can we learn from the Swedish case, where resistance against IMCS has been particularly vigorous and widespread?*

The study aims to investigate how the EED has been integrated in the Swedish national context through the lens of sociotechnical systems theory (STS) and historical institutionalism (HI). Using qualitative methods, the research begins by mapping the socio-political context of heating infrastructure in the residential sector of Sweden, identifying key stakeholders and actors as well as their interest in the existing technological system. Thereafter, the research analyses the attitudes of these actors towards the IMCS requirement and their power to influence the Swedish implementation of the EED. The paper will thereby contribute to an increased understanding of how national sociotechnical and institutional settings can help or hinder the implementation of EU energy policies targeting technological infrastructures.

IMCS are a complementary technology installed on existing heating infrastructures, closely affecting the everyday lives of consumers. While mainstream energy transitions literature has typically focused on industry-level shifts such as renewable energy transitions, changes in mundane, everyday technologies have remained understudied. Nevertheless, these are similarly critical and intricate as they have a broad impact but are closely intertwined with deeply engrained consumer practices and complex political contexts (Geels, 2018; Roberts and Geels, 2018; Furlong, 2014). By focusing on IMCS, the study will address this gap in the literature.

The research points to the important role of the EU in pushing toward a sustainable energy transition. However, it also reveals the significance of considering path dependence and active regime resistance from domestic stakeholders as an obstacle to implementing EU policies in national contexts, and in particular those affecting technological systems.

2. Literature Review

2.1. Theoretical Framework

Ensuring a swift and sustainable transition to a low-carbon future is a pressing political as well as substantive problem. STS theory views changes in technological infrastructures as part of broader sociotechnical transitions (STT). The theory is therefore an obvious candidate for analysing how material and socio-political elements of technologies interact to influence low-carbon energy transitions (Savaget et al., 2014; Geels, 2006). A central objective of STS theory is to understand how changes in technological infrastructures are mediated by different actors over time, making it a suitable framework for this study (Raven et al., 2012).

STS are conceived as consisting of three conceptual levels, organised hierarchically: sociotechnical niche, regime, and landscape. The sociotechnical regime represents the meso-level in the multi-level perspective of STS, including social actors such as users, engineers, scientists, and policymakers who share a set of rules. These form "networks with mutual dependencies" that stabilise the incumbent system (Geels, 2007, p.128; Geels, 2004; Fuenfschilling and Truffer, 2014). So-called selection environments are shaped by the sociotechnical regime and its industry and market structures, dominant technologies, user practices, established knowledge bases, cultural significances, and public policies (Smith et al., 2005). Innovations can penetrate selection environments through protective spaces, sociotechnical niches, where they are "shielded, nurtured and empowered" until they eventually replace dominant technologies (Verhees et al., 2015, p.1; Smith and Raven, 2012). The sociotechnical niche can be geographical, for example, a specific region, or regulatory, such as government subsidies (Smith and Raven, 2012; Geels, 2019). Finally, the macro-level of the STS is the landscape, representing broader, external institutional developments that influence the sociotechnical regime but that the regime has little influence upon (Geels, 2004). STTs are conceptualised as regime shifts that occur through complex and dynamic interactions between these three levels of STS (Geels et al., 2017).

While providing a simple heuristic for analysing STTs, STS theory is not without its critics. Political ecologists have argued that STS theory depoliticises technological transitions (Lawhon and Murphy, 2011). In a similar vein, Geels (2019) sustains that the theory often neglects the politics and power relations involved in STTs. Lawhon and Murphy (2011) and Raven et al. (2012) highlight several shortcomings of STS theory that will be considered in analysing the case study of this paper: 1) focus on technological artefacts and ignorance of the

context they are in; 2) disregard of actors that are not involved in the transition but will be impacted by it; and 3) neglect of the spatialities of transitions, a "geographical naivety".

Lockwood (et al. 2015 & 2019), Andrews-Speed (2016), and Roberts and Geels (2019) acknowledge that an important limitation of STS theory is that it does not explicitly consider institutional aspects of STTs. Institutions encompass formal laws, regulations, and policies, as well as informal norms that together organise political, economic, and social interaction (North, 1991). This paper will attempt to address some of these common critiques by combining STS theory with a HI approach. HI expects institutional settings to shape the objectives of different actors and the distribution of power among them (Thelen and Steinmo, 1992). The approach emphasises the importance of the landscape in STTs, maintaining policy changes occur through critical junctures, where external forces bring about incremental adjustments or abrupt changes (Thelen, 2003). Roberts and Geels (2019, p.225) argue that HI and STS theory are compatible because they "share an interest in meso-level phenomena" looking at "actors, rules, and institutions". Furthermore, the approaches align well in emphasising the temporal dynamics of STTs, that are often characterised by path dependence.

By combining the above-outlined theories, the paper will move on to explore how the sociotechnical and institutional context of Sweden's heating infrastructure has influenced the implementation of the EED and specifically the required introduction of IMCS. In doing so, the research will look beyond the material challenges of energy transitions and focus on the institutional and social context, involving elements of path dependence, power, and agency.

2.2 Policy Context

In this section, important elements of the policy context in which the EED operates will be outlined. This will provide background for exploring the obstacles to implementing the EED in Sweden.

2.2.1 The EU Policy Context

Europeanization of Energy Policy

The implementation of the EED in Sweden entails a process of Europeanization of Sweden's energy policy. Within the EU, there is a constant tension between the potential welfare gains from harmonisation of national policies and ensuing benefits for the Internal Market, on the one hand, and the potential losses from overriding national policies, on the other (Börzel,

2002). That is to say, there is a struggle between coordination of EU policies across the Union and adapting them to the particular contexts of the Member States. There are considerable differences in the degree to which Member States are required to transfer authority to the European level depending on policy sector, EU competences, and type of legislation, resulting in different degrees of Europeanization (Bocquillon and Maltby, 2020).

In the energy sector, Member States have traditionally developed policies under national authority (Tews, 2015). Only in 2007, with the adoption of the Lisbon Treaty, did energy policy officially become part of Union competences (Tews, 2015; Article 194 Treaty on the Functioning of the European Union). The Treaty established that the EU could shape common energy policies, whereas the right to decide on the energy mix remains a Member State issue. Subsequently, energy has become a domain in which EU and national competences are mixed. The common energy policies mainly relate to 1) the internal energy market; 2) energy security; 3) energy efficiency and renewables; and 4) connection of transmission grids (Struntz et al., 2015).

The Energy Efficiency Directive

Although the EED includes a multitude of technological and policy measures, this paper focuses Articles 9-11 related to metering of energy consumption for heating in MABs (EC, 2021). Article 9 of the EED 2012/27/EU introduces IMCS as a method of increasing energy efficiency in the residential sector by altering user practices:

Article 9

Metering

1. Member States shall ensure that, in so far as it is technically possible, financially reasonable and proportionate in relation to the potential energy savings, final customers for electricity, natural gas, district heating, district cooling and domestic hot water are provided with competitively priced individual meters that accurately reflect the final customer's actual energy consumption and that provide information on actual time of use.

Figure 1. Exert from Article 9 of the EED (2012/27).

There are two aspects of this Article to be unpacked and looked at more closely for the purposes of this paper (see *Figure 1*). Firstly, the definition of final customers has been further clarified in the amending Directive 2018/2002/EU and particularly in Article 9a-c and Recital 31. In Swedish MABs, heating, cooling, and hot water are commonly purchased collectively by an

association of end-users, typically housing cooperatives (Savvidou and Nykvist, 2020). However, the EED maintains that energy consumption should be billed to final customers defined as residents rather than associations of end-users.

Secondly, the Article includes a conditionality, only requiring the instalment of IMCS when it is "technically possible, financially reasonable and proportionate in relation to the potential energy savings". The conditionality was a result of responses from public consultations showing most stakeholders did not think the requirement should be mandatory under all circumstances (Working Staff EC, personal communication, 14 March). The conditionality has been used by several Member States, including Sweden, as grounds for making broad exceptions from the implementation of the EED. However, the amending EU Directive 2018/2012 in its Article 9b added a requirement for Member States to make public their interpretation of the conditionalities, no longer allowing them to claim blanket non-action.

2.2.2 Swedish Policy Context

Energy Efficiency of the Swedish Residential Sector

The residential sector in Sweden constitutes close to 40% of national final energy consumption (Swedish Energy Agency, 2019). The building stock consists of 2.5 million MABs, many of which were constructed in the post-war period and are today in need of renovations (Femenias and Lindén, 2010, Savvidou and Nykvist, 2020). Since then, construction levels have been low. Consequently, to increase energy efficiency, refurbishments of existing buildings or instalments of efficiency devices will be necessary (Palm and Reindl, 2016). However, Vogel et al. (2016) and Nässen and Holmberg (2005) argue there are no real incentives for actors involved in the construction and maintenance of MABs in Sweden to invest in energy efficiency and the long-term operation of buildings, suggesting that the current governance structure fails to deliver energy-efficient homes.

A factor weakening incentives for improving energy efficiency in Sweden is the low price of energy. According to Nässen and Holmberg (2005), energy efficiency measures targeted at demand-side management, such as IMCS, were most prominent in the Swedish residential sector in the 1970s when oil prices spiked. The following introduction of nuclear power lowered energy prices, disincentivising investments in energy efficiency. Consequently, Sweden's energy policy became oriented towards reducing energy sector emissions through supply-side management. Savvidou and Nykvist (2020) insist that an increased focus on

demand-side management of energy emissions in the residential sector is an important, yet often neglected measure toward a low-carbon energy transition in Sweden.

Housing Cooperatives within the Swedish Institutional Context

Although there are several different MAB ownership forms in Sweden, this study focuses on MABs owned by homeowner cooperatives and rental cooperatives (together referred to as housing cooperatives), constituting about 50% of all MABs in Sweden (Boverket, 2019; Statistics Sweden, 2019). Residents of homeowner cooperative MABs are members of the cooperative by owning a share of the building, their apartment, whereas in rental cooperatives, the cooperative owns the building and rents out apartments to the residents. Homeowner cooperatives have been conceptualised as a participatory (quasi-democratic) housing form as the board of cooperatives are elected by its members (Nair et al., 2017; Bengtsson, 1992). In return for a monthly fee, the housing cooperatives manage "operation and maintenance, capital investments, shared spaces and collective services", including energy efficiency refurbishments (Vogel et al., 2016, p.429).

Housing cooperatives were established in Sweden in response to the housing crisis after World War I (Christophers, 2013). Bengtsson (1992) divides the development of housing cooperatives into two distinct periods: consolidation and expansion. In the consolidation period, the HSB (Savings and Construction Association of the Tenants) developed organisational strength and ideological credibility through association with the Social Democratic Party and the labour movement. Through tenure legislation, housing finance, and an altered market environment, a second stage ensued after World War II, that of expansion (Sorvoll and Bengtsson, 2018). Bengtsson (1992) stresses the importance of the institutional environment for the growth of housing cooperatives in this second period. Cooperative housing became embedded in the Swedish welfare model, writes Bengtsson (1994, p.94), in that "ideological credibility and organisational stability nourished political and institutional support, which in its turn, bred market success".

During the post-War period, the housing sector became characterised by increased corporatism whereby nationwide associations of tenants, housing cooperatives, public housing, and housing developers emerged as powerful actors that acquired a regulative role. Housing associations representing diverse actors on the housing market became important civil society organisations incorporated into corporatist governance structures, gaining a key role in providing affordable housing and addressing core questions of social welfare (Ames, 1949; Bengtsson and Sorvoll,

2018). Even today, housing associations exert considerable political pressure. They are key actors politicising the housing sector and influencing public opinion (Baheru, 2020). The associations tend to opt for collective bargaining among representatives of market actors rather than to demand government legislation (Christophers, 2013). To understand the role of cooperative housing and collective bargaining as well as the challenges to implementing the EED in Sweden, an insight into the broader Swedish institutional context is in order.

Sweden has been, with short interruptions, a social-democratic welfare state for close to a century (Moller, 2020). Swedish society is characterised by a developed organisational context where groups of citizens are commonly represented collectively by organisations. Interest organisations have been actively integrated into state policymaking in a corporatist relation. This context of close collaboration between the state and major interest organisations is often referred to as the Swedish model, with its roots in the 20th-century labour movement, that was also crucial for the creation of tenant associations (Rothstein, 2005). The Swedish model is characterised by high levels of trust "both vertically between citizens and the elite and horizontally between individuals" (Rothstein, 2005, p.209). Trädgårdh et al. (2013) argue that the exceptionally high levels of trust in government institutions in Sweden are a result of the vital, extensive civil society and its close relationship with the state. Others, however, believe symbiotic ties between the state and interest organisations undermine the vigour of civil society and thus erodes democracy (Boli, 1991).

The Swedish institutional model is also characterised by high levels of transparency in decision-making. A vital component of this is the extensive use of public consultations with selected stakeholders and actors as a routine part of drafting laws and regulations. Public consultations serve to legitimise policymaking and integrate new information (Lundberg, 2013).

2.2.3 Individual Metering and Charging Systems versus Flat Rates

It is a premise of the EED that IMCS enable a consumption-based cost allocation of heating and hot water, that reduces household energy consumption by encouraging saving behaviour. However, in Sweden, there is an alternative way of charging heating and hot water consumption in MABs, namely a flat rate or so-called "warm rent" in rental cooperatives. Determining whether IMCS, objectively speaking, are more energy-efficient than flat rates in MABs in Sweden is beyond the scope of this paper. However, some known benefits and

drawbacks will be outlined below, particularly regarding metering of heating which is the focus of this paper.

Sweden has a long tradition of using flat rates to allocate costs for heating in MABs. Heating expenses are distributed based on the floor area of apartments rather than on actual household energy consumption. Therefore, heating costs are fixed and included in the monthly fee paid to the housing cooperatives (Savvidou and Nykvist, 2020). Moreover, residents have a limited ability to regulate their indoor temperature as there is a "temperature ceiling" that can be reached, set out by the housing cooperatives (Swedish Government, 2013).

Several studies show that by increasing residents' awareness of their energy use and creating a financial incentive to lower energy consumption, IMCS increase the energy efficiency of households (Sigglesten and Hansson, 2010; Teres-Zubiaga et al., 2018). However, it is also acknowledged that while IMCS motivate households to lower their energy consumption, they also disincentivise building managers from conducting energy efficiency refurbishments (Sigglesten and Olander, 2013; Sigglesten, 2014). This is often referred to as the "split incentives" issue. Still, Nair et al. (2017), studying barriers to energy efficiency investments in Swedish cooperative MABs, show that most cooperatives are not planning to conduct energy efficiency refurbishments in the next ten years anyway. Additionally, the EC maintains that because IMCS place the costs of energy on end-consumers, they could incentivise consumers to pressure building managers to undertake energy efficiency refurbishments (Working Staff EC, personal communication, 14 March).

To sum up, even though the EU favours IMCS there is a debate as to what infrastructural arrangement is most efficient in general, and specifically in Sweden.

3. Methodology

To investigate obstacles to a coherent EU energy efficiency policy, the research examines the STT of Sweden's heating infrastructure triggered by the EED. The research relies on primary sources, analysed using qualitative methods rather than model-based scenarios, as the latter are ill-equipped to address issues of power and agency that are imperative in STTs (see Section 8)(Geels et al., 2020&2017).

Firstly, process-tracing was conducted to create a detailed narrative of the STT. This was supplemented by qualitative document analysis, involving an in-depth review of stakeholder,

government, and EU policies and statements. Secondly, since individuals are often made invisible in institutional accounts of policy developments, a focus group was conducted with residents of a MAB in Sweden to enable a more granular understanding of user practices, cultures, and values that might influence the STT (Suddaby et al., 2014; Lawhon and Murphy, 2011). The combination of research methods produced a comprehensive account of the STT looking at both the "macro-scale" policymaking dynamics between the EU and the Swedish Government, and the "meso-level" engaging domestic consumers, stakeholders, and policymakers. Although interviews with stakeholders and policymakers in Sweden and the EU could have been an option, this was not chosen due to resource and time constraints.

The methodology enabled the research to explore the following questions:

- Who are the key actors and stakeholders involved in the governance of the heating infrastructure in Swedish MABs?
- What are the interests of these actors and stakeholders, and how have these interests evolved?
- How have regime members resisted or adapted to the STT triggered by the EED?
- How can the EU overcome obstacles to a coherent energy policy such as those encountered in Sweden?

3.1 Process-tracing

A theoretically informed process-tracing of the implementation of the EED in Sweden was conducted. Process-tracing, in its simplest form, is useful for analysing "trajectories of change and causation" and is particularly appropriate for case-study research (Collier, 2011, p.1). The process-tracing enabled the creation of a timeline and detailed narrative of the STT (George and Bennet, 2005; Papachristos, 2018; Roberts and Geels, 2019). It also provided a preliminary understanding of the roles and positions of the actors and stakeholders involved in the STT. Included in the process-tracing were the type of documents listed in Table 1.

Reconstructing a policy process based on policy documents risks over-estimating the influence of certain actors (Bowen, 2009). Additionally, there is a danger of biased selectivity and absence of documents (Yin, 1994; Collier, 2011). To avoid biases and identify potential gaps in the available documents, a wide variety of documents and actors were reviewed. In Sweden, most government correspondence and policies are public records. Therefore, access to communications between the EC and the Swedish Government could be obtained upon request.

In this stage of the research, the temporal horizon of the analysis was delineated to the period from 2012 (when the EED was adopted) to 2021. Although an expansion of this timeline might have contributed to a more comprehensive analysis of factors influencing the policy developments, the broader scope would have, by the same token, prevented a granular examination of the documents (Papachristos, 2014). Admittedly, the process-tracing entailed a judgement about "system boundaries", that is, factors to be considered in the research as causal (Papachristos, 2014; Geels, 2011).

Table 1. Types of documents reviewed	
Actor	**Type of document**
Stakeholders (see Table 2)	Statements on webpages
	Media
	Reports
	Responses to government public consultations
Government	Communications with the EC (received upon request)
	National transposition of the Directive – documents provided to the EU showing the national transposition of the Directive
	Legal documents – regulations, proposals and legislation
	Public consultations with stakeholders and government agencies
European Union	EU Directives – proposal, opinions, first reading and final Directive
	EU Pilot against Sweden
	Staff working documents
	Documents stating best practice for implementation of the EED

Table 2. Stakeholders included in the document analysis			
	Type of associations	Name in Swedish	Name in English
Housing Associations	Associations of Housing Cooperatives	Bostadsrätterna	Homeowner cooperatives association
		Hyresgästernas Sparkasse och Byggnadsförening (HSB)	Savings and Construction Association of the Tenants
	Tenants Association	Hyresgästföreningen	Tenants Association
	Association of housing developers	Riksbyggen	National House-building Association
		Fastighetsägarna	Property Owners' Association
	Public housing association	Sveriges Allmännytta	Public Housing Sweden
Energy associations	Association for energy efficiency companies	Energieffektiviseringsföretagen	Energy Efficiency Companies' Association
	Association for companies that supply, distribute, sell and store energy	Energiföretagen	Energy Companies' Association
	Association of companies that install technologies and infrastructures for heating, water, electricity and telecommunications	Installationsföretagen	Installation Companies' Association
	Association for actors in the individual metering and cost-allocation for heating and hot water	Sveriges Förening för Förbruksmätning av Energi (SFFE)	Swedish Association for Metering of Energy

3.2 Qualitative Document Analysis

Process-tracing was combined with qualitative document analysis, a method for systematically reviewing and interpreting documents to "elicit meaning, gain understanding, and develop empirical knowledge" (Bowen, 2009, p. 27). The documents were categorised in terms of 1) the type of actor (according to STS theory and HI); 2) their positions regarding IMCS; and 3) their means of influencing the STT. The categorisation facilitated an in-depth understanding of the institutional setting of the STT, major policy debates, and interests of influential actors and

stakeholders (Karppinen and Moe, 2019). Through the document analysis, 1) sources of path dependence and 2) power relations between the above-mentioned actors were identified.

Documents cannot be treated as neutral or exhaustive accounts of a policy process, as they present a construction of reality from a certain perspective (Cloke et al., 2004). Therefore, the documents were considered critically in light of the literature review (Section 2) (Bowen, 2009). Additionally, considerations of subjectivity were important, reflecting on who produced the document and with what intentions. I was also cognisant of my positionality as a researcher from Sweden, not letting my prior perceptions from personal experiences influence the analysis (England, 1994).

3.3 Focus Group

In the second stage of the research, a focus group with residents from a MAB in Stockholm, Sweden, was performed. Focus groups are useful for exploring the socially constructed nature of knowledge, including "the discourses which shape practices of everyday life, the ways in which meanings are reworked and subverted, and the creation of new knowledge out of seemingly familiar understandings" (Cameron, 2005, p. 159). The focus group questions were informed by the literature review and the findings from the document analysis (see Appendix 2) (Bowen, 2009). Rather than aiming to generalise the findings to the Swedish population at large, the focus group enabled an understanding of *possible* attitudes and consumer practices that might influence the STT (Geels, 2004). Because participants of the focus group could agree with or challenge one another, the method provided a fruitful avenue for exploring diverse and contrasting views (Secor, 2009; Longhurst, 2010).

The MAB in which the participants live is managed by a homeowner cooperative. The participants were recruited through convenience sampling (Barbour and Schostal, 2005). Letters were sent to forty residents in the building complex, and five responded. The focus group was held online, and due to availability and time restrictions, only one focus group was conducted. Having participants from the same building complex, however, allowed for a detailed discussion of the technological infrastructure in question (Conradson, 2005). Still, the fact that some participants knew each other might have adversely affected their level of comfort in disclosing information regarding everyday practices (Hopkins, 2007). Participants were made aware of the nature of the focus group and asked if they agreed to being recorded before

giving consent to participate. Additionally, ethical clearance was secured before conducting the focus group.

4. Analysis and Discussion

In this section, the research findings will be analysed and barriers to the implementation of the EED in Sweden will be investigated. The findings, and the broader research question, will be discussed using the lens of STS theory and HI.

The incorporation of IMCS into Swedish energy efficiency policy in accordance with the EED would entail a sociotechnical transformation of Sweden's heating infrastructure in MABs triggered by a process of Europeanization of EU energy policy. STTs are dynamic and non-linear, involving a web of actors with divergent interests, resources, and expectations (see Section 2.1) (Smith et al., 2005). As STTs demand an institutionalisation of new technologies, they entail a "reorganization of laws, technologies, business models and use patterns" and thus a destabilisation of existing sociotechnical regimes (Fuenschilling and Truffer, 2014, p.773; Smith and Raven, 2012). At the same time, incumbent sociotechnical regimes can be stabilised by path dependence, often making sociotechnical transitions contested and resisted processes (Geels, 2004).

The section will begin by examining the institutional stability and path dependence of the sociotechnical regime of heating infrastructure in Swedish MABs. Thereafter, the analysis will explore how relations between sociotechnical regime members and the EU influenced the pace and direction of the STT caused by the implementation of the EED in Sweden, specifically the introduction of IMCS. The paper will conclude by reflecting on how path dependence and resistance from the incumbent regime can create obstacles to a coherent EU energy efficiency policy and how the latter can be addressed.

4.1 Path Dependence of the Swedish Sociotechnical Regime

Within the multi-level STS framework, the sociotechnical regime denotes the "institutionalized core" of the STS (Fuenschilling and Truffer, 2014). The regime embodies beliefs and collective ideas about preferred technological practices, policy goals, and developments (Roberts and Geels, 2019; Thelen, 1999). Smith et al. (2005) argue that there are core and periphery members of sociotechnical regimes, delineated according to the extent to which they contribute to the reproduction of the regime. In the Swedish context, the research indicated that the core regime

members are 1) Consumers, 2) Corporate actors in the housing market (see Table 2), and 3) the Government.

As policies are disposed to developing in a manner in which the same actors, institutions, and governing ideas dictate over longer time-frames, path dependence and potential lock-ins can develop (Andrews-Speed, 2016; Roberts and Geels, 2019; North, 1998; Lockwood et al., 2016). Furthermore, Fuenschilling and Truffer (2014) argue that path dependence is particularly prominent in the housing sector as renovations are usually costly and permanent. According to Geels (2019), there are three types of lock-in mechanisms that can cause path dependence of sociotechnical regimes: 1) techno-economic, generated by sunk costs and economies of scale, 2) social and cognitive, related to routines, user practices, and the social capital of incumbent regime members, and 3) institutional and political, caused by existing policy frameworks that support incumbent regimes and often enable preferential access to policy networks.

This section will review the nature of the sociotechnical regime by examining user practices and perceptions, as well as stakeholder and government statements and policies indicating dominant interests and attitudes concerning the introduction of IMCS, and thus potential sources of path dependence.

Consumers

User practices and behaviours can be influential in STTs, either supporting or resisting the potential adoption of innovative technologies (Geels, 2004). According to STS theory, user practices are created over time with the institutionalisation of technological systems. Furthermore, as argued by Suddaby et al. (2014, p.101), “to be institutionalized means to become taken-for-granted”. In other words, users are prone to being content or unengaged with the technologies and infrastructures they utilise, which can contribute to path dependence. This seems to be the case with the heating infrastructure in Swedish MABs.

As heating is centrally regulated by housing cooperatives and energy costs are part of the aggregated monthly bill paid to the cooperatives, consumers are not required to actively engage with their energy consumption (Platten et al., 2020). This became evident in the focus group as the participants did not know how much they pay for heating. Furthermore, the focus group discussion revealed that the participants do not regulate their energy consumption by adjusting their radiators as they were not sure how the radiators worked. Despite being able to regulate

their indoor temperature through valves on their radiators, some participants thought they could only turn the heating on or off and started experimenting during the focus group.

The participants said they would want to be able to regulate their indoor temperature more and would lower it if they could. Although three out of five participants found the temperature in their apartments too high, they said they open windows and wear shorts rather than adjust their radiators. The participants did not seem to find the high temperature of their apartments problematic though, perhaps because their utility bills do not reflect their actual energy consumption. Even though some consumers may find the temperature ceiling too low, it seems to be accepted by most consumers, possibly because collective solutions are commonly found to be more practical and because the system has become "taken-for-granted" (Trädgårdh et al., 2013 ; Suddaby et al., 2014). It appears that the focus group participants had not reflected on the technological system that provides them heating, seemingly because they had not experienced significant problems with it. As with many infrastructural systems, if they work, they remain invisible to users (Platten et al., 2020).

Cultural and symbolic meanings attached to technological artefacts can cause path dependence (Geels, 2004). Some argue that the Swedish flat rate system is grounded in a notion of solidarity, as the heating costs of larger households are subsidised by smaller, often wealthier households through the flat rate (Rohracher and Köhler, 2019; Boverket, 2008). Although the participants were conscious of this symbolic aspect of the infrastructure, one participant argued that the flat rate system is only reasonable as far as people do not consume wastefully, and thus highlighted its inherent free-rider problem:

> *If there are older people, who often have a tendency to be colder than young people, (…) then it would be conceivable to show solidarity. But if someone maximises their temperature and showers all the time and then leaves the windows open and just can't be bothered to lower the temperature because they are lazy, then one would get angry.*

Consequently, it seems the participants thought the practical aspects of the current system, paying for heating as part of the monthly housing cooperative fee rather than a separate bill, was its most desirable characteristic. One of the participants said that they thought IMCS seemed complicated and would not want the administrative burden:

> *It's enough with the electricity bill, the phone bill and the other bills.*
>
> *I wouldn't want to install a system that is very advanced and costs a lot, then I think things are better as they are.*

The social learning process inherent with the introduction of new technologies also appears to be an important factor preventing the participants from unquestionably supporting IMCS. In line with this finding, Glad's (2012) study of the experimental introduction of IMCS in a Swedish MAB in Norrköping concludes that many users do not trust IMCS because they are a new technology.

The focus group revealed that none of the participants were familiar with metering technologies. After an explanation of what IMCS are, the participants concurred that installing meters would likely reduce both their individual and the building's overall energy consumption. The participants thought that if it could be shown that IMCS would significantly reduce energy consumption or the monthly costs of energy, they would consider advocating for the system. Moreover, one participant added that the continuously increasing importance of environmental issues would make them willing to pay more for an environmentally friendly technology. There was a discussion as to the environmental benefits of raising awareness, where many agreed that IMCS could serve an important function:

> *The more we meter (measure) and talk about these issues, the more we enter a thinking where we try to make an effort.*
>
> *The purpose would be to inform people and make them conscious of their energy consumption. For that purpose, I think meters are efficient.*
>
> *More information about how small changes from each person can contribute a lot for the environment is good.*
>
> *I think the environment is the most important factor. The consumption in our part of the world is insanely high. The entire Atlantic culture consumes an indecent amount of energy (…), we have to reduce it.*

The increasing consciousness of environmental degradation may signal a broader cultural shift that could become a driving factor in the STT. Yet, the costs of utility bills appeared to be more important:

> *Of course, you think about the environment, most people do, but at the end of the day, it is the wallet that matters if we are being honest.*
>
> *It can't cost too much just to meter. If we can do it in a cheap and efficient way, then it is interesting, but otherwise, the system is good as it is.*

In conclusion, the focus group indicates several sources of socio-cognitive and techno-economic path dependence amongst consumers in Sweden that align with those theorised in STS theory: 1) routinised user practices, 2) the potential financial costs of IMCS, 3) the

symbolic meaning of the current system, and 4) a lack of knowledge of IMCS (Geels, 2019). The findings suggest that the sociotechnical regime is stabilised by consumer demand showing a preference for the technological infrastructure in place or, perhaps, rather a lack of knowledge of IMCS. Nevertheless, all participants expressed a strong interest in IMCS and wanted to know more about the technology and its potential environmental benefits.

Stakeholders in the Swedish Housing Sector

As described in Section 2.2.2, the housing market in Sweden is well organised in the form of housing associations that collectively represent different interests on this market (Vogel et al., 2015). The literature review and document analysis indicated that the associations of housing cooperatives, and tenants, on the one hand, and of public housing and building developers, on the other, are core members of the sociotechnical regime because of their long history in Sweden and their central role in managing the heating infrastructure in MABs (Bengtsson, 1992; Christophers, 2013; Vogel et al., 2016).

In line with STS theory and HI, it seems that sunk costs and the increasing returns effect of the management practices developed around the existing infrastructural arrangement have created techno-economic lock-ins in the sociotechnical regime (Andrews-Speed, 2016; Geels, 2019). The main concerns of the housing associations expressed in public consultations and articles on their web pages and in media were the upfront and long-term maintenance costs associated with installing IMCS for heating, with many associations branding IMCS a risky investment. These associations ground their resistance to IMCS in that 1) installing meters will be expensive; 2) there is uncertainty whether IMCS will reduce energy consumption (HSB, 2019; Sveriges Allmännytta, 2019a; Riksbyggen, 2019); and 3) IMCS would create split incentives (see Section 2.2.3) (HSB, 2019; Bostadsrätterna, 2019).

Beyond these techno-economic sources of path dependence, the housing associations also reinforce political and institutional path dependence, arguing the implementation of the EED would undermine “the Swedish Model” (see Section 2.2.2) (HSB, 2019; Sveriges Allmännytta, 2019c; Rothstein, 2005; Geels, 2019). It seems that the housing associations view the implementation of the EED as a step towards more individualised management of housing and subsequently a threat to established corporatist relations.

The Swedish Government

The government is an important actor that legitimises and implements domestic as well as EU rules and policies (Jacobsson and Sundström, 2015). STS scholars recognise that government policies are crucial in providing a protective space for innovative technologies (Raven et al., 2016). Still, government policies often play a formative role in reproducing sociotechnical regimes, thereby creating barriers to STTs rather than supporting niche innovations or conforming to landscape pressures (Smith et al., 2005; Roberts and Geels, 2019). The document analysis suggests that the Swedish Government acted as a stabilising force reaffirming political and institutional path dependence and protecting the incumbent sociotechnical regime. This mainly occurred through reluctance to change formal rules and regulations in the housing sector (Vogel et al., 2015).

Certainly, the Swedish Government undertook formal steps toward transposing Articles 9-11 of the EED into Swedish law in 2012. In 2014 the Energy Metering Law (2014:267) was enacted, requiring meters to be installed in new and existing MABs where cost-efficient and technically feasible (see *Figure 2*). However, Article 5 of the Energy Metering Law stipulated that the Swedish National Board of Housing, Building, and Planning (Boverket) would find these conditions to be met. Between 2014-2019 Boverket conducted periodic evaluations of the cost-efficiency of IMCS in Sweden, concluding each time that IMCS were cost-inefficient in all MABs in Sweden (Boverket 2014, 2015, 2017&2018). Hence, the Swedish Government did not give effect to Articles 9-11 of the EED. The situation changed only after the EC started an infringement procedure against Sweden (2018/2201), which will be reviewed in more detail in Section 4.2 (EC, 2018). The reluctance of the government to transpose the EED suggests it acted as an important regime stabiliser that protected the incumbent regime to the point of facing sanctions by the EU (Smith et al., 2005).

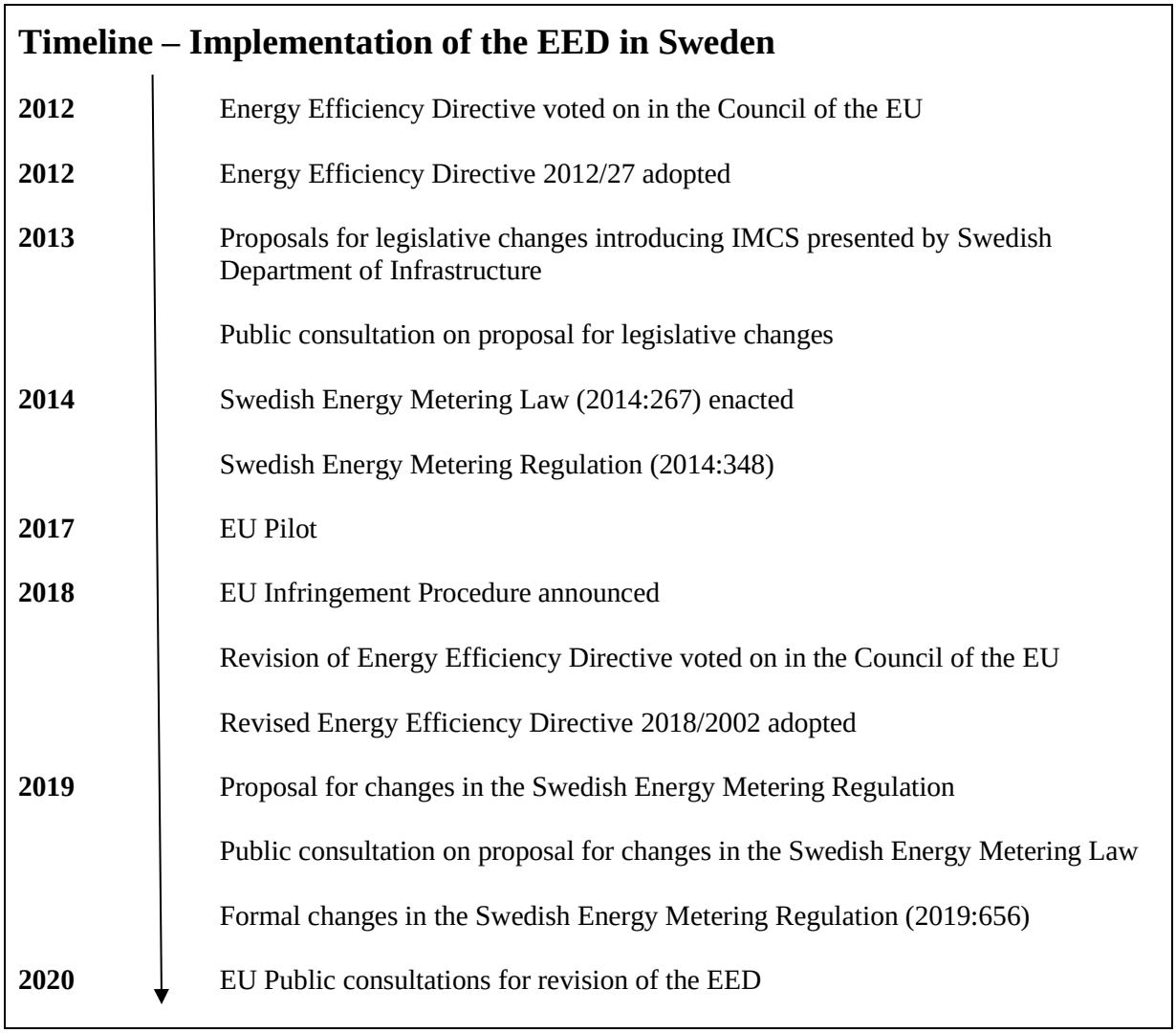

Figure 2: Timeline of the EED and its implementation in Sweden.

In response to the infringement procedure, the Government nevertheless altered the provision of the Implementing Regulation on Energy Metering in 2019 (2019:656), further aligning Swedish law with the EED (see *Figure 2*). Pursuant to the new Regulation, buildings with an energy performance higher than 200Wh/m2 are required to install IMCS (180 Wh/m2 in the Northern regions). However, the current Regulation still allows for broad exceptions to the instalment of IMCS in MABs, where this is not technically feasible and will not lead to proportionately large energy savings. Importantly, the Swedish Government has not created a protective niche environment for IMCS, for instance, through subsidies for the instalment of IMCS (Smith and Raven, 2012; Economidou et al., 2020). Consequently, it seems that the Government remains reluctant to endorse IMCS (Turnheim and Sovacool, 2020; Geels, 2012), thereby stabilising the incumbent sociotechnical regime by reaffirming political and institutional path dependence (Geels, 2019).

Interim Conclusion

The sociotechnical regime established around the existing technological system seems highly institutionalised and stable in Sweden as the flat rate system is embedded in both informal (user preferences and cultural norms) and formal (government and stakeholder policies) institutions that reinforce the system. The widespread, historical use of flat rates and the institutional matrix supporting the system has reaffirmed path dependence of the incumbent sociotechnical regime (North, 1991; Geels, 2019). Subsequently, the regime seems to be treated preferentially by users, existing stakeholders, and policymakers. Corporate actors on both sides of the housing market and the government have vested interests in preserving the status quo and therefore resist pressures for a transition from the EU. However, end-consumers have also acted as regime stabilisers. Because of the high level of alignment amongst sociotechnical regime members, creating "networks with mutual dependencies", it seems the regime has remained relatively coherent throughout the implementation of the EED (Geels, 2007, p.128).

Nevertheless, accounts of STTs solely grounded in path dependence as an explanation for regime stability often produce simplified explanations of processes that are socially and politically contentious (Suddaby et al., 2014). To understand barriers to the implementation of the EED in Sweden, we therefore need to look beyond path dependence of the sociotechnical regime and include considerations of the distribution of power and agency amongst the actors involved in the STT, including the EU (Mahoney and Thelen, 2010; Geels, 2014). The next section will therefore explore the power dynamics that shape how the EED was received, negotiated, and finally transposed into Swedish law.

4.2 Power and Agency

STTs are commonly interpreted as driven by selection pressures from niche innovations and/or landscape developments (see Section 2.1) (Smith et al., 2005; Geels, 2004). Although there is no absolute way of "allocating a given actor to a given level in these perspectives", in this context EU policy paradigms appear to act as decisive landscape pressures challenging the sociotechnical regime in Sweden and purposively driving a STT (Upham et al., 2014, p.778; Smith et al., 2005). Berkhout et al. (2004) offer a more fine-grained conceptualisation of landscape pressures that may drive transitions. Following their categorisation, the EED can be considered a "politically motivated change in the landscape" caused by the EU's environmental agenda, creating "competition between different visions for the future" held by Swedish regime members and EU policymakers (Berkhout et al., 2004, p.65). The EU represents a paradigm

centred around the individual, economic incentives, and market-based solutions, very different from the collective, solidarity-based paradigm dominant in Sweden. However, in contrast to traditional definitions of a sociotechnical landscape where the landscape cannot be influenced by the regime, in this context regime members in Sweden may shape EU policies and therefore "the landscape" (Geels, 2004; Smith et al., 2005). The following section will review the power and agency of the key actors involved in the implementation of the EED, that is their ability to bring about or resist change.

Consumers

Homeowner cooperatives are conceptualised as a form of democratic institution since they rely on the engagement of their members in the governance of the cooperatives (Bengtsson, 1992). However, it seems decisions on energy refurbishments remain out of sight from residents. While the focus group participants were aware of their ability to vote in the cooperative, most of them did not engage in the decision-making process with only one person having attended meetings:

> *One can start attending the annual meetings, I haven't. But of course, one can influence if one would like to.*
>
> *I try to go to the meetings because they are good meetings. But it is an enormous cooperative, I've been a member of smaller cooperatives where almost everyone has to engage and be part of the committee.*

Perhaps this lack of engagement is due to the widely acknowledged high levels of trust in Sweden between citizens and governing agencies, such as the cooperative governing bodies and the housing associations (Rothstein, 2005; Andrews-Speed, 2016). Indeed, it is recognised in STS theory that within informal institutions, trust among citizens and toward those giving advice or managing the technological infrastructure is decisive for the efficacy of STTs (Andrews-Speed, 2016).

When asked who should make decisions such as to instal IMCS, the participants were torn. Still, they were leaning toward local actors. Perhaps this speaks to higher levels of trust in domestic actors:

> *The residents. Or possibly the members of the cooperative committee, but they are selected by the residents.*
>
> *If it can really reduce energy consumption, then perhaps the decision should be made at a higher level. The government could introduce grants or subsidies for such installations.*

It should not be the EU.

Smith et al. (2005) argue that the involvement of households in STTs is less intensive than that of other actors, as they do not engage in developing formal rules and institutions. Although there are exceptions to this argument (see Schnitzler, 2013&2016; Hajdjinak and Asenova, 2019), the focus group findings suggest that Smith et al.'s (2005) observation does apply in the Swedish case. Even though housing cooperatives' and tenants' associations are supposed to be corporate organizations representing the interests of residents, there is a distance between consumers and these corporate actors who have developed their own agendas. Consequently, the voices of consumers are largely absent from the policymaking process on the Energy Metering Law (Swedish Government, 2013).

Overall, the focus group, together with the document analysis, indicates a lack of engagement from residents. Although the small scale of the focus group means there may be consumers who are willing to be more actively involved, the document analysis did not show any collective organization of consumers participating in the IMCS debate, nor an effort by the government to consult consumers, suggesting the findings are applicable to the broader consumer base in Sweden.

Stakeholders in the Swedish Housing Sector

As determined earlier, housing associations are core members of the sociotechnical regime. However, the document analysis demonstrates that the associations have not only exhibited inertia but have actively resisted the introduction of IMCS through formal and informal political channels. The ability of sociotechnical regime members to resist landscape pressures such as the EED can be conditioned by several factors including their access to financial resources, the effectiveness of their discursive power as well as their ability to produce salient knowledge and promote or block legislation through close relations to policymakers (Smith et al., 2005; Geels, 2014, Lockwood, 2019; Andrews-Speed, 2016).

Cultural and discursive struggles are likely in STTs, as competing representations of technologies "will colour their attractiveness to different audiences" (Smith et al., 2005, p.1507; Geels, 2019). The document analysis suggests that the housing associations exert significant discursive power, affecting the appeal of IMCS to different actors. By co-writing Op-Eds headlined "*The poor are forced to choose not to have heat"* (Widerholm et al., 2020), *"Metering heating in rental cooperative houses will not be fair"*, and *"Say no to the EU*

requirements on our buildings" (Nordstrand et al., 2019a&b*)*, in major newspapers (*Svenska Dagbladet*), the housing associations have been influential in projecting guiding visions for the future of the sociotechnical regime and in framing the debate regarding IMCS in Sweden. Furthermore, the associations have repeatedly claimed that IMCS will be detrimental to consumers and the Government, thereby leveraging their resistance (Bostadsrätterna, 2019; Sveriges Allmännytta, 2017; HSB, 2019; Hyresgästföreningen, 2019). The associations of housing developers have similarly produced salient knowledge regarding IMCS via studies, which found IMCS to be both cost-inefficient and damaging for the environment in the Swedish context (Sveriges Allmännytta, 2019a; Riksbyggen, 2019; Smith et al., 2005). Even though a metering association (SFFE) and the EC representative in Sweden rebutted the Op-Eds of the housing associations, it seems that the housing sector remains united against the implementation of the EED, a fact the associations frequently emphasise (Areskog Mascarenhas, 2019; Pålsson, 2019, Fastighetsägarna, 2019).

Importantly, the document analysis shows the housing associations have common views concerning the development of the sociotechnical regime despite representing different groups on the housing market. Dominant discourses seem to have generated a coordinated response to the landscape pressure (Smith et al., 2005; Geels, 2019). There has been close collaboration and coordination of resources between the associations in lobbying against IMCS both domestically and in the EU (Sveriges Allmännytta, 2011). Additionally, they are backed by most government agencies and stakeholders, including the energy associations (except SFFE), in their resistance (Swedish Government, 2013). The associations appear acutely aware of their power as a political pressure force, showing significant agency through collective resistance (Baheru, 2020; Roberts and Geels, 2019).

Beyond attempting to oppose the implementation of the EED through informal political channels, the housing associations also seem influential in shaping formal institutions – rules and regulations - predominantly through participating in public consultations, both in Sweden and the EU (Swedish Government, 2013, p.127; Department of Infrastructure, 2019a; Swedish Tenants Union, 2020; Public Housing Sweden, 2020). The Swedish Government conducted several consultations on the Energy Metering Law in 2014 and on the changes in its Implementing Regulation in 2019, in which housing associations, energy associations and governmental agencies were included (Swedish Government, 2013; Department of Infrastructure, 2019a). Lundberg (2013) says the inclusion of certain actors in public consultations can allude to their status as either political insiders or outsiders and show biases

in the policy process. Although a metering association (SFFE) partook, it seems to be a less influential outlier, perhaps because of its novelty in comparison to the housing associations and its small membership (predominantly of international companies) (Lundberg, 2013; SFFE, 2019, 2005&2021).

The document analysis suggests the government gave priority to the opinions of housing associations in drafting the Energy Metering Law (2014:267) as well as in responding to the EU-pilot in 2017 that preceded the infringement procedure in 2018 (EC, 2017) (see *Figure 2*). In the EU-Pilot, the Swedish Government was asked to respond to the concerns of the EC as to the lack of implementation of the EED in Sweden. Although the Directive left room for flexibility regarding IMCS, the Commission rejected Sweden's claim that IMCS were cost-inefficient in all MABs (EC, 2017). In responding to the EC, the Swedish Government invoked many of the arguments against IMCS brought up by the housing associations in public consultations and media, echoing the narrative advanced by the associations (Department of the Environment and Energy, 2018; Swedish Government, 2013). Furthermore, the Government seems to have tried to cater to the complaints of these stakeholders by adding exemptions to the Energy Metering Regulation when it was revised in 2019. The document analysis, therefore, suggests that there was a "core regime level alliance" between the government and housing associations speaking to the latter's power and agency as incumbent stakeholders (Geels, 2014, p.27).

Nevertheless, even with the broad exemptions allowed in the Energy Metering Law, the government faces critique from stakeholders for seeking to enforce the IMCS requirement. The housing associations argue that the EED, despite its flexible conditionality, imposes excessively detailed requirements (Sveriges Allmännytta, 2011). The associations urge the Swedish Government to push for the removal of the IMCS obligation from the EED and, if necessary, take the matter to the EU Court of Justice (Sveriges Allmännytta, 2019b; HSB, 2019; Fastighetsägarna, 2019). Moreover, in the ongoing EU public consultations in connection with the potential revision of the EED, the Swedish associations of tenants and public housing are bypassing the Government and pushing for the EED to become more technically neutral on the EU-level (Swedish Union of Tenants, 2020, Public Housing Sweden, 2020).

Europeanization of energy policy seems to have caused domestic stakeholders to organise against supranational governance generating political tension (Solorio and Jörgensen, 2020).

While it is difficult, and not the purpose of this research, to draw a unitary causal link between the resistance of domestic stakeholders and the policy developments that followed the introduction of the EED, the document analysis indicates that housing associations were influential in impeding the STT and had significant ability to resist landscape pressures through their discursive power and close link to policymakers (Smith et al., 2015). Nevertheless, the final transposition of the EED into Swedish regulation is perhaps indicative of the limits to the power of the incumbent regime members and the significant authority of the EU.

The Swedish Government

Governments of EU Member States act as important intermediaries between the EU and domestic stakeholders, having a central role in legitimising supranational governance and ensuring that rules are transposed, implemented, and enforced (Jacobsson and Sundström, 2015). Europeanization can be conceptualised as a "'reciprocal relationship' (Andersen and Liefferink, 1997, p.10) between political negotiations at the domestic and the European level" (Börzel, 2002, p.3). In the context of the EED, the Swedish Government has mediated between resistance from incumbent domestic stakeholders, on the one hand, and the landscape pressures from EU policy, on the other.

While on the domestic level, the previous section suggests the Government has tried to attend to the interests of incumbent stakeholders, on the EU level, its actions have been somewhat inconsistent. The EED was negotiated with all Member States and the European Parliament before it reached a final compromise. When the proposal for the EED was voted upon in the Council, Sweden in both 2012 and 2018 voted *for* its adoption (Appendix 3) (Council of the European Union, 2012&2018). Member State governments often try to shape EU policies to minimise domestic tensions, however, it seems that the Swedish Government failed to, or did not attempt to influence the policymaking process in the EU to exclude Articles 9-11 from the EED (Putnam, 1988; Börzel, 2002). Alternatively, the government did not think that the Articles would be strictly enforced in Sweden, relying on the conditionality of the Directive. Even though the government supported the adoption of the EED, it then tried to effectively stall the introduction of IMCS at the implementation stage, perhaps due to the resistance from housing associations.

The case study reveals the pressing issues that can arise in the later stages of policymaking when second-order opposition may manifest itself in conjunction with implementation and interpretation of rules, rather than when a Directive is adopted.

Interim Conclusion

Interactions between actors with differential agency and power are important in shaping STTs and the implementation of EU policies. In Sweden, negotiation of the STT, and the process of Europeanization it entails, occurred horizontally between domestic stakeholders and government as well as vertically with the EU. The incumbent stakeholders seem to exert significant power and agency in resisting landscape pressures from the EU, leaving the government in a complex role of balancing between this domestic resistance and the external pressure from the EU, prompting contradictory actions. Even though the EC has allowed significant levels of flexibility to accommodate national diversity, the implementation of the EED seems to be viewed as an imposition by sociotechnical regime members in Sweden that have arguably managed to challenge pressures for a STT from the EU. Metering technology appears to have become a material site for political contestation to the European project (Schnitzler, 2013). Strikingly, consumers, that will ultimately experience the transition most intimately, have remained absent from the debate, which could be a factor explaining how the housing associations have been able to push their policy agenda so unobstructed in the national context.

The research illuminates the complex process that can accompany the implementation of certain EU policies and the important, often neglected role of active regime resistance in STTs (Geels, 2014). Nevertheless, through a process of negotiation between the actors included in this study, a STT has now been initiated, but on an incremental scale, with an estimated 13 % of MABs in Sweden having to install IMCS by July 2021 (Department of Infrastructure, 2019b). Thus, it seems that the EU has punctuated the equilibrium of the sociotechnical regime in Sweden and provided a juncture for initiating change (Thelen, 2003).

5. Conclusion-Obstacles to a Coherent EU Energy Efficiency Policy

Through the case study of the implementation of the EED in Sweden, this research has revealed the difficulties that can arise when EU policies reach the widely diverse institutional settings of its Member States. Using STS theory coupled with a HI approach, the paper has shown the tenacity of the sociotechnical regime in Sweden and its embeddedness in local institutional contexts. Due to path dependence, STTs can meet active and passive resistance to change at various levels and stages of the policy process as well as from diverse actors. The effect of this resistance, however, depends on the power and agency of incumbent regime members. The paper, therefore, points to the importance of considering local institutional contexts and the

power of incumbent regime actors when seeking to diffuse policies from the supranational level. These issues are imperative to consider in the EU context, where common policies need to be enforced in 27 different local contexts.

Nevertheless, the research also shows that Europeanization of energy policy has the potential to discontinue path dependence and drive STTs. With the revision of the Swedish Energy Metering Regulation in 2019, an institutional and geographic niche for IMCS, albeit narrow, has been created that allows for experimentation and a process of trial-and-error (Geels, 2004; Smith and Raven, 2012). The flexible method that the EU has used in enforcing Articles 9-11 of the EED is therefore arguably a good compromise, allowing cognitive development of user practices, knowledge, and technical expertise regarding IMCS. Still, innovations only have an impact if they are diffused more widely, which requires them to become embedded in broader cultural, user, industry, and policy environments (Geels, 2020). Consequently, the case suggests purposeful STTs demand the involvement and contribution of a wider set of actors.

Considering how the EU can overcome the obstacles to a coherent energy efficiency policy is particularly relevant now, as the EED is potentially going to be revised to overcome current barriers to its implementation (EC, 2021). The power of corporatist actors is unique to the Swedish case, making some of the findings of this paper context specific. Nevertheless, there are important lessons that can be extrapolated beyond the Swedish setting.

Geels (2020, p.12) argues that "firms often gradually reorient to address social or environmental problems if they are stimulated by attractive financial incentives, forced by legislation or pushed by public opinion". Although the legislation has been altered in Sweden, there seems to be a lack of corresponding change in financial mechanism and public opinion. The main ground for resistance from housing associations seemed to be the costs of installing and maintaining IMCS. This suggests that the EU could do well in including requirements for Member State governments to create financial incentives or support mechanisms, that could push incumbent stakeholders to ultimately reorient toward IMCS. Additionally, as the focus group participants were interested in knowing more about IMCS and recognised their potential environmental benefits, the research suggests the EU should consider complementing changes in formal institutions with non-regulatory mechanisms targeting informal institutions, such as information campaigns.

The research, however, also raises questions as to the extent to which the EU should strive for harmonisation of energy efficiency policies. The diversity found in the EU presents fertile soil

for learning from different contexts. There is a myriad of factors that should be considered in assessing the potential of innovative efficiency technologies to increase sustainability in diverse local contexts. Innovative technologies, often characterised by uncertainty, are not always universally "better", rather they can have disadvantages and imply social costs in certain institutional contexts. For instance, are there potential social costs incurred if Swedish collective solutions and their underlying solidarity approach are withered away? Or are there political costs to mounting perceptions of the Union as overly interventionist and insensitive to local preferences? Considering how the EU can accommodate the diverse energy landscapes of its Member States and whether it should strive for harmonisation of energy efficiency policies despite the challenges seen in the Swedish case is, therefore, an important normative question for policymakers as well as for academics. Future research could do well in exploring these questions by looking at how STTs precipitated by the Europeanization of energy policy play out differently in countries with differential powers to contest and influence policies at the EU level.

7. Bibliography

Ames, J. W. (1949) Co-operative housing in Sweden. The Irish Monthly, 77 (913), 310-320.

Andersen, M. S. and Liefferink, M. S. (1997) Introduction: The impact of the pioneers on EU Environmental Policy. *In:* E. E. Zeff and E. B. Pirro (eds.) *European Environmental Policy: The Pioneers.* Manchester: Manchester University Press, p.1-39.

Andrews-Speed, P. (2016) Applying Institutional Theory to the Low-Carbon Energy Transition. *Energy Research and Social Science,* 13 (1), 216-225.

Araral, E. (2013) Ostrom, Hardin and the commons: A critical appreciation and a revisionist review. *Environmental Science & Policy,* 36 (1), 11-13.

Baheru, H. (2020) *Hyressättning – Prisets reglering vid bostadshyra*. [Rent-Setting. The Regulation of Price for House Renting]. Stockholm: Jure.

Barbour, R. S. and Schostak, J. (2005) Interviewing and focus groups. *In:* B. Somekh and C. Lewing (eds.) *Research Methods in Social Sciences.* London: SAGE Publications, 41-49.

Bengtsson, B. (1992) Not the middle way but both ways - Cooperative housing in Sweden. *Scandinavian Housing and Planning Research,* 9 (2), 87-104.

Berkhout, F., Smith, A. and Stirling, A. (2004) Socio-technological regimes and transition contexts. *In:* B. Elzen, F. W. Geels and K. Green (eds.) *System Innovation and the Transition to Sustainability.* Massachusetts: Edward Elgar Publishing, 48-75.

Bocquillon, P. and Maltby, T. (2020) EU energy policy integration as embedded intergovernmentalism: the case of Energy Union governance. *Journal of European Integration,* 42 (1), 39-57.

Boli, J. (1991) Sweden: Is there a viable third sector? *In:* R. Wunthnow (ed.) *Between States and Markets: The Voluntary Sector in a Comparative Perspective.* Princeton: Princeton University Press.

Bowen, G. A. (2009) Document analysis as a qualitative research method. *Qualitative Research Journal,* 9 (2), 27-40.

Börzel, T. (2002) Pace-setting, foot-dragging, and fence-setting: Member State responses to Europeanization. *JCMS,* 40 (2), 193-214.

Cameron, J. (2005) Focussing on the focus group. *In.* I. Hay (ed.) *Qualitative Research Methods in Human Geography*. Melbourne: Oxford University Press, 156-182.

Christophers, B. (2013) A monstrous hybrid: The political economy of housing in early twenty-first century Sweden. *New Political Economy,* 18 (6), 885-911.

Cloke, P. J., Cook, I., Crang, P., Goodwin, M., Painter, J. and Philo, C. (2004) *Practicing Human Geography.* London: SAGE Publications.

Collier, D. (2011) Understanding process tracing. *Political Science and Politics,* 44 (4), 823-30.

Conradson, D. (2005) Focus groups. *In:* R. Flowerdew and D. Martin (eds.) *Methods in Human Geography*. 2nd. Oxon: Routledge, 128-142.

Economidou, M., Todeschi, V., Bertoldi, P., D'Agostino, D., Zangheri, P. and Castellazzi, L. (2020) Review of 50 years of EU energy efficiency policies for buildings. *Energy and Buildings,* 225 (1), 1-20.

England, K. V. L. (1994) Getting personal: Reflexivity, positionality, and feminist research. *The Professional Geographer,* 46 (1), 80-89.

Femenias, P. and Lindén, A-L. (2010) Energy efficiency in the housing sector – The Swedish case, *Conference Paper: ENHR - Urban Dynamics and Housing Change.*

Filippini, M., Hunt, L. C. and Zoric, J. (2014) Impact of energy policy instruments on the estimated level of underlying energy efficiency in the EU residential sector. *Energy Policy,* 69 (1), 73-81.

Fuenfschilling and Truffer (2014) The structuration of socio-technical regimes – Conceptual foundations from institutional theory. *Research Policy,* 43(4), 772-791.

Furlong, K. (2014) STS beyond the "modern infrastructural ideal": Extending theory by engaging with infrastructure challenges in the South. *Technology in Society.* 38 (1), 139-147.

Geels, F. W. (2004) From sectoral systems of innovation to socio-technical systems: Insights about dynamics and change from sociology and institutional theory. *Research Policy,* 33 (1), 897-920.

Geels, F. W. (2007) Transformations of large technical systems: A multilevel analysis of the Dutch highway system (1950-200) *Science, Technology & Human Values,* 32 (2), 123-149.

Geels, F. W. (2011) The multi-level perspective on sustainability transitions: Responses to seven criticisms. *Environmental Innovation and Societal Transitions,* 1 (1), 24-40.

Geels, F. W. (2012) A socio-technical analysis of low-carbon transitions: introducing the multi-level perspective into transport studies. *Journal of Transport Geography,* 24 (1), 471-482.

Geels, F. W. (2014) Regime resistance against low-carbon transitions: introducing politics and power into the multi-level perspective. *Theory, Culture & Society,* 31 (5), 21-40.

Geels, F. W. (2018) Disruption and low-carbon system transformation: Progress and new challenges in socio-technical transitions research and the multi-level perspective. *Energy Research & Social Science,* 37 (2), 224-231.

Geels, F. W. (2019) Socio-technical transitions to sustainability: a review of criticism and elaborations of the Multi-Level Perspective. *Current Opinion in Environmental Sustainability,* 39 (1), 187-201.

Geels, F. W. (2020) Transformative innovation and socio-technical transitions to address grand challenges. *European Commission Directorate-General for Research and Innovation,* R & I Working Paper 2020/12.

Geels, F. W., Mc Meeking, A. and Pfluger, B. (2020) Socio-technical scenarios as a methodological tool to explore social and political feasibility in low-carbon transitions: Bridging computer models and the multi-level perspective in UK electricity generation (2010-2050). *Technological Forecasting and Social Change,* 151 (1), 1-14.

Geels, F.W. and Roberts, C. (2019) Conditions for politically accelerated transitions: Historical institutionalism, the multi-level perspective, and two historical case studies in transport and agriculture. *Technological Forecasting and Social Change,* 140 (2), 221-240.

Geels, F. W., Sovacool, B. K., Schwanen, T. and Sorrell, S. (2017) Socio-technical dynamics of low-carbon transitions. *Joule,* 1 (3), 463-479.

George, A. L. and Bennett, A. (2005) *Case Studies and Theory Development in the Social Sciences.* Cambridge: MIT Press.

Glad, W. (2012) Housing renovation and energy systems: The need for social learning. *Building Research and Information*, 40 (3), 274-284.

Hajdinjak, M. and Asenova, D. (2019) Sustainable energy consumption and energy poverty: challenges and trends in Bulgaria. *In:* F. Fahy, G. Goggins and C. Jens (eds.) *Energy demand challenges in Europe: Implications for policy, planning and practice.* Cham: Palgrave MacMillan, 115-127.

Hopkins, P. E. (2007) Thinking critically and creatively about focus groups. *Area*, 39 (4), 528-535.

Jacobsson, S. and Bergek, A. (2004) Transforming the energy sector: the evolution of technological systems in renewable energy technology. *Industrial and Corporate Change,* 13 (5), 815-849.

Jacobsson, B. and Sundström, G. (2015) The Europeanization of the Swedish State. *In:* J. Pierre (ed.) *The Oxford Handbook of Swedish Politics.* Oxford: Oxford University Press, 515-528.

Karppinen, K. and Moe, H. (2019) Text as data: Document analysis. *In:* H. Van den Bluck, M. Puppis, K. Donders, L. Van Audenhove (eds.) *The Palgrave Handbook for Methods for Media Policy Research.* Cham: Springer, 249-263.

Lawhon, M. and Murphy, J. T. (2011) Socio-technical regimes and sustainability transitions: Insights from political ecology. *Progress in Human Geography*, 36 (3), 354-378.

Lockwood, M. (2015) The political dynamics of green transformations: Feedback effects and institutional context. *In:* I. Scoones, M. Leach, P. Newell (eds.) *The Politics of Green Transformations.* London: Routledge, 86-101

Lockwood, M., Kuzemko, C., Mitchell, C. and Hoggett, R. (2016) Historical institutionalism and the politics of sustainable energy transitions: A research agenda. *Environment and Planning C: Politics and Space*, 35 (2), 312-333.

Lockwood, M., Mitchell, C. and Hogget, R. (2019) Unpacking "regime resistance" in low-carbon transitions: The case of the British Capacity Market. *Energy Research & Social Science,* 58 (1), 1-12.

Longhurst, R. (2010) Semi-structured interviews and focus groups. *In:* N. Clifford, S. French. and G. Valentine, eds. *Key Methods in Geography*. London: SAGE Publications, 125-138.

Lundberg, E. (2013) Does the Government selection process promote or hinder pluralism? Exploring the characteristics of voluntary organizations invited to public consultations. *Journal of Civil Society,* 9 (1), 58-77.

Mahoney J. and Thelen K. (2010) *Explaining Institutional Change: Ambiguity, Agency and Power*. Cambridge: Cambridge University Press.

Moller, T. (2020) Political Party Dynamics and Democracy in Sweden: Developments since the "Golden Age". Oxon: Routledge.

Nair, G., Azizi, S. and Olofsson, T. (2017) A management perspective on energy efficient renovations in Swedish multi-family buildings. *Energy Procedia,* (132), 994-999.

Nässen, J. and Holmberg, J. (2005) Energy efficiency- a forgotten goal in the Swedish building sectors? *Energy Policy*, 33, 1037-1051.

North, D. (1991) Institutions. *Journal of Economic Perspectives*. 5 (1), 97-112

North, D. C. (1998) Institutional change: a framework of analysis. *In:* D. Baybrooke, ed. *Social rules: Origin; Character; Logic: Change.* New York: Routledge, 189-200.

Palm, J. and Reinfl, K. (2016) Understanding energy efficiency in Swedish residential building renovation: A practice theory approach. *Energy Research & Social Science,* 11 (1), 247-255.

Papachristos, G. (2014) Towards multi-system sociotechnical transitions: why simulate. *Technology analysis & strategic management.* 26 (9), 1037-1055.

Papachristos, G. (2018) A mechanism-based transition research methodology: Bridging analytical approaches. *Futures,* 98 (1), 57-71.

Platten, J.V., Mangold, M. and Mjörnell, K. (2020) A matter of metrics? How analysing per capita energy use changes the face of energy efficient housing in Sweden and reveals injustices in the energy transition. *Energy Research & Social Science,* 70 (1), 1-12.

Putnam, R. (1988) Diplomacy and Domestic Politics. The Logic of Two-Level Games. *International Organization,* 42 (2), 427-460.

Raven, R., Kern, F., Verhees, B. and Smith, A. (2016) Niche construction and empowerment through socio-political work. A meta-analysis of six low-carbon technology cases. *Transitions,* 18 (1), 164-180.

Raven R., Schot, J. and Berkhout, F. (2012) Space and scale in socio-technical transitions. *Environmental Innovations and Societal Transitions,* 4 (1), 63-78.

Remling, E. (2018) Depoliticizing adaptation: a critical analysis of EU climate adaptation policy. *Environmental Politics,* 27 (3), 477-497.

Roberts, C. and Geels, F. W. (2019) Conditions for politically accelerated transitions: Historical institutionalism, the multi-level perspective, and two historical case studies in transport and agriculture. *Technological Forecasting & Social Change,* 140 (1), 221-240.

Rohracher, H. and Köhler, H. (2019) Households as infrastructure junctions in urban sustainability transitions: The case of hot water metering. *Urban Studies,* 56 (11), 2372-2386.

Rothstein, B. (2005) Social capital in the social democratic welfare state. *In:* B. Rothstein (ed.) *Social Traps and the Problem of Trust*. Cambridge: Cambridge University Press, 71-91.

Savaget, P., Geissdoerfer, M., Kharrazi, A. and Evans, S. (2019) The theoretical foundations of sociotechnical systems change for sustainability: a systematic literature review. *Journal of Cleaner production,* 206 (1), 878-892.

Savvidou, G. and Nykvist, B. (2020) Heat demand in the Swedish residential building stock – pathways on demand reduction potential based on socio-technical analyses. *Energy Policy,* 144 (1), 1-15.

Schnitzler, A. V. (2013) Travelling technologies: Infrastructure, ethical regimes, and the materiality of politics in South Africa. *Cultural Anthropology,* 28 (4), 670-693.

Schnitzler, A. (2016) *Democracy's Infrastructure: Techno-Politics and Protest after Apartheid.* New Jersey: Princeton University Press.

Secor, A. J. (2009) Social surveys, interviews, and focus groups. *In:* B. Gomez, J. and P. Jones (eds.) Research Methods in Geography. Oxford: Wiley-Blackwell, 194-206.

Sigglesten, S. (2014) Reallocation of heating costs due to heat transfer between adjacent apartments. *Energy and Building,* 75 (1), 256-263.

Sigglesten, S. and Hansson, B. (2010) Incentives for individual metering and charging. *Journal of Facilities and Management,* 8 (4), 299-307.

Sigglesten, S. and Olander, S. (2013) Individual metering and charging of heat and hot water in Swedish housing cooperatives. *Energy Policy*, 61 (1), 874, 880.

Smith, A and Raven, R. (2012) What is protective space? Recognizing niches in transitions to sustainability. *Research Policy*, 41, 1025-1036.

Smith, A., Stirling, A. and Berkhout, F. (2005) The governance of sustainable socio-technical transitions. *Research Policy*, 34 (10), 1491-1510.

Solorio and Jörgensen (2020) *A Guide to EU Renewable Energy Policy: Comparing Europeanization and Domestic Policy Change in EU Member States.* Cheltenham: Edward Elgar Publishing.

Sorvoll, J. and Bengtsson, B. (2016) The Pyrrhic victory of civil society housing? Co-operative housing in Sweden and Norway. *International Journal of Housing Policy*, 18 (2), 124-142.

Statistics Sweden (2019) Just over 4.9 million dwellings in Sweden. [Online] Available from: https://www.scb.se/en/finding-statistics/statistics-by-subject-area/housing-construction-and-building/housing-construction-and-conversion/dwelling-stock/pong/statistical-news/dwelling-stock-2018-12-31/ [Accessed: 13/04/2020].

Struntz, S., Gawel, E. and Lehmann, P. (2015) Towards a "Europeanization" of EU Member States' energy policies? *Economics of Energy & Environmental Policy*, 4 (2), 143-160.

Suddaby, R., Foster, W. M. and Mills, A. J. (2014) Historical institutionalism. *In:* M. Bucheli and D. Wadhwani (eds.) *Organizations in Time: History, Theory, Methods.* Oxford: Oxford University Press, p.100-124.

Teres-Zubiaga, J., Pérez-Iribarren, González-Pino, I. and Sala, J. M. (2018) Effects of individual metering and charging of heating and domestic hot water on energy consumption of buildings in temperate climates. *Energy Conversion and Management*, 171 (1), 491-506.

Tews, K. (2015) Europeanization of Energy and Climate Policy: The struggle between competing ideas of coordinating energy transitions. *Journal of Environment & Development*, 24 (3), 267-291.

Thelen, K. (1999) Historical Institutionalism in comparative politics. *Annual Review of Political Science,* 2 (1), 369-404.

Thelen, K. (2003) How institutions evolve: insights from comparative historical analysis. *In:* J. Mahoney and D. Rueschemeyer (eds.) *Comparative Historical Analysis in the Social Sciences*. Cambridge: Cambridge University Press, 208-240.

Thelen, K. and Steinmo, S. (1992) Historical institutionalism in comparative politics. *In:* S. Steinmo and K. Thelen, eds. *Structuring Politics.* Cambridge: Cambridge University Press, 1992, 1-32.

Trädgårdh, L., Låndåsen, S. W., Wollebaek, D. and Svedberg, L. (2013) *Den svala svenska tilliten*. Stockholm: Författarna och SNS Förlag.

Turnheim, B. and Sovacool, B. K. (2020) Exploring the role of failure in socio-technical transitions research. *Environmental Innovation and Societal Transitions*, 37 (1), 267-289.

Upham, P., Kivimaa, P. Mickwitz, P. and Åstrand, K. (2014) Climate policy innovation: a sociotechnical transitions perspective. *Environmental Politics*, 23 (5), 774-794.

Verbong and Geels (2007) The ongoing energy transition: Lessons from socio-technical, multi-level analysis of the Dutch electricity system (1960-2004). *Energy Policy*, 35 (1), 1025-1037.

Verhees, B., Raven, R., Kern, F. and Smith (2015) The role of policy in shielding, nurturing and enabling offshore wind in the Neatherlands (1973-2013). *Renewable and Sustainable Energy Reviews,* 816-829.

Vogel, A. J., Lind, H. And Lundqvist, P. (2016) Who is governing the commons: studying Swedish housing cooperatives. *Housing, Theory and Society*, 33 (4), 424-444.

Vogel, J. A., Lundqvist, P. and Arias, J. (2015) Categorizing barriers to energy efficiency in buildings. *Energy Procedia*, 75 (1), 2839-2845.

Wittmater, J. M., Geus, T. D., Pel, B., Avelino, F. Hielscher, S., Hoppe, T., Muhlemeier, S., Stasik, A., Oxenaar, S., Rogge, K. S., Visser, V., Marin-Gonzalez, E., Ooms, M., Buitelaar, S., Foulds, C., Petrick, K., Klarwein, S., Krupnik, S., Vries, G. D., Wagner, A. and Härtig, A. (2020) Beyond instrumentalism: Broadening the understanding of social innovation in socio-technical energy systems. *Energy Research & Social Science,* 70 (1), 1-10.

Yin, R. K. (1994*). Case Study Research: Design and Methods* (2nd ed.). Thousand Oaks, CA: Sage.

8. Bibliography of Cited Primary Sources

Areskoug Mascarenhas, K. A. (2019) Mäta förbrukning kan spara mycket energi [Metering energy consumption can save a lot of energy]. *Svenska Dagbladet*, 9 September 2019 [Online] Available from: https://www.svd.se/mata-forbrukning-kan-spara-mycket-energi [Accessed: 10/11/2020].

Boverket (2008) Individuell mätning och debitering i flerbostadshus. [Individual metering and charging in multi-apartment buildings.] [Online] Available from: https://www.boverket.se/globalassets/publikationer/dokument/2008/individuell_matning.pdf [Accessed: 10/11/2020].

Boverket (2014) Individuell mätning och debitering vid ny- och ombyggnad. [Individual metering and charging for new construction and reconstructions]. [Online] Available from: https://www.boverket.se/globalassets/publikationer/dokument/2014/individuell-matning-och-debitering-vid-ny-och-ombyggnad.pdf [Accessed: 11/11/2020].

Boverket (2015) Individuell mätning och debitering i befintlig bebyggelse. [Individual metering and charging in existing buildings] [Online] Available from: https://www.boverket.se/globalassets/publikationer/dokument/2015/individuell-matning-och-debitering-i-befintlig-bebyggelse.pdf [Accessed: 11/11/2020].

Boverket (2017) Individuell mätning och debitering. [Individual metering and charging] [Online] Available from: https://www.boverket.se/globalassets/publikationer/dokument/2017/individuell-matning-och-debitering---uppfoljning-2017.pdf [Accessed: 12/11/2020].

Boverket (2018) Individuell mätning av värme, kyla och tappvarmvatten. [Individual metering and charging for heat, cooling and hot water] [Online] Available from: https://www.boverket.se/sv/byggande/uppdrag/avslutade-uppdrag/individuell-energimatning/ [Accessed: 10/11/2020].

Boverket (2019) Upplåtelseformer och boendeformer i Sverige. [Forms of letting and housing in Sweden] [Online] Available from: boverket.se/sv/samhallsplanering/bostadsmarknad/bostadsbestandet/upplatelseformer/ [Accessed 29/10/2020].

Bostadsrätterna (2019) Remissvar avseende promemoria om Förbättrat genomförande av EU-direktive om energieffektivetet – Individuell mätning av mätning av värme och tappvarmvatten i befintlig bebyggelse, I2019/01869/E. [Response to public consultation Improved implementation of the Energy Efficiency Directive – Individual metering of heating and hot water in existing buildings].

[Online] Available from: https://www.regeringen.se/4ad5e9/contentassets/3c4f850e3f8d4a819c1241fc379d8837/bostadsrattern a.pdf [Accessed: 21/10/2021].

Council of the European Union (2012) Voting result. Directive of the European Parliament and of the Council on energy efficiency and repealing Directives 2004/8/EC and 2006/32/EC [First reading] – 1288th meeting. [Online] Available from: https://data.consilium.europa.eu/doc/document/ST-14707-2012-INIT/en/pdf [Accessed: 20/03/2020].

Council of the European Union (2018) Voting result. Directive of the European Parliament and of the Council amending Directive 2012/27/EU on energy efficiency (First reading) – 3658th meeting. [Online] Available from: https://data.consilium.europa.eu/doc/document/ST-14998-2018-INIT/en/pdf [Accessed: 20/03/2021].

Department of Infrastructure (2019a) Förbättrat genomförande av direktivet om energieffektivitet – Individuell mätning av värme och tappvarmvatten i befintlig bebyggelse. [Improved implementation of the Energy Efficiency Directive – Individual metering of heat and hot water in existing buildings] [Online] Available from: https://www.regeringen.se/4adac2/contentassets/0453ad9489764dde9791c7408550c531/promemorian -forbattrat-genomforande-av-eed_remiss.pdf [Accessed: 20/12/2020].

Department of Infrastructure (2019b) Begränsade krav på IMD-installation införs. [Limited requirements on installing IMCS are introduced] [Online] Available from: https://www.regeringen.se/pressmeddelanden/2019/11/begransade-krav-pa-imd-installation-infors/ [Accessed: 10/12/2020].

Department of the Environment and Energy (2018) Svar på Europeiska kommissionens skrivelse med formell underrättelse angående Europaparlamentets och rådets direktiv 2012/27/EU (SG Greffe (2018) D/15074, överträdelseärende nr 2018/2201) [Answer to the European Commission's formal notice of infringement regarding the European Parliament and Commission Directive 2012/27/EU [(SG Greffe (2018) D/15074, infringement procedure nr 2018/2201)]

European Commission (EC) (2017) THEMIS/EU Pilot Ref. No. EUP (2017) 9196.– *Accessed upon request form the Swedish Government.*

European Commission (EC) (2018) Formell underrättelse – Överträdelse nummer 2018/2201 [Formal notice – Infringement number 2018/2201]. – *accessed upon request from Swedish government.*

European Commission (EC) (2019) In focus: Energy efficiency in buildings. [Online] Available from: https://ec.europa.eu/info/sites/info/files/energy_climate_change_environment/events/documents/in_focus_energy_efficiency_in_buildings_en.pdf [Accessed: 14/04/2020].

European Commission (EC) (2021) Energy efficiency directive. [Online] Available from: https://ec.europa.eu/energy/topics/energy-efficiency/targets-directive-and-rules/energy-efficiency-directive_en [Accessed: 20/03//2021].

Fastighetsägarna (2019) Remissvar av promemorian Förbättrat genomförande av direktivet om energieffektivitet – Individuell mätning av värme och tappvarmvatten i befintlig bebyggelse [Response to public consultation Improved implementation of the Energy Efficiency Directive – Individual metering of heating and hot water in existing buildings]. [Online] Available from: https://www.regeringen.se/4ad5ea/contentassets/3c4f850e3f8d4a819c1241fc379d8837/fastighetsagarna-sverige.pdf [Accessed 21/10/2020].

HSB (2019) Remissvar, Förbättrat genomförande av direktivet om energieffektivitet – Individuell mätning av värme och tappvarmvatten i befintlig bebyggelse [Response to public consultation Improved implementation of the Energy Efficiency Directive – Individual metering of heating and hot

water in existing buildings]. [Online] Available from: https://www.hsb.se/siteassets/remissvar/hsb-remissvar_forbattrat-genomforande-av-direktivet-om-energieffektivitet_imd-varme-och-vv_190918.pdf [Accessed: 22/10/2020].

Hyresgästföreningen (2019) Remissvar, Förbättrat genomförande av direktivet om energieffektivitet – Individuell mätning av värme och tappvarmvatten i befintlig bebyggelse [Response to public consultation Improved implementation of the Energy Efficiency Directive – Individual metering of heating and hot water in existing buildings]. [Online] Available from: https://www.regeringen.se/4ad5ea/contentassets/3c4f850e3f8d4a819c1241fc379d8837/hyresgastforeningen.pdf [Accessed: 22/10/2020].

Nordstrand, A., Lennebo, R., Linder, M. Lago, A. and Linde, L. (2019a) "Mäta förbrukning i hyreshus blir inte rättvist". *Svenska Dagbladet*, 28 September 2019. [Online] Available from: https://www.svd.se/mata-forbrukning-i-hyreshus-blir-inte-rattvist [Accessed: 18/03/2020].

Nordstrand, A., Lennebo, R., Linder, M., Lago, A. and Linde, L. (2019b) "Nobba EU-kraven på våra bostäder." *Svenska Dagbladet*, 10 September 2019. [Online] Available from: https://www.svd.se/nobba-eu-kraven-pa-vara-bostader [Accessed: 18/03/2020].

Public Housing Sweden (2020) Feedback on European Commission Initiative: EU Energy Efficiency Directive – evaluation and review [Online] Available from: https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12552-EU-energy-efficiency-directive-EED-evaluation-and-review/F553353_en [Accessed: 03/04/2020].

Pålsson, J. (2019) "Effektivt att boende betalar för sin värme". *Svenska Dagbladet*, 25 September 2019 [Online] Available from: https://www.svd.se/effektivt-att-boende-betalar-for-sin-varme [Accessed: 10/11/2020].

Riksbyggen (2019) Remissvar: Förbättrat genomförande av EU-direktivet om energieffektivitet – Individuell mätning av värme och tappvarmvatten i befintlig bebyggles [Response to public consultation Improved implementation of the Energy Efficiency Directive – Individual metering of heating and hot water in existing buildings]– I2019/01/01869/E. [Online] Available from: https://www.regeringen.se/4ad5eb/contentassets/3c4f850e3f8d4a819c1241fc379d8837/riksbyggen.pdf [Accessed: 22/10/2020].

Sveriges Allmännytta (2011) Treparten uppvaktar EU-parlamentarikerna om EE-direktivet. [The three-party alliance courts members of the European Parliament on the Energy Efficiency Directive] [Online] Available from: https://www.sverigesallmannytta.se/treparten-uppvaktar-eu-parlamentarikerna-om-ee-direktivet/ [Accessed: 20/10/2020].

Sveriges Allmännytta (2017) Gemensam sak i energifrågan [Common cause in the energy question]. *Sveriges Allmännytta*. [Online] Available from: https://www.sverigesallmannytta.se/gemensam-sak-i-energifragan/ [Accessed: 30/04/2020].

Sveriges Allmännytta (2019a) Förslag om krav på IMD i befintliga bostäder. [Proposal on requirements of IMCS in existing buildings]. [Online] Available from: https://www.sverigesallmannytta.se/forslag-om-krav-pa-imd-i-befintliga-bostader/ [Accessed: 20/11/2020]

Sveriges Allmännytta (2019b) Nej till IMD-krav – bostadsbranschen uppvaktade energiministern [No to IMC requirement – the housing sector courts the energy minister.] [Online] Available from: https://www.sverigesallmannytta.se/nej-till-imd-krav-bostadsbranschen-uppvaktade-energiministern/ [Accessed: 21/11/2020].

Sveriges Allmännytta (2019c) Remissyttrande, Förbättrat genomförande av direktivet om energieffektivitet – Individuell mätning av värme och tappvarmvatten i befintlig bebyggelse

[Response to public consultation Improved implementation of the Energy Efficiency Directive – Individual metering of heating and hot water in existing buildings]. [Online] Available from: https://www.regeringen.se/4ad5eb/contentassets/3c4f850e3f8d4a819c1241fc379d8837/sveriges-allmannytta.pdf [Accessed: 21/11/2020].

Sveriges Förening för Förbruksmätning av Energi (SFFE) (2015) Remissvar Boverkets rapport 2015 – IMD i befintliga fastigheter. [Online] Available from: https://www.sffe.se/2015/12/05/remissvar-boverkets-rapport-om-imd-i-befintliga-fastigheter/ [Accessed: 10/01/2021].

Sveriges Förening för Förbruksmätning av Energi (SFFE) (2019) Remissvar, Förbättrat genomförande av direktivet om energieffektivitet – Individuell mätning av värme och tappvarmvatten i befintlig bebyggelse [Response to public consultation Improved implementation of the Energy Efficiency Directive – Individual metering of heating and hot water in existing buildings] [Online] Available from: https://www.regeringen.se/4ad5eb/contentassets/3c4f850e3f8d4a819c1241fc379d8837/svensk-forening-for-forbrukningsmatning-av-energi.pdf [Accessed: 5/10/2020].

Svensk Förening för Förbruksmätning av Energi (SFFE) (2021) Svensk Förening för Förbrukningsmätning av Energi. *Svensk Förening för Förbrukningsmätning av Energi.* [Online] Available from: https://www.sffe.se/ [Accessed: 01/20/2021].

Swedish Energy Agency (2019) Energiläget 2019 [The energy sector situation 2019]. T 2019:2.

Swedish Government (2013) Prop. 2013/14:174 [Government Bill 2013/14:174] Genomförande av Energieffektivitetsdirektivet [Implementation of the Energy Efficiency Directive]. [Online] Available from: https://www.regeringen.se/contentassets/010c46fecf1942a985c282e359d6b7ea/genomforande-av-energieffektiviseringsdirektivet-prop.-201314174 [Accessed: 15/03/2020].

Swedish Union of Tenants [Hyresgästföreningen] (2020) Feedback on European Commission Initiative: EU Energy Efficiency Directive – evaluation and review, [Online] Available from: https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12552-EU-energy-efficiency-directive-EED-evaluation-and-review/F553809_en [Accessed: 03/04/2021].

Widerholm, J., von Platten, J. and Mangold, M. (2020) ”Fattiga tvingas välja bort värme” [”The poor are forced to choose away the heat”]. *Svenska Dagbladet*, 2 January 2020. [Online] Available from: https://www.svd.se/fattiga-kan-tvingas-valja-bort-varme [Accessed: 10/11/2020].

8. Appendix 1 – Ethical Clearance Form

Research Ethics
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KING'S College LONDON

31/10/2020

Dara Engelbrekt

Dear Dara

What are the challenges to a coherent EU energy efficiency policy? The case study of Sweden and individual metering and charging systems.

Thank you for submitting your Minimal Risk Self-Registration Form. This letter acknowledges confirmation of your registration; your registration confirmation reference number is MRSU-20/21-21164

IMPORTANT CORONAVIRUS UPDATE: In light of the COVID-19 pandemic, the College Research Ethics Committee has temporarily suspended all primary data collection involving face to face participant interactions, unless the data collection fall under one of the exemptions and fulfils the criteria outlined by CREC at the link below:

https://internal.kcl.ac.uk/innovation/research/ethics/applications/COVID-19-Update-for-Researchers

Ethical Clearance

Ethical clearance for this project is granted. However, the clearance outlined in the attached letter is contingent on your adherence to the latest College measures when conducting your research. Please do not commence data collection until you have carefully reviewed the update and made any necessary project changes.

Ethical clearance is granted for a period of **one year** from today's date and you may now commence data collection. However, it is important that you have read through the information provided below before commencing data collection:

As the Minimal Risk Registration Process is based on self-registration, your form has not been reviewed by the College Research Ethics Committee. It is thereforeyour responsibility to ensure that your project adheres to the Minimal Risk Guiding Principles and the agreed protocol does not fall outside of the criteria for Minimal Risk Registration. Your project may be subject to audit by the College Research Ethics Committee and any instances in which the registration process is deemed to have been used inappropriately will be handled as a breach of good practice and investigated accordingly.

Record Keeping:

Please be sure to keep a record of your registration number and include it in any materials associated with this research. It is the responsibility of the researcher to ensure that any other permissions or approvals (i.e. R&D, gatekeepers, etc.) relevant to their research are in place, prior to conducting the research.

In addition, you are expected to keep records of your process of informed consent and the dates and relevant details of research covered by this application. For example, depending on the type of research that you are doing, you might keep:

- A record record of all data collected and all mechanisms of disseminated results.
- Documentation of your informed consent process. This may include written information sheets or in cases where it is not appropriate to provide written information, the verbal script,or introductory material provided at the start of an online survey.
  Please note: For projects involving the use of an Information Sheet and Consent Form for recruitment purposes, please ensure that you use the KCL GDPR compliant Information Sheet & Consent Form Templates
- Where appropriate, records of consent, e.g. copies of signed consent forms or emails where participants agree to be interviewed.

Audit:

You may be selected for an audit, to see how researchers are implementing this process. If audited, you and your Supervisor will be asked to attend a short meeting where you will be expected to explain how your research meets the eligibility criteria of the minimal risk process and how the project abides by the general principles of ethical research. In particular, you will be expected to provide a general summary of your review of the possible risks involved in your research, as well as to provide basic research records (as above in Record Keeping) and to describe the process by which participants agreed to participate in your research.

Remember that if you at any point have any questions about the ethical conduct of your research, or believe you may have gained the incorrect level of ethical clearance, please contact your supervisor or the Research Ethics Office.

Data Protection Registration

If you indicated in your minimal risk registration form that personal data would be processed as part of this research project, this letter also confirms that you have also met your requirements for registering this processing activity with King's College London in accordance with the General Data Protection Regulation (GDPR).

More information about how the GDPR affects researchers can be found here: https://internal.kcl.ac.uk/innovation/research/Research-Governance/how-does-GDPR-affect-research/How-does-GDPR-affect-research

Please note that any changes to the storage, management, or type of personal data being collected should also be included in a modification request.

We wish you every success with your project moving forward.

With best wishes,

The Research Ethics Office

On behalf of the College Research Ethics Committee

9. Appendix 2 – Translated Focus Group Prompts

Your energy consumption habits and thoughts about the current system

- What are your views on your building's current system of a pooled heating network and flat rate on hot water consumption?
    - What do you think are the positive aspects of the current system?
        - (Solidarity, fairness, environmental impact, other)
    - What are your complaints of the current system if you have any?
        - (Expensive, temperature, unfair, environmental impact, other)
    - Do you have a rough idea of how much of your monthly fee is spent on heating and warm water use?
        - If yes, do you think this is a reasonable amount?
    - Would you say you receive satisfactory information regarding your household's monthly energy consumption?
- What are your main considerations regarding heating in your apartment?
- What are your main considerations regarding hot water use in your apartment?
- What are your considerations regarding your general energy consumption?
        - (Cost, comfort, environmental impact)
- What factors influence your choice of indoor temperature?
- In what ways would you change your consumption of heating if you had the opportunity to do so?
    - Would you want to change the temperature in your apartment?
        - Why/Why not?
- Do you pay attention to the amount of warm water you use in your everyday?
    - What, if anything, would make you change your warm water consumption?
- What kind of measures have you seen being taken by your housing cooperative to increase the energy efficiency of your building?
    - What do you think about these measures?
        - Are they satisfactory?
    - Are you yourself taking any measures for limiting your personal energy use?

In what ways do you conceive of IMCS?

- What do you know about Individual metering and charging systems (IMCS)?
    - What kind of information have you received regarding IMCS?
        - Do you think you should have been informed of the existence of this option?
    - What do you think some of the advantages and disadvantages of IMCS are compared to the current flat rate on heating and hot water consumption?
- Do you think people should pay according to their own energy consumption or that this should be a cost shared collectively? Why?
- If you had IMCS for heating and hot water in your building in what ways do you think the energy use of your household would change?
    - Would you change the temperature in your apartment?
        - Why would you do so?
            - (Comfort, Financial, Environmental concerns)
    - In what ways do you think your water consumption habits would change?
        - Why?
    - What do you think would become your main considerations in your everyday energy consumption?
            - (Cost, comfort, environment)
    - In what ways would you expect energy consumption to change in you building with the instalment of IMCS?

    - Why?
    - (more or less energy consumed)

The decision-making process

- Who do you think should be in charge of decision-making regarding the choice between IMCS and pooled systems in Sweden?
    - (Building managers, government, EU, users)
- What sorts of considerations do you think decision-makers in these areas should prioritize?
    - (Economic, environmental, fairness, energy poverty)
- What, if anything, would make you more engaged in these decision-making processes?
    - (higher energy prices, unfair outcomes, unsatisfactory comfort)

10. Appendix 3 – Vote for EU Energy Efficiency Directive in the Council

General Secretariat of the Council

Institution **Council of the European Union**
Session **3188**
Configuration **Employment, Social Policy, Health and Consumer Affairs**
Item **2011/0172 (COD)** (Document: **35/12**)
Voting Rule **qualified majority**
Subject Directive of the European Parliament and of the Council on energy efficiency and repealing Directives 2004/8/EC and 2006/32/EC

Sitting date **4/10/2012**

Member State	Vote	Weighting
Belgique/België	↑	12
България	↑	10
Česká republika	↑	12
Danmark	↑	7
Deutschland	↑	29
Eesti	↑	4
Éire/Ireland	↑	7
Ελλάδα	↑	12
España	↓	27
France	↑	29
Italia	↑	29
Κύπρος	↑	4
Latvija	↑	4
Lietuva	↑	7
Luxembourg	↑	4
Magyarország	↑	12
Malta	↑	3
Nederland	↑	13
Österreich	↑	10
Polska	↑	27
Portugal	↓	12
România	↑	14
Slovenija	↑	4
Slovensko	↑	7
Suomi/Finland	□	7
Sverige	↑	10
United Kingdom	↑	29

Vote		Members	Votes Cast
Yes	↑	24	299
No	↓	2	39
Abstain	□	1	7
Not Participating	✕	0	0
Total		27	345

* qualified majority is reached if
at least 255 votes in favour are cast
by at least 14 of the 27 participating Council members

For information only:
More: http://www.consilium.europa.eu/public-vote

Figure 3: Voting results for the EED (2012/27) in the Council (Council of the European Union, 2012).

Vote	Members		Population (%)
Yes	24		93,86%
No	2		4,26%
Abstain	2		1,87%
Not participating	0		
Total	28		

Sitting date: **04/12/2018**

Final result

Member State	Weighting	Vote
BELGIQUE/BELGIË	2,22	
БЪЛГАРИЯ	1,39	
ČESKÁ REPUBLIKA	2,04	
DANMARK	1,12	
DEUTSCHLAND	16,10	
EESTI	0,26	
ÉIRE/IRELAND	0,93	
ΕΛΛΆΔΑ	2,10	
ESPAÑA	9,08	
FRANCE	13,09	
HRVATSKA	0,81	
ITALIA	11,95	
ΚΎΠΡΟΣ	0,17	
LATVIJA	0,38	

Member State	Weighting	Vote
LIETUVA	0,56	
LUXEMBOURG	0,12	
MAGYARORSZÁG	1,91	
MALTA	0,09	
NEDERLAND	3,36	
ÖSTERREICH	1,71	
POLSKA	7,41	
PORTUGAL	2,01	
ROMÂNIA	3,83	
SLOVENIJA	0,40	
SLOVENSKO	1,06	
SUOMI/FINLAND	1,07	
SVERIGE	1,97	
UNITED KINGDOM	12,85	

** When acting on a proposal from the Commission or the High Representative, qualified majority is reached if at least 55 % of members vote in favour (16 MS) accounting for at least 65% of the population*

For information: http://www.consilium.europa.eu/public-vote

Figure 4: Voting results for the EED (2018/2002) in the Council (Council of the European Union, 2018).