The Colour of Heating was Red: An overview of historical and policy narratives of domestic heating in Sweden, 1940 - present

JustHeat Strand II Report

von Platten, Jenny; Palm, Jenny

2023

JustHeat Strand II Report

The Colour of Heating was Red

An overview of historical and policy narratives of domestic heating in Sweden, 1940 – present

Jenny von Platten
Jenny Palm

International Institute for Industrial Environmental Economics, Lund University

Prologue: A History of the Present

This report has been written within the project *Looking Back to Move Forward: a Social and Cultural History of Heating* (JustHeat). The aim of the project is to unpack previous heating transitions at the home front since 1940 in order to enable more just and inclusive heating transitions in the future. The background is the notion that home heating transitions are deeply personal in the sense that they affect daily routines, division of labour between family members, and how we use our homes and energy alike. While there is much to be learned from intended as well as unintended effects of previous transitions, little effort has been put into understanding the lived experiences of technological changes in home heating, despite the uneven yet deep impacts they have had in society. This project will fill this gap by using oral histories to collect individual and collective experiences of home heating transitions that can complement and nuance dominating transition narratives.

As a starting point, this report aims to tell the history of home heating in Sweden as it has been documented and told in policymaking and in the public debate. This will primarily be done by reviewing formative political documents and newspaper articles. In so doing, current transitions in domestic heating can be better understood in light of past transitions, and this report can be used as a formal narrative against which to confirm, complement, and contrast the oral histories. It is by no means a complete review of the events, arguments, and effects of home heating transitions since the 1940's, but it captures some of the most important changes that – more or less, and for better or for worse – have affected people's everyday lives.

JustHeat is supported by Forte, Sweden, The Academy of Finland, The Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI), Romania and United Kingdom Research and Innovation under CHANSE ERA-NET Co-fund programme, which has received funding from the European Union's Horizon 2020 Research and Innovation Programme, under Grant Agreement no 101004509.

Cover photo by Jenny von Platten

ISBN: 978-91-87357-91-6

International Institute for Industrial Environmental Economics
Lund University
Box 188, 221 00 Lund
Visiting address: Tegnérsplatsen 4, Lund

www.iiiee.lu.se

Table of Contents

1940 – 1960: Laying the Grounds for the Collective Swedish Folkhem

Remedying a Low Standard of Housing

Up until WWII, Swedish housing standard was low in relation to other European countries, with over-crowdedness and technical substandard. The idea of the Swedish *Folkhem*, the people's home, was introduced in 1928 by the leader of the social democratic party Per Albin Hansson who articulated a vision of Swedish society as equal and inclusive, built on cooperation and helpfulness. The left-wing block won the election in 1932 and the social democratic party formed government. The following year, they appointed a committee to investigate the overcrowding in Swedish housing and propose guidelines for Swedish housing policy, which came to lay the ground for the development on the housing market for the post-war period and all the way until the 1990's when the liberal conservative party formed government.

Before WWII, heating was mainly provided through burning of wood, coal, and coke, with central heating starting to be widely deployed in the 1930's. In the early stages of the housing committee's investigation, it was argued that although central heating had many benefits compared to tiled stoves, the shift to central heating could have negative implications for lower-income households, as "*at lower incomes, poor families are either cold at home or, preferably, collect fuel by gathering pieces of wood and old twigs at construction sites or in the forest. This way of economising cannot be applied to central heating, which is controlled through a large boiler room.*" (SOU 1935:2, p. 203). Moreover, they discussed a drawback of cold homes being that residents tend to gather in one room that is kept warm whereas other rooms are left cold to save fuel, which in turn can lead to issues connected to overcrowding (SOU 1935:2).

As access to the previously used solid fuels became limited during the war, the prices of solid fuels increased significantly. Solid fuels were replaced by oil burning in individual burners and oil became increasingly common among Swedish households in the 1940's and onward (SOU 1951:32). In what was described as the first overview of Swedish energy supply in 1951, it was argued that the shift away from solid fuels to oil entailed several benefits for home heating, such as easier and more hygienic operation, higher efficiency, and reduced requirement for space. But it was also argued that the shift towards less bulky and more concentrated fuels reduced the amount of space that was kept for fuel storage, thus limiting fuel stocks and increasing dependence on fuel deliveries and distributional services (SOU 1951:32).

The housing committee proposed their final recommendations in 1945, demanding, among other things, increased housing standards, state responsibility for housing construction under municipal auspices, the establishment of public housing companies operating without profit-making purposes, and reasonable proportions between housing costs and income, aiming for rent levels to fall below 20 percent of household income (SOU 1945:63). This rental level limit of 20 percent included what they referred to as "peace heat" ("*fredsvärme*"), i.e., heating costs at peacetime in the absence of energy price peaks (SOU 1945:63, p. 414). They argued that including peacetime heating costs in the rent was legitimate as well as natural from the perspective of the tenant, and that it would facilitate benchmarking and statistics of rent levels (SOU 1945:63). The committee also emphasised the importance of keeping operational costs down, mainly referring to heating and maintenance costs, and particularly in housing occupied by lower-income families (SOU 1935:2).

Fuel Clauses

An effect of the increased energy prices during WWII was the emergence of *fuel clauses* (bränsleklausuler) in rental contracts. During WWI, central heating was rare meaning that

most tenants were individually responsible for their heating through fireplaces or stoves and thus had to carry the increased fuel costs themselves. However, as landlords still were affected by the increased fuel prices, general rent increases were enforced to cover the increased costs for landlords. This led to a new regulation on rent increases in 1917, stating that landlords who were responsible for heating (e.g. central heating) should establish rent levels excluding heating costs, and then add heating costs either as a fixed cost (warm rent) or based on actual energy use and costs in the building or city at the end of the heating season (cold rent) (SOU 1942:20). In the warm rent contracts, it was however possible to add a clause stating that the fixed heating cost could be increased with a specified amount in the event of significantly increased fuel prices; this was a means to ensure that fuel price increases would not be incorporated into the rent without means to revoke it once fuel prices dropped. Whether to apply the warm rent system or the cold rent system was decided locally by experts in rental committees. In the Stockholm region, the committee agreed on the warm rent system whereas the committee in Malmö chose the cold rent system, where heating costs were paid by tenants in retrospect at the end of the heating season. These respective systems came to be applied in the greater vicinity of the city regions, although the warm rent system was the more common one (SOU 1942:20).

When the fuel prices began to rise again in 1939, central heating had become common and landlords started to develop the fuel clauses remaining from WWI to be more adapted to the new situation with rationing and replacement fuels in order to distribute heating costs more efficiently. This led to a plethora of new fuel clauses emerging until harmonisation occurred during 1941 and three main fuel clauses were primarily being used. In an attempt for further harmonisation of heating costs in rental housing, a committee was appointed in 1941 to provide guidelines for calculation of heating costs. The argument was that regardless of how heating costs were paid, either as warm rent or cold rent, it was necessary to establish buildings' "normal" energy use for heating in order to be able to (i) move between warm rent and cold rent systems (if needed), and to (ii) rightfully calculate increases in fuel costs during extraordinary circumstances when increased heating costs for tenants were motivated according to the fuel clauses. It was argued by the committee that during normal circumstances, the warm rent system was the preferred system in regards to technical development while also being the most convenient and natural system for both landlord and tenant. However, in terms of regulating heating costs under extraordinary circumstances, they ultimately recommended the cold rent system, but emphasised the need to keep tenants informed on expected heating costs so that they could be able to estimate and plan expenses. This was thought to be important for psychological reasons (SOU 1942:20).

When fuel prices increased in 1951, the debate on fuel clauses saw an upsurge as tenants were facing significant rent increases[1], and as it was revealed that a plethora of different fuel clauses were still being used across Sweden, tenants demanded "just fuel clauses" where more just calculations of heating costs were to be adopted[2]. The Tenants' Organization had appointed a fuel committee that after thorough investigations suggested a uniform and simplified fuel clause[3].

Individual Metering and Billing of Energy for Heating

In the early 1940's, individual metering and billing of energy for heating started being tested out in some multifamily houses in Stockholm and it started being discussed as an effective means to save energy during WWII. This individual metering differed from the earlier cold rent system in the way that individual meters were actually installed for households, meaning

[1] "Stegrade bränslepriserna skjuter hyrorna i höjden", Arbetet, March 7th 1951
[2] "Hyresgästerna kräver rättvis bränsleklausul", Arbetet, September 18th 1952
[3] ibid.

that they could directly influence their own heating costs. In the earlier cold rent system, heating costs were not registered for individual households, but total heating costs were rather distributed across households based on some method for allocation such as apartment size, meaning that households had little power, and economic incentives, to actually influence their costs. Sweden looked to the Danish system where individual meters for heating was already installed in the majority of the multifamily housing stock and significant energy savings had been observed. The early tests in Stockholm showed positive results with significant energy savings[4], and it could be read in the newspapers that individual metering and billing of energy for heating would reduce costs for tenants, landlords, and for the nation through reduced fuel consumption and import[5]. While some tenants argued that the individual metering constituted a more economically rational and fair method of heating cost allocation[6], others pointed to the fact that the costs of implementing these meters would be an additional cost burden for tenants, particularly pointing out that the deployment of individual meters was being strongly pushed by a company selling such meters, AB Svensk Värmemätning[7]. Representatives of the company were given space in one of the largest newspapers to promote individual metering of energy for heating and hot water, pointing out among other things that "*One can of course adopt all sorts of perspectives on this issue – social and hygienic, for example – but the economic perspectives must still be the fundamental ones.*"[8].

In 1951, a first overview of Swedish energy supply was provided through a governmental report (SOU 1951:32) that suggested further investigation of individual metering and billing of energy for heating. Between 1953-1954, a study of individual metering of energy for heating and hot water was conducted for 100 apartments to investigate the accuracy of meters as well as their effect on energy savings. The results of the study were in line with findings from Denmark, showing a relatively high accuracy of energy metering, energy savings around 10 percent, but also pointing to varying heating needs depending on where in the building an apartment was located (SNB 36/1956). In the 1950's and 1960's, individual metering and billing of energy for heating and hot water was implemented in approximately 200 000 apartments in Sweden (SOU 1974:65). Additional loans were supplied to facilitate the installation of individual meters for heating as this system was thought to improve "housing economy" ("boendeekonomi") (SOU 1974:65, p. 204), but these loans were cancelled in 1959 and in the 1970's, only around 100 000 of the installed meters were actually being used, primarily among private landlords and housing cooperatives (SOU 1974:65). The main reason for the decreasing interest in individual metering of energy for heating was the additional administrative burdens and costs for the landlord (SOU 1974:65). Thus, despite the upswing and growing interest for this cold rent system in the 1940's, 1950's and 1960's, implementation of individual meters remained limited, and particularly so among public housing companies.

The Swedish Folkhem (People's Home)

In 1947, a new housing provision law was enacted that made municipalities responsible for planning and construction of housing. Guided by the recommendations of the housing committee, the public housing companies aimed for a high production of housing with low rental levels. As such, the concept of the *Swedish folkhem* (people's home) and welfare state started taking physical form as good housing for all was to be built to alleviate substandard housing conditions. The idea of providing good housing all across society was interpreted as not building housing particularly targeted towards lower income households, but instead maintaining a high standard of housing all across society. This marked a clear distinction

[4] "Värmemätning spar bränsle", Svenska Dagbladet, March 11th 1941
[5] "Mätning av värme och varmvatten blir besparing för hyresgäster", Dagens Nyheter, January 26th 1944
[6] "Betalning efter värmemätare", Aftonbladet, March 16th 1940
[7] "Angående värmemätning", Arbetet, July 6th 1945
[8] "Liten intervju – om värmemätning", Dagens Nyheter, October 10th 1946

between Sweden and many other European countries where the post-war period was characterised by rapid construction of social housing particularly targeted towards lower-income households. It also marked the start of the Swedish era of "social engineering" characterised by the government disciplining the population into more sanitary and civilised manners and lives.

By 1950, almost one hundred new public housing companies have been established and start acting as an alternative to private housing companies and resident housing cooperatives. During the rapid built-up of the Swedish *folkhem* between 1945 and 1960, the share of households with central heating increased from 59% to 82% (Rudberg 1992). Similarly, the share of households with access to WC increased from 52% to 82%, and those with access to their own bathroom increased from 14% to 71% (Rudberg 1992). Multifamily housing was the main foci of this construction period, providing both rental apartments and resident-owned apartments owned by housing cooperatives.

District Heating

Alongside the construction of housing was the first expansion of district heating in Sweden in the 1950's. The first Swedish district heating plant, which was also municipally owned, was built in Karlstad in 1948. Nine more systems were then built around Sweden in the 1950s (Palm 2004). However, it was not primarily the demand for heating that spurred the deployment of Sweden's first district heating networks, but rather the demand for electricity as cities were growing. Municipalities thus built combined heat and power plants to support the increasing electricity demand, and gained district heating as a secondary product that was integrated into the *folkhem's* multifamily housing (Summerton 1992).

Increased investigation into the possibilities of district heating had been suggested in the report on Swedish energy supply in 1951 (SOU 1951:32), where a deviant opinion on district heating by Stockholm municipality was also briefly described. According to an investigation by Stockholm municipality, increased centralisation of heating production was not desirable. They argued: "*All throughout human history, apart from the past 15 years on certain locations around the globe, humans have had local fireplaces – and there is no reason to resolutely claim that this particular circumstance made man less healthy and content than today*" (SOU 1951:32, p. 34).

Yet the general support for district heating was strong, and in 1950 it was written in the newspaper about the new large district heating grid in Norrköping and how pleasant it would be for landlords to escape the trouble of managing boilers and the change to wood burning during times of crisis, while still offering tenants adequate indoor temperatures and practically unlimited supply of hot water[9]. Other benefits were also described, such as the potential for reduced heating costs for tenants, increased comfort, the increased possibility to shift fuels, and the reduced smoke pollution in cities[10]. In 1953, district heating was discussed at a tenants' conference in Stockholm where reports were given from the first large district heating networks in Karlstad and Norrköping and plans for new district heating grids were discussed[11]. However, newspapers reported that open conflicts had persisted for years between tenants and landlords regarding the pricing of district heating in Karlstad, and an article from 1956 describes how tenants in several places where district heating had been deployed were disappointed by the high prices[12]. While tenants had been promised reduced heating costs, district heating had turned out to be more expensive than the individual oil boilers it replaced[13]. Tenants did not

[9] "Fjärrvärme till stadsdelar via halvmilarör", Aftonbladet, November 27th 1950
[10] Ibid.
[11] "Fjärrvärme diskuteras vid hyresgäst-konferens", Aftonbladet, August 17th 1953
[12] "Fjärrvärmen för dyr – Hyresgästerna besvikna", Aftonbladet, December 27th 1956
[13] Ibid.

understand why district heating was more expensive and thus developed a guarded position towards new large-scale combined heating and power plants powered by steam and nuclear. An ombudsman for tenants expressed it as "*District heating – yes please – but it cannot cost a single penny more than heating with the cheapest conventional fuels*."[14]

Despite the development of district heating and more automated firing in boilers, both contributing to reduced workloads for property managers, the number of workers within property management increased in the latter half of the 1950's, leading to an increased number of workers in their trade union and improved contractual benefits[15]. Still, district heating expansion during the *folkhem* (1945-1960) was limited, and individual oil boilers dominated the heating market into the 1960's, successively replacing solid fuels such as wood, coal, and coke.

1960's: A Call for Cleaner Air Promotes Collective Heating

In the 1960's, the effect of oil burning on air quality grew increasingly recognised and gained much attention in the public debate. As a consequence, the interest for centralised, collective heating systems that would remove pollution from city centres increased (SOU 1966:65), and this development was further spurred by a political decision by the social democratic party in 1965 to build one million homes in the coming decade, the so called Million Homes Programme. It was now possible to consider air pollution already in the planning steps for the new housing areas that were to be built all across Sweden. This was facilitated by increased municipal responsibility for heating supply (SOU 1966:65) in combination with municipalities' responsibilities for housing provision and their strong part in the Million Homes Programme. It was argued by some that municipalities should be able to force property owners to connect to district heating[16], and this development was supported by a proposition on common facilities including heating systems (Proposition 1966:128).

While electricity supply had previously fallen short of the demand in a constant effort to keep up, supply had increased in the 1960's to meet demands through the expansion of hydropower in the North of Sweden (Johansson 2021), which allowed for the state-owned electricity provider Vattenfall to promote increased electricity use through electric heating. One of the reasons behind this were the optimistic forecasts for nuclear power as a cheap source of electricity and thus a continuous growth of electricity demand (Vattenfall 2023). In 1966, a debate on electric heating took place partly centred around diverging opinions on when electricity from nuclear power would start being supplied. Primarily, this debate concerned replacing oil boilers with electric heating in single family houses, although some were arguing for electric heating of whole cities[17]. Others were critical of the strong promotion of electric heating from the government and electricity suppliers and questioned the alleged environmental benefits of electric heating[18].

In 1969, the Swedish Environmental Protection Agency published a report on air pollution where they argued that the best options for home heating were large-scale production through district heating or nuclear power plants and that it should be just as natural for municipalities to be responsible for heating supply as for them to be responsible for water and sewers[19]. The same year, many ads for electric heating, particularly targeting single-family house owners,

[14] "Fjärrvärmen för dyr – Hyresgästerna besvikna", Aftonbladet, December 27th 1956
[15] "Mer folk I fastighetsskötsel trots fjärrvärme och robotar", Aftonbladet, June 12th 1960
[16] "Rök och avgaser", Dagens Nyheter, February 23rd 1966
[17] "Eluppvärm Stockholm!", Dagens Nyheter, July 8th 1966
[18] Elvärmen och miljön", Dagens Nyheter, September 5th 1966
[19] "Gör luften renare", Aftonbladet, February 18th 1969

could be seen in national newspapers addressed from the electricity sector[20]. Electric heating was presented as an environmentally sustainable option to oil boilers, and with beneficial electricity tariffs offered to homeowners, it was often presented as a cheap option as well. One ad included a quote from a woman in a new single-family housing area with electric heating saying "*We are very content with electric heating. We have lived in a house with an oil boiler before. Now we never face any worries, never any odour or smell. Electric heating is quiet and clean. And surprisingly cheap!*"[21]

1970's: Oil Crises and Nuclear Power

At the beginning of 1970, Sweden's water basins for hydropower were running low causing power scarcity and rationing of electricity. As this followed the heavy promotion of electric heating from large power producers in 1969, questions were raised regarding the reasoning among electricity suppliers. In an interview in a national newspaper in March 1970, the operational manager of Vattenfall explained that they stopped the ads as soon as they realised that they were approaching a power shortage, and when asked whether they will continue their promotion for electric heating once the scarcity is over he said that they did not see any correlation between the power shortage and the increase of electric heating[22]. The Swedish Petroleum Institute took this opportunity to promote oil heating and pointed to the risks of only investing in electric heating; with these semi-detached and detached houses often being built without chimneys, residents were left with little flexibility for heating in general and in times of crisis in particular[23]. In their ad, they wrote "*Image if we didn't have oil. Then most people in this country would probably be freezing by now.*"[24]

Following the development in the 1960's towards more collective heating systems, a governmental investigation was appointed in 1973 on increased planning in heating supply (SOU 1974:77). This investigation thus came to overlap with the first oil crisis in 1973 and resulted in a new regulation on public district heating facilities (allmänna fjärrvärmeanläggningar) being enforced in 1974. It also prompted another governmental investigation (SOU 1976:55) which led to a regulation on municipal energy planning being enforced in 1977, thus giving municipalities the responsibility and control over heat planning that had been suggested already in the 1960's. According to many, it wasn't until after the oil crisis in 1973 energy policy as we know it today truly started being implemented in Sweden (Energimyndigheten 2000).

When the oil crisis in 1973 hit, households in single-family houses faced increased heating costs as most houses were heated with an oil boiler. At the time, most boilers were only made for oil, meaning that the possibilities to change to other fuels were limited[25]. Heating costs in houses with district heating or direct electric heating increased as well since most electric and district heating power plants used oil as their main fuel[26]. The end of 1973 was also the first time the term *energy poverty* (energifattigdom) was used in Swedish media in reference to the Swedish context[27]. The term was used in a column in a local newspaper that referred to previous energy crises and problematised the standard of continuous increase in energy use[28]. The term energy

[20] "För framtidens skull… Dags för miljövänlig värme", Dagens Nyheter, February 20th 1969; "För framtidens skull… Dags för miljövänlig värme", Aftonbladet, March 3rd 1969
[21] "Framsynt förbud mot luftföroreningar gav 81 nya Lundavillor elvärme", Aftonbladet, January 21st 1969
[22] "Varför har vi elbrist, Sven Lalander?", Aftonbladet, March 5th 1970
[23] "Tänk om vi inte haft oljan.", Aftonbladet, March 22nd 1970
[24] Ibid.
[25] "Pannor bara för olja!", Arbetet, October 18th 1973
[26] Ibid.
[27] "Energikrisen", Borås Tidning, December 10th 1973
[28] "Energikrisen", Borås Tidning, December 10th 1973

poverty was only mentioned once again during the 1970's, then it was not used again until in the 2000's in reference to the Swedish context.

Rationing

To reduce oil use, energy savings campaigns were rolled out and rationing measures implemented. The information campaigns encouraged people to reduce indoor temperatures to at least 20°C, to refrain from running portable electric radiators, and to take quick showers instead of baths[29]. Newspapers wrote about how to maintain good personal hygiene while saving hot water[30]. District heating was rationed for the first couple of months of 1973 and was based on previous energy use (Vedung and Hansén 2019). However, rationing of electricity was never implemented as voluntary energy savings were rather successful. It has been argued that the government and prime minister Olof Palme managed to create a coherent, legitimate, and convincing "crisis narrative" that got through to the people and as such kept the mandatory rationing to a minimum (Vedung and Hansén 2019). Later on, as lessons were drawn from the oil crisis in 1973 to prepare for future crises and rationing, it was however argued that the rationing based on previous energy use was unfair as it disfavoured those who had already saved energy on their own initiatives[31]. Another lesson learned was to encourage lowered indoor temperatures before restricting reduced use of hot water, as decreased hot water use had caused much discontent in 1973/1974[32].

Critique of Fuel Clauses and an Upswing for Cold Rent

The drastic increases in oil prices in 1973 spurred rent increases which led to debates regarding fuel clauses being brought to the fore again. Despite the efforts to harmonise and simplify fuel clauses in the 1940's as well as in the 1950's, there were still many different ones being used that were complicated and difficult to understand, particularly among private landlords. Public housing companies had developed a system that was more thoroughly controlled and easier to understand whereas private housing companies to a greater extent used fuel clauses in the way they were developed during the war[33]. As such, tenants had a hard time understanding how much they were paying for heating and were faced with high rent increases that they could not fully understand[34]. The fuel clauses were described in news media as "peculiar" and "old remains from the war"[35], and landlords were accused of utilising the fuel clauses and the oil crisis to drastically increase rent levels. The fuel clause that was mainly being used in Stockholm had led to tenants' heating costs constituting 54% of their cold rent[36], and there were reports of landlords increasing the heating surcharge three-fold although oil prices had only doubled[37]. The conflict and discontent that arose led to the Tenants' Association demanding the fuel clauses to be abolished, but with little hearing at the time[38].

Alongside the debate around the fuel clauses arose the discussion of individual metering and billing of energy for heating once again. The liberal people's party (Folkpartiet) wanted the sitting government to promote energy savings through liberal means particularly focusing on home heating. Apart from additional insulation in older buildings, they suggested implementing individual metering and billing of energy for heating to give households

[29] "Dämpa så räcker oljan bättre!", Aftonbladet, November 22nd 1973
[30] "Ransoneringen och hygienen", Barometern, December 27th 1973
[31] "Så möter vi nästa kris", Arbetet, July 25th 1975
[32] Ibid.
[33] "Höjt hyresbränsle I värmen berikar oljebolag och redare", Arbetartidningen, July 20th 1973
[34] "Hyreslägenheters uppvärmning", Borås Tidning, February 7th 1971
[35] "Tala med Carlsson om bränslepåslaget", Dagens Nyheter, January 25th 1974
[36] Ibid.
[37] "Fastighetsägarna utnyttjar "oljekris" – Chockhöjningar av bränsletillägget", Arbetartidningen, January 30th 1974
[38] Ibid.

economic incentives to reduce their energy use[39]. This suggestion was echoed by voices from the building industry in an op-ed that discussed the previous reservations against individual metering, particularly the administrative cost burden and the risk for injustices related to heating, i.e., lower income households not being able to afford sufficient warmth. The latter was suggested to be able to remedy by offering housing allowances or social welfare subsidies to families with children, people in retirement and people with long-term illness that potentially have a higher heating demand than other households. It was argued that if overall energy use could not be reduced through individual metering, economically disadvantaged households would be the most exposed in times of scarcity as higher income households would have means to cope[40]. One drawback of individual metering and billing of energy for heating was mentioned, namely the risk of "heat stealing" between neighbours due to heat transmission, potentially causing injustices if one neighbour lowers their indoor temperature and relies on the heating from their neighbours. This drawback was however dismissed by posing the question "*how can one ever fully reach justice?*"[41].

In 1973, a committee was appointed by the government to conduct a national energy prognosis which was published in 1974 (SOU 1974:65). Part of the report had been dedicated to investigating and discussing whether to apply *collective* billing or *individual* metering and billing of energy for heating in apartments. It was concluded that while the arguments for individual metering of heating was for each tenant to pay in proportion to their energy use for heating, as discussed in the 1940s and 1950's, this was difficult to achieve in reality given the heating transmission between apartments and thus the issue of "heat stealing" and the injustices related to that. The issue of split incentives between tenants and landlords was also raised, pointing to the fact that although tenants were incentivised to reduce energy use for heating with cold rent, much could be gained by putting the economic incentives on the landlord instead with warm rent as the landlords have significant possibilities to improve energy efficiency (SOU 1974:65).

Yet, ultimately, the justice aspect appeared to be central in the committees' arguments against individual metering and billing of energy for heating. It was said that a high standard of housing and associated amenities was a fundamental pillar in the social housing policy of Sweden, and the idea of letting the supply of heating depend on affordability, potentially causing significant inequalities between tenants even within the same building, had not been considered socially acceptable in Sweden. Further, it was argued that the collective form of housing that multifamily housing entails was supported by the idea that collective goods and services, among which heating was considered to belong, should be paid in solidarity. In terms of energy for hot water, the report discussed the more realistic possibilities for individual metering and billing, but it was pointed out that such a system would lead to high costs for high consumers of hot water, primarily assumed to be families with children and people suffering from illness; groups that had been brought to the fore when hot water rationing was discussed in 1973/1974. It was further noted that individual metering and billing of energy for hot water could potentially have negative implications for the hygienic standard in the population (SOU 1974:65).

It was finally concluded that the warm rent system was the by far dominant one and that there were no obstacles to implementing warm rent where it currently was not applied. They also concluded that even through warm rent had grown increasingly common, there were still various sorts of fuel clauses being used, and the recent increases in heating costs had driven

[39] "Folkpartigrupp star fast: Det går att spara energi!", Göteborgs-Posten, September 1st 1973
[40] "Mät värmen – spara miljarder", Göteborgs-Posten, December 13th 1973
[41] Ibid.

many landlords that had adopted the warm rent system to return to the cold rent system (SOU 1974:65).

The fuel clauses then continued to contribute to illegitimate rent increases throughout the 1970's, and the critique and discontent grew stronger and stronger. Within public housing companies, warm rent had come to be the standard and the Tenants' Association kept pushing for abolishment of fuel clauses and the implementation of warm rent also among private landlords. Investigations were conducted that showed that tenants with fuel clauses were being overcharged for their heating costs[42]. Finally, an agreement was settled between the organisations on the housing market in 1979, marking an end to the use of fuel clauses at the end of the year with warm rent being effectively implemented across the housing stock[43]. Simultaneously, the majority of newly constructed multifamily buildings were being connected to district heating grids, and many of the existing multifamily buildings converted from oil to district heating throughout the 1970's (SOU 1980:43). Still, approximately 60% of multifamily buildings were heated with oil at the end of the 1970's, and only a small share, around 5%, were heated with direct electric heating (SOU 1980:43).

Uncertain Future for Nuclear and Electric Heating

Since the end of the 1960's when electric heating had been strongly promoted, there had been an ongoing debate regarding whether to use direct electric heating or oil heating in single-family houses, and electric heating started taking market shares from oil. In 1970, around 10% of single-family houses had direct electric heating, which had reached to around 30% at the end of the 1970's, spurred by high oil prices, relatively cheap electricity and high hopes and ambitions for nuclear power (SOU 1980:43). Between 1974 and 1977, 71% of the constructed single-family houses had direct electric heating, and around 10 000 single-family houses annually converted to electric heating (SOU 1980:43). Only a small share, less than 5%, of single-family houses were heated with district heating (SOU 1980:43).

But as the oil crisis in 1973 had brought about substantial efforts into energy saving programmes in existing buildings (SOU 1980:43) and building regulations demanding higher energy performance in new construction (SBN 1975), direct electric heating was now seen as an inefficient means to heat Swedish homes. Forbidding direct electric heating was discussed alongside plans to seal leaky houses, the so called "Operation Seal Sweden" ("Operation täta Sverige")[44]. Towards the end of the 1970's, the debate around nuclear power was also progressing with a growing scepticism about the role of nuclear power in society. This debate culminated when the Three Mile Island accident occurred in 1979 which led to the decision to hold a public election of the future of nuclear in Sweden in 1980. As such, the uncertainty of future electricity supply further aggravated the reservations against direct electric heating (SOU 1980:43). Between the oil crisis in 1979 and the upcoming election on nuclear in 1980, single-family house owners faced large uncertainties regarding the best way to heat their homes[45].

Overall, the oil crises and the debate around nuclear in the 1970's marked a shift in Swedish energy policy that up until this point had been focused on securing sufficient energy supply and expanding the electric grid (Kaijser, Mogren et al. 1988). Some argue that energy use before the 1970's to some extent was seen as something that could not be affected or changed, but that this supply doctrine was replaced, or at least accompanied, by the need to reduce

[42] "Höjd hyra från 1 januari – Bränsleklausul slopas", Svenska Dagbladet, June 28th 1979
[43] "Oljepriset slår hårt trots slopad klausul – Hyra seriehöjs för 200 000", Dagens Nyheter, June 28th 1979
[44] "Villaägare får nya lån – om de byter ut elvärmen", Aftonbladet, November 19th 1977
[45] "Hur kan jag värma mitt hus 1985?", Aftonbladet, March 14th 1980

energy demand by improving energy efficiency and rethink energy demands (Kaijser, Mogren et al. 1988).

1980's: Collective Heating Systems and Heat Pumps

The public election on the future of nuclear power in Sweden was held on March 23rd 1980, where the winning option for nuclear power was a long-term phase-out of nuclear to facilitate the transition away from oil and to await other renewable energy options to develop. The existing reactors could keep running and reactors under construction could be finalised and put into use, but all nuclear should be phased out by 2010.

This fuelled the continued development of electric heating. Although oil use was reduced after the oil crisis in 1973, the rate of conversion increased after the second oil crisis (Energimyndigheten 2000). A new programme for energy policy was established in 1981 (Proposition 1980/81:90, Riktlinjer för energipolitiken, Bilaga 1). As a part of it, the government provided subsidies for conversion from oil heating to electric heating (Energimyndigheten 2000), which led to many households in single-family housing converting to direct electric heating or electric boilers. However, critique was raised towards the fact that electric heating appeared to be the only option for single-family house owners and that there was no clarity in how these houses were to be heated in the future when nuclear was phased out[46]. In the news media, it was said that homeowners were abandoned by this new policy programme and left with little guidance on how to best heat their homes[47].

Another part of the energy policy programme was a strong promotion, politically and economically, of district heating expansion which gave district heating many advantages in relation to other heating sources (Mårtensson 2006). With the regulation on municipal energy planning, municipalities held and exerted much power over the development of district heating (Mårtensson 2006). The fact that municipalities coordinated energy planning in combination with the high share of multifamily housing constructed during the Million Homes Programme facilitated collective heating systems over individual ones (Dzebo and Nykvist 2017). In 1982, a requirement to implement oil reduction plans was added to the regulation on municipal energy planning, which led to fossil fuels being increasingly substituted for biofuels in district heating production and combined heating and power plants (Energimyndigheten 2000).

Heat Pumps in Single Family Housing

The lack of good substitutes for electricity heating for homeowners spurred a debate about the best option for electric eating. During a three-day symposium in 1983 gathering several national leading experts to discuss "*How shall future single-family houses be heated?*", the realistic future and economic feasibility of heat pumps was heavily debated and contested, with reports of experts falling into hectic arguments during the coffee breaks[48]. At this time, the heat pump technology was at an early stage where public awareness of heat pumps had increased somewhat throughout the 1970's, but the heat pump demand was primarily driven by early adopters with the interest and economic means to invest in this new and rather expensive technology (Johansson 2021). The government provided the heat pump market with subsidised loans and investments between 1978 and 1984 which to some extent broadened the targeted market group, yet it remained characterised by innovative consumers (Johansson 2021).

Alongside the slow progress for small-sized heat pumps was a parallel development of including large-sized heat pumps in district heating grids. As such, scepticism against heat

[46] "Det finns bara ett alternativ för villaägaren", Dagens Nyheter, March 5th 1981
[47] "Efter energipropositionen: Kol-Sverige är här", Dagens Nyheter, February 18th 1981
[48] "Eluppvärmning av småhus – Expertstrid om bästa sättet", Dagens Nyheter, November 21st 1983

pumps as being a technology that disturbed existing systems decreased in favour of them being increasingly viewed as a complement in synergy with existing systems (Johansson 2021). Installation of these large-sized heat pumps peaked during the first half of the 1980's and decreased in the latter half of the decade as oil prices began to drop again. The interest for large-sized heat pumps in district heating never returned after that (Johansson 2021).

Homeowners Caught in the "Electric Heating Trap"

By the mid-1980's, subsidies and loans for conversion to electric heating as well as for energy efficiency measures in housing were reduced, despite the high costs of converting from direct electric heating to a water-based heating system. People were said to have been tricked into the "electricity trap" ("elfällan") and were now not receiving much help to get out of it[49]. In 1989, the national homeowners' association wrote an open letter to the government asking how Swedish villas were planned to be heated in the future. They expressed great worry among the 850 000 house owners dependent on electricity for heating and asked about future heating systems and the costs for converting away from electric heating to new sustainable options if electricity prices were to rise. Further, they emphasised that homeowners had been loyal and attentive to the government's recommendations over the past 15 years in converting from oil to electric heating and investing in additional insulation of their homes. Now the debate was instead dominated by the need to reduce dependence on electricity, leaving house owners worried about increasing costs and the lack of sustainable options[50]. Later on in the 1990's, it was also reported about how residents were "suffering in the sealed villas of the 1980's" with extensive complains of respiratory issues, tiredness, and headaches, among other things[51]. This suffering was attributed to the increased requirements on insulation after the 1970's oils crises, and particularly the lack of harmonisation between solutions for insulation, sealing, heating, and ventilation.

1989 also saw what turned out to be the starting point of Sweden's future system for environmental taxes when the committee on environmental levies presented their report *Put a Value on the Environment!* (SOU 1989:21). The potential introduction of new environmental taxes spurred fears that households' heating costs would come to increase drastically[52], but this did however not turn out to be the case as energy taxes were reduced as a counteracting measure when environmental taxes were introduced in the early 1990's (Johansson 2021).

1990's: End of Housing Policy and Deregulations

The 1990's saw many political changes compared to the preceding decades, starting with a shift from the social democratic government to a centre-right government in 1991. The more liberal politics that followed contributed to reduced governmental influence on the housing market through a depletion of housing policy in favour of a more market-driven system (Olsson 2010). As such, the municipalities' role and responsibilities in housing provision decreased, slowly starting to undermine the social housing politics and the *folkhem* that had been built up in Sweden from the 1940's (Olsson 2010, Hedin, Clark et al. 2012).

Increased Focus on Environmental Sustainability

Another change with implications for home heating in the early 1990's was the increased environmental and CO2 taxations stemming from an increased awareness of environmental degradation. Thus, while the heating transition in the 1980's first was driven by a desire to reduce oil use, it came to be more and more influenced by the increased recognition of

[49] "Dyrbart byta värme i småhuset", Dagens Nyheter, February 28th 1987
[50] "Husägare pejlar partierna", Dagens Nyheter, August 5th 1989
[51] "Boende lider i 80-talets täta småhus", Göteborgs-Posten, April 8th 1994
[52] "Om miljöavgifter införs: Hushållen drabbas hårdast", Göteborgs-Posten, October 10th 1989; "Värmekostnad höjs kraftigt", Svenska Dagbladet, October 21st 1989

environmental sustainability, and thus a desire to limit environmental damage such as acidification and eutrophication.

Sweden has a long tradition of energy taxation which in 1991 was complemented by the introduction of the world's first CO_2 tax on fossil fuels. In combination, the CO_2 taxes and the energy tax form a total tax level on fuel consumption (IEA 2019). The increased energy taxes spurred the interest in new heating technologies such as heat pumps (Dzebo 2017), which also presented an opportunity for households in single-family housing with direct electric heating to reduce their electricity use for heating.

An Upswing for Heat Pump Technology

The new taxes increased prices for oil and electricity in Sweden even before oil prices started rising towards the end of the 1990's (Johansson 2021). In 1990, a man close to retirement wrote a letter to the editor in one of the largest national newspapers entitled "Insane electricity prices"[53], complaining about the electricity price increase between 1985 and 1990 and how it affected him in his semi-detached house with direct electric heating. He called the electricity taxation "unfair" and highlighted that people had been urged to install direct electric heating in the early 1970's when it was advocated as a clean future source of heating[54].

In addition to the increased environmental taxes, the financial crisis in 1992/1993 further incentivised households to reduce their energy use for financial reasons, and the heat pump followingly started to become a status symbol (Johansson 2021). By the mid-1990's, the Swedish heat pump industry had developed heat pumps that were mature for the home heating market, and during the years to come the heat pump market in Sweden grew bigger than any other in Europe (Johansson 2017).

Continued Development of District Heating

In parallel, district heating continued to expand and decarbonise home heating. In addition to the transition from fossil fuels to biofuels in the 1980's, district heating faced another significant change in the 1990's as heat from waste incineration was increasingly integrated into the grids (Dzebo 2017). At the same time, the number of district heating companies had increased from around 40 in 1970 to over 200 in the 1990s, among which the majority are municipal companies (Rydegran 2018).

Deregulation of the Electricity Market

As a step in a series of increased privatisation of public sectors and services in the 1990's, such as in housing provision but also mail services, telecommunications, railways, education, and health care, the electricity market was deregulated in 1996 (Blomgren 2021). This deregulations was thus a sign of the times, and up until then the state had had planned the needed electricity generation and the development of the electric grid, although private actors to some extent were allowed to partake in electricity generation (Högselius and Kaijser 2006). After winning the election in 1991, the centre-right government had proposed a deregulation of the electricity market with the aim to "*through increased competition achieve an even more rational use of resources and to ensure users flexible conditions for delivery of electricity to the lowest possible cost*" (Blomgren 2021). The new regulation was enforced with a fairly high level of agreement between the centre-right block and the social democratic block, and practically entailed that customers were free to choose their own electricity supplier and that the price of electricity supply was no longer regulated.

However, while electricity trading had been deregulated and was under the freedom of customers' choice, the electric grids were still inherently natural monopolies. Already in March

[53] "Elpriser ej kloka", Svenska Dagbladet, April 7th 1990
[54] Ibid.

of 1996, three months after the deregulation had been enforced, the national association for homeowners (Villaägarna) raged against differences in the grid tariffs across the country, causing vast disparities in heating costs among houseowners with electric heating[55]. Another aspect of the deregulation was that in order to change electricity supplier, customers had to have a metering device installed that measured the hourly electricity use. However, the cost of installing a metering device exceeded the potential cost savings from changing electricity supplier for many smaller electricity consumers, practically leaving many households outside of the deregulated electricity market. Towards the end of the year, the national association for homeowners partnered with other national organisations on the housing market in a demand for lower electricity prices. They called the deregulation a "giant fiasco", stating that a vast majority of customers had faced increased electricity costs since its enforcement and that many electricity companies had seized the opportunity to transfer as high shares as possible of their costs to the monopolar grid-part of their companies before the deregulation[56]. They emphasised that the increased costs primarily affected smaller electricity consumers, such as households, since larger electricity consumers such as industries had been able to negotiate lower prices. As such, they described the deregulation as "reversed Robin Hood politics", where money was taken from the small customers and given to the large ones[57]. Finally, they demanded that the requirement of a metering device to be able to change electricity supplier, i.e., to join the electricity market, should only apply above a certain limit be set as high as possible, thus exempting as many smaller electricity consumers as possible from the requirement of a metering device. A reform was then enforced in 1999 that allowed all customers to freely and at no cost choose their electricity supplier, which is the way that the market has remain until today. As such, it wasn't until 1999 that the electricity market opened up to all customers.

Preparing for Closing Nuclear Reactors

The Chernobyl disaster in 1986 had initiated a discussion in Sweden regarding speeding up the closing of nuclear reactors in advance of 2010. After a few turns back and forth in when and how many reactors to shut down, it was finally decided in 1997 that one reactor should be shut down in 1998 and another one in 2005; the end-date 2010 was on the other hand withdrawn and replaced with an ambition to close reactors in a steady state but with no determined final date (Blomgren 2021).

With many households still facing increased electricity costs from the deregulation, the decision to close one reactor already in 1998 once again stirred up worries among homeowners with electric heating. It was written in news media that the 750 000 households in villas with electric heating would be the ones to pay for a large share of the closing of nuclear reactors in Sweden, despite a subsidy programme to support reduced electricity use was put in place in 1998 to facilitate the closing of the two reactors[58]. This included subsidies for conversion away from electric heating to biofuels, or to reduce electricity use through a heat pump (Regulation 1997:635), as well as subsidies for houses with electric heating to shift to district heating (Regulation 1997:634). But households could not be granted more than 20 000 SEK for conversion (Regulation 1997:634-5), and a conversion from direct electric heating could at the time cost around 80 000 SEK[59], meaning that households with limited financial resources were not able to cope with the conversion costs from direct electric heating even with the help from governmental subsidies. Nevertheless, as electricity prices began to drop after the reform

[55] "Villaägarna rasar mot elpriserna", Göteborgs-Posten, March 29th 1996
[56] "Vi kräver lägre elpriser – nu", Aftonbladet, October 12th 1996
[57] Ibid.
[58] "750 000 villaägare drabbas", Dagens Nyheter, February 6th 1997
[59] Ibid.

of the deregulation in 1999[60], the conversion away from electric heating did not proceed to the extent that the government had hoped when implementing the subsidies[61].

2000's: Increasing CO_2 Taxation and Phasing out Oil

High oil prices in combination with increased taxes on energy and CO_2 at the beginning of the 2000's led to a rapid conversion away from oil firing in Swedish single-family housing (Sveriges Riksdag 2018). 40 000 households annually replaced oil firing with other heating sources between 2001 and 2005, and this rate increased to 70 000 per year when a conversion subsidy away from oil was introduced to single-family households in 2006-2007 (Sjunnesson and Helldorff 2012). This subsidy was accompanied by a conversion subsidy away from direct electric heating in single-family and multifamily housing between 2006-2010 (Boverket 2011), similar to the subsidy that was in place between 1997 and 2002 as part of the policy programme to facilitate the termination of a nuclear reactor in 1998 (Statens energimyndighet 2005). However, this time around it was possible to apply for an additional subsidy for the extra cost of converting from direct electric heating to a waterborne heating system. The heating sources being promoted were primarily heat pumps, with ground-source heat pumps growing in popularity, biofuels through complementing the existing oil boiler, and district heating, but subsidies were also given to solar heating[62]. At the time of these subsidies being rolled out, it was emphasised by the national association for homeowners that short-term political decisions had been very leading in homeowners' choice of heating system, with changed directions coming only 10 years apart[63]. Given that the service life of heating systems are around 20 to 30 years, the political twists and turns had been economically challenging to keep up with for homeowners[64].

The high oil prices favoured electric heating despite governmental efforts to reduce electric heating[65], but having been established in the 1990's, the heat pump market continued to grow throughout the 2000's, successively replacing oil boilers and direct electric heating. Now, heat pumps did not only start taking significant market shares in single-family housing, but also came to expand more into multifamily housing where district heating was the dominant heating source. In contrast to the synergistic relationship that had existed between district heating and large-sized heat pumps in the 1980's, the relationship between the two heating sources now grew to be more filled with conflict and competition (Johansson 2021). Shifts from district heating to heat pumps had previously been very uncommon but started and have continued to occur, with the monopolistic character of district heating and the fear of lock-in being raised as some of its disadvantages (Johansson 2021).

District Heating Persists and Provokes

By the 2000's, district heating continued to hold its dominating position in multifamily housing and expanded in single-family housing in the transition away from oil. In terms of its perception among the public, a study analysed how district heating was portrayed in national newspapers and periodicals as well as in a couple of smaller local newspapers during 1996 to 2007. In general, district heating had been portrayed in in a positive light when technology and environmental concerns are in focus, but in a more negative, or at least critical, light when economical aspects are considered (Palm and Magnusson 2009). The latter is strongly related to the natural monopoly that district heating constitutes, which energy customers perceived to be exploited by the energy companies. District heating tariffs were for example a highly

[60] "Sänkta elpriser efter reformen", Aftonbladet, October 15th 2000
[61] "Oväntad motvind för energipolitiken", Dagens Nyheter, August 6th 2000
[62] "Dags för ny värme", Dagens Industri, March 4th 2006
[63] "Elvärmen behåller greppet om småhusägarna", Dagens Industri, March 4th 2006
[64] Ibid.
[65] "Villaägare väljer el före dyr olja", Dagens Nyheter, January 19th 2001

debated topic, particularly in Stockholm. After the local and partly municipally owned district heating company was sold to a private actor in 2002, tariffs increased rather rapidly which stirred a lot of umbrage. Once this narrative was established, there was not room for reporting on much else than increased tariffs and grievances. Customers felt locked-in and requested competition on the district heating market. In Stockholm, it is likely that it was the *increase* in tariffs that constituted the greatest source of conflict rather than the actual pricing, albeit it being high (Palm and Magnusson 2009).

In terms of environmental aspects of district heating the debate was rarely of critical nature, but rather described district heating as having positive environmental implications locally as well as globally. Grid expansion and new power plants were also portrayed as measures for reduced environmental impact, often alongside reports of the expected emission reductions the plants will contribute to. However, the actual need for new power plants was rarely discussed, showcasing the one-sided focus on energy supply that for a long time has dominated the Swedish energy discourse (Palm and Magnusson 2009).

The technical aspects of district heating were sometimes described on an overarching level, such as water being heated and then transported through pipelines to the energy customers, but never beyond that. This could imply that the technology was stabilised and embedded into society to such an extent that further discussion of the technical aspects became redundant (Palm and Magnusson 2009).

2010's: Bidding Areas for Electricity and more Ambitious Climate Targets

In 2011, a large change occurred on the Swedish electricity market as the country was divided into four bidding areas. This was conducted as a means to handle transmission limitations by demand from the European Commission. Sweden has traditionally had plenty of energy and has been a net exporter of electricity since 2011. The challenges for the Swedish electricity grid system are linked to the transmission of electricity as the majority of Sweden's electricity production takes place in the north, while the largest electricity consumption takes place in the southern parts of Sweden where most people live. The bidding areas were thus a construction to introduce price differences that reflect the balance between electricity supply and demand, which would encourage increased generating and transmission capacity where it was most needed. The SE1 area is the Luleå bidding area in the north. Sundsvall bidding area is the SE2, Stockholm SE3 and Malmö SE4. The areas in the north, SE1 and SE2 have a generation surplus, while the two in the south (SE3 and SE4) have a generation shortage.

In 2014, the Swedish Energy Agency warned that the lowest-income households were spending increasing shares of their income on energy due to the general electricity price increases over the past 20 years, brought about by increased taxation and costs for raw materials[66]. While income levels had increased at the same pace as electricity prices for the majority of the population, the lowest income households were lagging behind and spending approximately twice the share of their income on energy costs (8%) compared to other households (4%). One reason mentioned was the financial inability among low-income households to invest in more energy efficient solutions such as heat pumps and additional insulation. The Swedish Energy Agency thus said that these households were approaching the internationally applied limit for energy poverty of 10%, but also emphasised that the Swedish social welfare system offered various financial supports to these households, thus somewhat protecting them from energy poverty[67]. This was the first time since the oil crises in the 1970's that the term energy poverty

[66] "Elkostnader slår mot låginkomsttagare", Sveriges Radio, June 27th 2014
[67] Ibid.

was used in Swedish news media in reference to the Swedish context. It thus gave rise to some reactions, and another newspaper made a comment on injustices in transition policy measures promoted by the green party[68]. First, it was argued that the green party's suggestion to close more nuclear reactors would increase electricity prices, thus aggravating the increasingly pressed situation for low-income households. Second, it was argued that the green party's suggestion of bonus-malus policies would end up being "reversed Robin Hood politics", where fees for unsustainable and inefficient technology, disproportionately affecting lower income households, would subsidise energy efficiency investments and solar PV installations among higher-income households[69].

Subsidies for household solar PV were first introduced in 2009 and offered households 60% of the total cost of installation. Since the start, the demand for the subsidy has exceeded the availability of financial support and money has continued to be allocated for this subsidy in the governmental budget with a rapid increase in allocated resources in 2017 (Energimyndigheten 2018). The subsidy level has however successively decreased from 60% in 2009 to 20% in 2023, but is from 2021 a general subsidy for investment in "green technology" rather than a pure subsidy for solar PV (Energimyndigheten 2023). Households also have the possibility to receive tax deductions for labour costs (ROT-avdrag) from installation for solar PV since 2021 (Energimyndigheten 2023), and a similar tax deduction has been possible for installation of certain heat pumps since 2009 (Johansson 2021).

In 2015, various circumstances affecting the electricity market spurred discussions of re-regulation of the electricity market across Europe. One of the leading experts in Sweden, now chief strategist at the Swedish Transmission System Operator (Svenska Kraftnät), was advocating to "trust the market" and criticising countries that were pricing electricity "as if it were a matter of social politics", arguing that fear of short-term price peaks hitting some households hard, even pushing them into energy poverty, could hinder market dynamics and harm the legitimacy of the European energy market[70]. Despite warnings of rising energy poverty in Sweden, energy poverty was described as something occurring in other parts of Europe and energy use was distinctively separated from social politics[71]. At this time, Swedish authorities were also questioning why energy poverty should be differentiated from general poverty when other forms of poverty, such as food or transport, were not (Johansson, Jonsson et al. 2015). This standpoint was echoed in multiple governmental documents such as Sweden's Integrated National Energy and Climate Plan (Ministry of Infrastructure 2020) and Sweden's Long-Term Renovation Strategy (Ministry of Infrastructure 2020) where it was stated that "*Sweden does not differentiate energy poverty from general poverty*", that the term 'energy poverty' consequently wasn't used in Sweden, and that no particular policies addressing energy poverty existed as the issue was dealt within social politics.

Around 2018, capacity shortages in the electricity grid, i.e., the transmission limitations that the bidding areas were supposed to address, started to become a known concept to the general public[72]. Capacity shortage in the electricity grid means that the grid is unable to supply electricity to all users who demand it at certain times. The grid is simply full, leading to large geographical price differences affecting households as well as industries. This has led to high-profile cases where companies have been refused requests to increase their output, i.e. the number of kilowatt-hours they can use at any one time, because the grid owner could not guarantee such an increase in supply (Palm 2021).

[68] "Åt den som har skall varda givet", Barometern, June 28th 2014
[69] Ibid.
[70] "'Våga tro på marknaden'", Dagens Industri, September 22nd 2015
[71] Ibid.
[72] "'Akut kapacitetsbrist i elnätet – regeringen måste agera'", Dagens Nyheter, March 23rd 2019

Capacity shortages can be addressed by expanding the grid, but this is an expensive and time-consuming solution. Another measure is to work on demand flexibility, which means that users adapt when they use their electricity based on the availability. The greatest strain on the grid is in the winter at certain times when various factors, such as cold weather or a lack of electricity supply, add up so that the momentary supply falls short of the momentary demand. As Swedish single-family houses to a large extent rely on electricity for heating, there is more strain on the grid during wintertime than in summer (Palm 2021).

Ambitious Climate Taxes and Politics

From 2004 onwards, the CO_2 tax was adjusted annually with the inflation and from 2017 onward an additional 2% annual increase was introduced. In 2017, the parliament adopted a national Climate Policy Framework including the Energy Agreement target for GHG, but also to reduce GHG emissions in non-European Union Emissions Trading System (EU-ETS) sectors by at least 63% in 2030 and by at least 75% in 2040 from 1990 values. One climate target is to have net-zero GHG emissions by 2045 and thereafter negative emissions. This target is set five years earlier than the EU roadmap target. The goal is to reduce domestic emissions by at least 85% from 1990 and have the remaining 15% from carbon capture and storage and emission reduction outside Sweden via international projects or mechanisms (IEA 2019). In 2017, Sweden's CO_2 tax was the highest in the world at USD 140/tCO_2-eq, followed by Switzerland with the second highest taxes at USD 87/tCO_2-eq (IEA 2019). In 2018, the CO_2 taxes for gasoline and diesel in Sweden were reduced parallel to the introduction of the emission reduction obligation system (IEA 2019).

Resistance to EU Requirements

Cold Rent

With lots of the public debate on home heating having focused on single-family housing since the abolishment of fuel clauses in 1980, the public eye was once again turned to tenants' heating situation when new EU requirements in Directive 2012/27/EU on Energy Efficiency demanded individual metering and billing of energy for heating, i.e., cold rent. In 2014, the Swedish government complied with the EU requirements by enacting a new regulation stating that individual metering and billing of energy for heating should be implemented when it is cost effective and technically feasible (Regulation 2014:267). In 2014 and 2015, the Swedish National Board of Housing, Building and Planning (Boverket) investigated when such implementation could be cost effective in new construction and reconstruction, as well as in the existing housing stock, respectively. The Board's conclusions were that the requirements would lead to unprofitable investments among housing constructors and landlord and thus that the requirements should be abolished (Boverket 2014, Boverket 2015). In 2017, these reports on cost efficiency were followed up by a report addressing some of the received critique and reasoning about issues of split incentives between tenants and landlords and its effects on total energy savings. The report also touched on justice aspects of cold rent versus warm rent, however, only in the sense of paying for one's own energy use and the risk of "heat stealing". Social risks connected to cold rent were not discussed as they had been in the 1970's, and the term energy poverty was not mentioned (Boverket 2017). Although the bottom line remained the same as in the 1970's, i.e., that the warm rent system should be protected, the arguments were now primarily of techno-economic nature.

Still, the EU Commission continued to push for implementation of cold rent in Sweden, leading to representatives from the social democratic party writing an op-ed arguing published in various newspapers under titles such as "*The EU should not decide over our rents in Sweden*"[73]

[73] "EU ska inte bestämma över våra hyror i Sverige", Blekinge Läns Tidning, July 29th 2017

and "*Keep the warm rent in our homes!*"[74]. Here, the split incentives argument was raised once again, but what they brought to the fore was the argument of everyone's equal right to an adequate and healthy indoor temperature. They argued that this should never become a matter of affordability and emphasised the increased risk for energy poverty that cold rent would entail. Moreover, that argued that we should keep the successful system with warm rent and promoted energy policy within the EU that benefits households, public health, as well as businesses and the environment[75].

Sweden managed to push back against the EU Commission's requirements until 2019 when a compromise was finally reached. The compromise entailed that cold rent should be demanded in the buildings with the lowest energy performance and was to be enforced in 2021 (Sveriges Riksdag 2022). However, the requirements could be dodged if the landlord improved the energy performance above the regulatory limit or if they in some other way could prove that the installation of individual meters would not be cost efficient. In the memorandum for the new regulation, it is described that the requirements target worst-performing buildings as cost efficiency will be higher in buildings with higher energy use for heating, i.e., that the regulation is based on techno-economic reasoning. In the 42-page document, the only mentioning of potential social effects of the regulation is found on the final page: "*One drawback is that if the requirement on installation of individual metering cause costly measures to be undertaken that do not bring a net benefit, housing costs could increase for residents. This could particularly affect vulnerable households. The exempts from the installation requirement are however meant to minimise the negative effects.*" (Regeringskansliet 2019).

The housing industry was rather unanimously opposed to the new regulation, and it was highlighted from academia that existing correlations between energy performance of housing and household income had been neglected[76]. This was due to the existing residential segregation causing lower income households to be overrepresented in multifamily housing with low energy performance. Thus, the cold rent requirement disproportionately affected residents in energy inefficient housing with low incomes, meaning that the protection against energy poverty that warm rent entails was to be removed in a part of the housing stock particularly vulnerable to energy poverty (von Platten, Mangold et al. 2020). The fact that this risk had not been recognised in the policymaking process could potentially be a consequence of the previously low integration between energy policy and social policy. Nonetheless, as the outcome of the regulation has not yet been evaluated it is difficult to draw any conclusions regarding the implications for energy poverty and heating injustices; the regulation rather acts as a telling example of the potentially new risks that transition policy can invoke if not carefully informed and designed.

Wood Stoves

Another EU-imposed requirement related to home heating was enforced in 2018 with more strict requirements on wood firing to protect the environment and reduce negative health implications from air pollution. To meet the EU requirements, the Swedish Board of Housing, Building and Planning introduced environmental requirements on installations of second-hand wood stoves, among other things, which caused a lot of resistance particularly among people living in rural areas[77]. Around 18 000 people joined a rebellion on social media, "Vedspisupproret" ("the Wood Stove Rebellion"), and protests included sending firewood by mail to the Swedish Board of Housing, Building and Planning as well as to politicians[78]. Those

[74] "Bevara varmhyran i våra hem!", Motala & Vadstena Tidning, July 31st 2017
[75] "EU ska inte bestämma över våra hyror i Sverige", Blekinge Läns Tidning, July 29th 2017
[76] "Fattiga kan tvingas välja bort värme", Svenska Dagbladet, January 2nd 2020
[77] "Boende på landsbygden protesterar mot vedledningskrav", SVT Nyheter, February 13th 2018
[78] "Efter Vedspisupproret – nu får vedspisen grönt ljus igen", SVT Nyheter, May 28th 2019

who were against the new requirements pointed to the importance of wood stoves for resilience in rural areas in case of power shortages[79] as well as the affordability of pre-used wood stoves compared to new ones[80]. One member of the rebellion said that the new requirements would make many households unable to afford a wood stove, and then "they won't have any preparedness"[81]. This reflected a general fear among residents in rural areas that wood stoves would become prohibited[82]. However, after evaluating the new requirement, the Swedish Board of Housing, Building and Planning concluded that with very few used wood stoves on the market, the relatively small health benefits and the rather high administrative costs could not motivate a continuation of the regulation[83]. The requirements on pre-used wood stoves were thus abolished in 2019

2020's: Times of Crisis

Sweden's electricity consumption is one of the highest in the world; in 2019, Sweden's electricity consumption per capita was 12,8MWh, which can be compared with the EU average of 6.0 MWh (IEA 2019). This has partly been due to large electricity-intensive industries and traditionally low electricity prices that have also resulted in widespread use of direct electric heating in detached houses (IEA 2019). Electricity prices in Sweden have been particularly low for the industry. In 2017, Swedish households pay on an average 166.61 EUR/MWh, where 38% are taxes. This is around median among the IEA members (IEA 2019).

Nuclear power has since the 1970's continued to play an important role in the Swedish electricity mix, yet several nuclear power reactors have been closed down during the years and in 2021 there were six reactors in operation in three different nuclear power plants: Forsmark, Ringhals and Oskarshamn. According to the owner of these plants (Vattenfall AB is the main owner of Ringhals and Forsmark, and Uniper of Oskarshams) will they run the plants until 2040 (Strålsäkerhetsmyndigheten 2023). Hydro and nuclear power has since the 1970's dominated electricity generation in Sweden and it has contributed to the Swedish energy system being considered cheap and clean (in the meaning non-fossil) (Kooij, Oteman et al. 2018). Combined heat and power generation has been quite stable around 10% of the fuel mix since the 1970's. Wind power has grown since the 2000's mainly due to the electricity certificate system that has supported investments in renewables.

The electricity prices increased during 2021 first due to lack of capacity in the grid (Palm 2021) and later due to Russia's invasion of Ukraine. The average monthly price for the households was in December 2022 234,59 EUR/MWh (Statista 2023).

Electricity and the Single-Family Housing Stock

Today, electricity accounts for half of the total heating demand in detached houses, wood and pellets account for one-third, and district heating accounts for the rest except for a small fraction still relying on fossil fuels for heating (IEA 2019). As such, heating costs for households in detached houses were heavily affected by the rise in electricity prices, and more so in the two southern bidding areas SE3 and SE4. While many households have replaced direct electric heating and electric boilers with heat pumps for improved efficiency (Palm, Reindl et al. 2020), there is still a significant share of houses being heated with direct electric heating and electric boilers, particularly among lower income households (von Platten 2023). Both direct electric heating and electric boilers are more than twice as common among low-income households than among high-income households in single-family housing, and while

[79] "Efter Vedspisupproret – nu får vedspisen grönt ljus igen", SVT Nyheter, May 28th 2019
[80] "Boende på landsbygden protesterar mot vedledningskrav", SVT Nyheter, February 13th 2018
[81] Ibid.
[82] "Vedspisuppror efter Boverkets nya utsläppsregler", Svensk Byggtjänst, January 24th 2018
[83] "Efter Vedspisupproret – nu får vedspisen grönt ljus igen", SVT Nyheter, May 28th 2019

almost 60% of high-income households in single-family housing have some sort of heat pump, only 35% of low-income households do (von Platten 2023). This shows how lower income households have had a harder time keeping up with the changes in in promoted heating systems in single-family housing since the 1970's and how this leads to them being disproportionately affected in times of crisis.

Energy Poverty, Cold Rent and the Multifamily Housing Stock

The increase of the district heating prices have in comparison been modest, on average they only increased by 1,5% during 2022 (Nils Holgersson-rapporten 2022). Municipal waste is an important fuel and incineration with energy recovery is an accepted waste treatment method and this fuel has not been affected by the Ukraine war. District heating[84] (DH) supplies 90 % of heat demand in multifamily buildings (IEA 2019), where warm rent remains the dominating system.

Warnings for energy poverty emerging as an issue in Sweden increased in 2021[85] with op-eds stating that "*Sweden's energy policy is threatening our welfare*"[86] and "*Society's resilience starts with energy policy*"[87]. News media started reporting on energy poverty among Swedish households at the end of 2021 when the first significant electricity price peaks occurred[88], and the term energy poverty made it into the Swedish list of "new words" in 2022 (Institutet för språk och folkminnen 2022). In the news reports, much focus was put on lower income households, particularly single parents[89] and people in retirement[90], and particularly those with direct electric heating. Despite Swedish households generally having relatively high indoor temperatures, with approximately 21°C in single-family houses and 22°C in multifamily houses over the past decades (Dzebo and Nykvist 2017), news articles described people restricting their heating to 13-16°C[91]. While many of the most vulnerable households were found in single-family housing, a lot of attention was also drawn to households living in apartments or semi-detached rental housing with cold rent *and* direct electric heating; these are two risk factors for energy poverty that tend to be intertwined in rental housing[92] as individual metering of electric heating always has been more cost efficient and accurate than individual metering of district heating (SOU 1974:65, p. 203 & 220). Compared to tenants with warm rent, these households faced direct and drastic increases in heating costs, whereas tenants with warm rent were to face a higher annual rent increase at the end of the year instead. As such, the risk for energy poverty suddenly became apparent and present among tenants with cold rent, effectively inducing compromises such as "heat or eat", whereas no such compromises were induced among tenants with warm rent. Among landlords with warm rent and electric heating, or in municipalities where district heating prices increased significantly, discussions about implementing cold rent were also raised[93], similar as during the oil crises in the 1970's (SOU 1974:65).

[84] Most DH is produced in co-generated plants, where both heat and electricity is produced. In 2016, co-generation accounted for 73% of the total DH generation and 10% of the total electricity generation in Sweden (IEA 2019).
[85] "Varning för energifattigdom", Nya Wermlandstidningen, December 8th 2021
[86] "Sveriges energipolitik hotar välfärden", Dalademokraten, June 29th 2021
[87] "Samhällets motståndskraft börjar i energipolitiken", Norra Skåne, December 10th 2021
[88] "Halva pensionen går till el: 'Det här går inte längre'", Sydsvenskan, December 18th 2021
[89] "Larm från Sydsverige: Barnfamiljer riskerar hamna i energifattigdom", Dagens Nyheter, October 6th 2022
[90] "Fler lever i energifattigdom – Caroline, 77: Det är verkligen kris", Hem & Hyra, December 6th 2022
[91] "Halva pensionen går till el: 'Det här går inte längre'", Sydsvenskan, December 18th 2021; "Direktverkande el: Yvonne, 74, jobbar extra för att ha råd med elräkningen", Hem & Hyra, February 13th 2023
[92] "Direktverkande el: Yvonne, 74, jobbar extra för att ha råd med elräkningen", Hem & Hyra, February 13th 2023
[93] "Ökande kostnader får fler fastighetsägare att överväga kallhyra", SVT Nyheter, September 29th 2022

Non-Ideal Policy Measures

Among the reactive policy measures implemented in 2022 was a financial subsidy for electricity costs that was distributed to households based on their electricity use, i.e., SEK/kWh, with different allowances depending on what electricity bidding area the household resides in. While financial support to households was welcomed, the subsidy faced critique for two main reasons. First, critique was directed towards the fact that the subsidy was based on electricity use rather than need for financial support. This was criticized on social welfare grounds, as higher-income households with larger homes and more electric appliances were given more compensation than lower-income households with lower energy use[94]. It was also criticised on environmental grounds as households that had made efforts to limit their electricity use were being "punished" by receiving lower subsidies and more "wasteful" households were "awarded" with higher financial support. In other words, both the design of the subsidy and the critique against it was the same as the rationing in the early 1970's, where allowed energy use had been based on historical energy consumption[95].

Second, there was much debate regarding the distribution of money across the bidding areas. In the first round of the subsidy, financial support was given to households in SE3 and SE4 based on their electricity use between October 1st 2021 and September 30th 2022 (Regulation 2022:1872). In the second round of the subsidy, which was being discussed in November 2022, it was first suggested by the government that financial support should once again only be given to households in SE3 and SE4. This caused a wave of critique and anger among households in the North, partly due to the fact that there had been no price differences between the bidding areas in November. The new subsidy was being called "unfair" and was viewed by households as well as industries in the North as part of the rural/urban divide and the general neglect of northern Sweden, bringing up arguments such as the lower incomes and higher tax rates in the North[96]. The social democratic party[97] and the left-wing party[98] also criticised the proposal by the centre-right government, who had taken the power from the centre-left government just months before, and the government eventually put forward a new proposal for the subsidy including all bidding areas at the end of 2022[99]. It was later decided that financial support should be given to households in all bidding areas based on their electricity use between November and December of 2022, but that the granted SEK/kWh should differ between the bidding areas based on how high the electricity prices had been (Regulation 2023:108).

After the reactive measures had been implemented, more long-term and proactive policies were drafted. In the fall of 2022, the government proposed a subsidy for improving energy performance through improved insulation as well as for converting to a more efficient and/or less electricity demanding heating system in single-family housing. The latter included converting from direct electric heating to a water or air-based heating system, heat pump installation, connection to the district heating grid, or converting to a heating system based on biofuels. Only houses where 50% of the heating demand is supplied by electricity or gas can be granted subsidies. Those who were critical of a conversion subsidy referred to the subsidies for conversion from oil to electric heating at the time of the oil crises, emphasising the short-term perspectives and potentially faulty prognoses that often inform policymaking[100]. Nonetheless,

[94] "Sveriges rikaste får mest i elstöd: 'Sjukt'", Expressen, November 26th 2022
[95] "Så möter vi nästa kris", Arbetet, July 25th 1975
[96] "Nu stiger elpriserna – och ilskan – i norr: 'Skrämmande'", Aftonbladet, November 29th 2022; "Elpris-ilskan växer i norr: 'Det här blev droppen'", Expressen, December 25th 2022
[97] "Kritik mot utbetalningarna av elprisstödet: 'Handlar om människors privatekonomi'", SVT Nyheter, November 30th 2022
[98] "Vänstern tar initiativ för elprisstöd i norr", Svenska Dagbladet, December 19th 2022
[99] "Nu ska hushåll även i norra Sverige få elprisstöd", Ny Teknik, December 31st 2022
[100] "Egna plånboken styr mot smartare elförbrukning", Sydsvenskan, January 18th 2022

the policy was enacted in 2023 and covers up to 50% of the investment cost for a more efficient heating system or improved insulation, however, the maximum subsidy level is at 30 000 SEK for each of these categories (Regulation 2023:402). With current costs of converting from direct electric heating to a water-based heating system possible landing around 200 000 to 300 000 SEK (Karlsborg kommun 2022), chances are that many low-income households with direct electric heating in single-family housing will not be able to afford a conversion even with the available subsidies (there is also e.g. the tax reduction for labour costs, ROT-avdrag). As such, there is a significant risk that both the reactive and the proactive policy measures were rather unsuccessful in targeting the lowest income households who ultimately were in the greatest need of financial support.

The Story of Home Heating in Sweden

Looking Back

This brief historical review of home heating in Sweden shows development in multiple directions. In multifamily housing, political measures have continuously tried to improve remnants of older and flawed systems. This includes the general standard of housing, installing central heating, harmonising and eventually abolishing fuel clauses, and finally ending up in a situation where warm rent and district heating dominates the multifamily housing stock, keeping residents warm and protected from sudden peaks in heating costs. This development started already with the housing committee's report in the 1945 (SOU 1945:63) when municipalities were given much responsibility for housing provision. The continued municipal planning for housing as well as for district heating later in the 1970's, when the multifamily buildings of the Million Homes Programme were also being finalised, created favourable conditions for the collective character of heating to become dominant.

To some extent, the collective mindset is present in the warm rent system as well. As this report has shown, warm rent appears to have been the dominating system in Sweden ever since central heating was widely installed during the first half of the 1900's, although the interest for cold rent, and the arguments for warm rent, have shifted over time. Interest for cold rent has primarily emerged when energy prices have increased rapidly, such as in the wartime of the 1940's, the oil crises in the 1970's, and in the current energy crisis. Yet, the Swedish warm rent system has stood the test of time. While the arguments for cold rent have remained the same, primarily the justice aspect of every tenant paying for their actual energy use as well as the energy savings aspect of putting economic incentives for energy savings on tenants, the arguments for warm rent have to a greater extent been subject to their historical context. In the early formative policy documents for multifamily housing and heating in the 1940's, it was argued that "peace heat" should be included in the monthly rent as it was thought to be "natural" for the tenant, it would facilitate benchmarking of rent levels, it would be beneficial for technological development and housing construction, and the predictability of heating costs would be good for "psychological reasons" as tenants could plan their expenses.

When the issue of warm or cold rent was investigated again in the 1970's, much emphasis was put on equality, solidarity, public health, and everyone's right to sufficiently heated homes. Heating was seen as one of many things that should be included in collective forms of housing. The split incentives between tenants and landlords were also mentioned at this time as buildings' energy performance suddenly climbed on the political agenda. In the latest debates on cold versus warm rent, initiated by EU requirements for energy efficiency, social arguments for warm rent have shone with their absence in policy documents. While arguments such as everyone's right to sufficient heating and risks for energy poverty have been brought up in op-eds, policy documents have almost exclusively focused on the techno-economic aspects and energy saving benefits of warm rent. Perhaps the EU requirements stating that cold rent should be implemented when cost efficient and technically feasible have limited the debate to these aspects and excluded the social aspects of warm rent from being part of the narrative. There is

nonetheless a pressing need to make room for social sustainability alongside environmental sustainability in current energy policy.

While the policy development for home heating in multifamily housing has moved in a rather straight direction since WWII, policy for heating in single-family housing has gone along a more crooked path. The historical documentation highlights the swiftly changing recommendations and suggestions from the government and how homeowners, particularly in the 1970's and 1980's, followed suit. The story of electric heating in Swedish single-family housing has been influenced by opinion and politics regarding nuclear power and changes in the electricity market. In retrospect, it is not difficult to see how homeowners have felt pushed into the "electricity trap"; a strong promotion of direct electric heating by the national energy company was followed by discussions on banning direct electric heating due to its energy inefficiency in the late 1970's; the uncertain future of nuclear power left homeowners without guidance on how to best heat their homes in the 1980's; the deregulation of the electricity market in 1996 was quickly followed by a decision to shut down two nuclear reactors in 1998 and 2005 respectively, invoking subsidies to reduce reliance on electric heating. This shows how and why the heat pump has grown to be such an important corner stone in the Swedish heating system, and particularly its ability to complement existing heating systems has been put forth as an important factor for its success (Dzebo and Nykvist 2017).

Now as new conversion subsidies are being rolled out, there is both the perspective of the government remedying the burdens of previous policies, and the risk of the government steering homeowners in the wrong direction. In light of the ongoing energy system changes, we must remain open to the fact that we do not certainly know what a future sustainable heating system for single-family housing will look like. The historical overview however shows that Swedish households have been actively engaged in the energy system and been part of implementing several transitions in the system during the years. Households have experienced a move from solid fuels, to oil, and to electricity. Many have also transitioned from using individual heating to connecting to a collective system, often district heating. This preparedness among Swedish households is less recognised, but constitutes an important potential in future transitions.

Increasing Distance to Those being Left Behind in the Heating Transition

When looking at the development of home heating in multifamily housing as well as single-family housing, it can be concluded that the vast majority of residents are finding themselves in beneficial situations with warm rent and district heating, or with a heat pump or other relatively modern heating systems. But one aspect that arises is that the distance to residents falling behind in the heating transition is increasing. While there is a standard of warm rent, some tenants are still stuck with cold rent contracts *and* direct electric heating, exposing them to a significant risk for energy poverty that is not at all present in the rest of the multifamily housing stock. Similarly, while many homeowners in single-family housing have invested in efficient heat pumps, additional insulation, and solar PV, all of which to some extent being subsidised, others lack the financial resources to make such investments, and are thus stuck with old and expensive heating systems. The fact that direct electric heating is overrepresented among low-income households in single-family housing showcases that it remains "expensive to be poor", and with the last years' high electricity prices, chances are that electricity bills have eradicated financial savings, pushing potential investments further away despite profitability of such investments increasing with increasing electricity prices.

In addition, recent political measures fail to reach the ones falling the farthest behind. First, the electricity price subsidy granted to households in 2022 and 2023 was based on residents' electricity use, meaning that tenants with direct electric heating and cold rent were likely to receive more financial support than other tenants, yet they would not receive as much as residents in large single-family houses with electricity usage stretching far beyond basic needs.

Second, the subsidy for conversion from direct electric heating to a water-based heating system is unlikely to stimulate investments among the lowest income households as the maximum level of financial support still would require a large upfront investment from the homeowner. It is thus to be expected that the subsidy to a large extent will act as an investment discount for households that would have been able to afford the conversion even without financial support.

Although the current energy crisis acted as a catalyst for energy poverty becoming a more widespread issue in Sweden, it should not be expected that the past years electricity price peaks are the last of their kind (von Platten 2022). Not only is the energy transition causing changes and at times instabilities in energy systems, but other societal developments might increase risks for energy poverty as well. Since the 1980's, Sweden has had the highest increase in income inequality among all OECD countries. The share of people living in poverty has decreased, yet inequalities are increasing. Viewing the development of home heating through this lens of increasing inequality paints a similar picture where it is likely that fewer and fewer are falling behind, yet those being left behind are staying there while those taking part of the heating transition are progressing further and further ahead. Inevitably, this reflects the increased neoliberal influences in politics over the past decades and calls for political measures that in a more targeted and efficient way ensures that the lowest income households are not left behind as the rest of Swedish society proceeds in the heating transition that for the most part, and for most people, has been and continues to be successful.

Looking Ahead

Indeed, the heating transition in Sweden has been described as successful in its close to complete decarbonisation of heating that has been achieved through decarbonised electric heating and district heating. The development of district heating in Sweden has particularly been described as a "success story" (Svensk Fjärrvärme 2009, Dzebo 2017), and in many ways it is. Yet the intrinsic monopoly that district heating entails might come to make it less attractive in the future, and as heating demands decrease in the future due to changes in the climate and improved energy performance of buildings (Magnusson 2012), profitability of district heating risks decreasing (Magnusson and Grundel 2023). If district heating prices begin to increase as a consequence, a situation may arise where those who can afford choose to opt out and invest in individual heating systems whereas those who cannot afford such investments are left to carry the increasing costs of a large-scale system being supported by fewer and fewer.

As such, one can ask whether the district heating sector will be able to move from a supply doctrine to an efficiency-oriented one. Some argue that the Swedish heating system remains primarily focused on energy supply with very limited interest in reducing heating demand and improving energy efficiency (Dzebo and Nykvist 2017), despite demands by the EU and inevitably a pressing global need to do so. It seems like the supply doctrine remains.

Finally, it remains to be seen if the new recognition of energy poverty in Sweden brought about by the energy crisis will manage to bridge the gap that, at least over the past decades, seems to have existed between energy policy and social policy. The regulation on cold rent from 2019 is a telling example of how policy measures in the heating transition can end up imposing new risks for energy poverty among already vulnerable groups if energy policy and social policy are not aligned. If we want to avoid injustices and increased inequality in ongoing and future transitions, we must inevitably look back and learn from history, but not only in the way that it has been done here; there is a strong need to complement policy documents and newspaper articles with voices and narratives that have not been represented in the public discourse. In finalising this report, it becomes evident that home heating, albeit being a significant part of everyday life in a Nordic country, has historically rarely been represented by social and cultural stories from households. We can read about how heating transitions have affected goals for

decarbonisation and households' heating expenditures, but what about their daily existence at home? Has that too become cleaner, warmer, and better over time? This will be further investigated in the continuation of this project where heating stories will be collected from a diverse set of households.

Academic Articles and Reports

Blomgren, J. (2021). Allt du behöver veta om Sveriges elförsörjning, Timbro förlag.

Boverket (2011). Utvärdering av stödet för konvertering från direktverkande elvärme i bostadshus. **2011**.

Boverket (2014). Individuell mätning och debitering vid ny- och ombyggnad. 2014:29. Available: https://www.boverket.se/globalassets/publikationer/dokument/2014/individuell-matning-och-debitering-vid-ny-och-ombyggnad.pdf

Boverket (2015). Individuell mätning och debitering i befintlig bebyggelse. 2015:34. Available: https://www.boverket.se/globalassets/publikationer/dokument/2015/individuell-matning-och-debitering-i-befintlig-bebyggelse.pdf

Boverket (2017). Individuell mätning och debitering. 2017:6. Available: https://www.boverket.se/globalassets/publikationer/dokument/2017/individuell-matning-och-debitering---uppfoljning-2017.pdf

Dzebo, A. and B. Nykvist (2017). Uppvärmning i Sverige - En succéhistoria med problem. Stockholm, Sweden.

Energimyndigheten (2000). Effektiv energianvändning: En analys av utvecklingen 1970-1998. ER 22:2000. Available: file:///C:/Users/je8437vo/Work%20Folders/Downloads/Effektiv%20energianv%C3%A4ndning%20(2).pdf

Energimyndigheten (2018). Förenklad administration av solcellsstödet. ER 2018:19. Available: https://www.energimyndigheten.se/contentassets/e3f3b7a4796d43a895720fd1ecf6669f/er201819-forenklad-administration-av-solcellsstodet_slutversion.pdf

Energimyndigheten. (2023). "Stöd som du kan få vid investering." from https://www.energimyndigheten.se/fornybart/solelportalen/vilka-stod-och-intakter-kan-jag-fa/stod-vid-investering/

Hedin, K., E. Clark, E. Lundholm and G. Malmberg (2012). "Neoliberalization of Housing in Sweden: Gentrification, Filtering, and Social Polarization." Annals of the Association of American Geographers **102**(2): 443-463.

Högselius, P. and A. Kaijser (2006). När folkhemselen blev internationell. Elavregleringen i historiskt perspektiv. Paper. Teknikhistoriska dagar.

IEA (2019). Energy Policies of IEA Countries: Sweden 2019 Review. Paris.

Institutet för språk och folkminnen. (2022). "Nyordslistan 2022." Available: https://www.isof.se/lar-dig-mer/kunskapsbanker/lar-dig-mer-om-nyord/nyordslistan-2022.

Johansson, B. (2021). Energibeskattningens utveckling i Sverige: En översiktlig historisk beskrivning. (LUTFD2/TFEM; Nr. 3111). Miljö- och energisystem, LTH, Lunds universitet.

Johansson, B., D. K. Jonsson, E. Veibäck and E. Mittermaier (2015). Energifattigdom, försörjningstrygghet och offentligt agerande. Totalförsvarets forskningsinstitut. FOI-R--4020--SE.

Johansson, P. (2017). A Silent Revolution : The Swedish Transition towards Heat Pumps, 1970-2015 Doctoral thesis, monograph, KTH Royal Institute of Technology.

Johansson, P. (2021). "Heat pumps in Sweden – A historical review." Energy **229**: 120683.
Kaijser, A., A. Mogren and P. Steen (1988). Att ändra riktning: villkor för ny energiteknik, Allmänna förl.

Karlsborg kommun. (2022). "Hus med direktverkande el." Available: https://www.karlsborg.se/bygga-bo--miljo/energi-och-klimat/hus-med-direktverkande-el/

Kooij, H.-J., M. Oteman, S. Veenman, K. Sperling, D. Magnusson, J. Palm and F. Hvelplund (2018). "Between grassroots and treetops: Community power and institutional dependence in the renewable energy sector in Denmark, Sweden and the Netherlands." Energy Research & Social Science **37**: 52-64.

Magnusson, D. (2012). "Swedish district heating—A system in stagnation: Current and future trends in the district heating sector." Energy Policy **48**: 449-459.

Magnusson, D. and I. Grundel (2023). "Large technical systems in shrinking municipalities – Exploring system reconfiguration of district heating in Sweden." Energy Research & Social Science **97**: 102963.

Ministry of Infrastructure (2020). Sweden's Integrated National Energy and Climate Plan.

Ministry of Infrastructure (2020). Sweden's Third National Strategy for Energy Efficient Renovation.

Mårtensson, W. (2006). Effektiva marknadsstrategier för fjärrvärme till småhus, Lunds tekniska högskola.

Nils Holgersson-rapporten (2022). Fastigheten Nils Holgerssons underbara resa genom Sverige - en avgiftsstudie för 2022. Stockholm.

Olsson, S. (2010). Bostaden som politiskt objekt och vara : kortfattad bostadspolitisk översikt från artonhundratalet till tvåtusentalet. Göteborg, Melica media.

Palm, J. (2004). Makten över energin: policyprocesser i två kommuner 1977–2001, Linköping University Electronic Press.

Palm, J. (2021). "Exploring Limited Capacity in the Grid: Actors, Problems, and Solutions." Frontiers in Energy Research **9**.

Palm, J. and D. Magnusson (2009). Medias rapportering om fjärrvärme : framställning och budskap nationellt och lokalt. Fjärrsyn. Stockholm, Svensk Fjärrvärme**:** 162.

Palm, J., K. Reindl, S. Sommer, S. Darby, N. van der Grijp, L.-C. Kaatz, G. Maggio, M. Mlinarič, L. Nagode, A. Nicita and G. Squadrito (2020). New Clean Energy Communities in a Changing European Energy System (NEWCOMERS): Deliverable D3.1 Description of polycentric settings in the partner countries.

Regeringskansliet (2019). Förbättrat genomförande av direktivet om energieffektivitet - Individuell mätning av värme och tappvarmvatten i befintlig bebyggelse. Infrastrukturdepartementet. I2019/01869/E

Rudberg, E. (1992). Folkhemmets byggande : under mellan- och efterkrigstiden. Stockholm, Svenska turistfören.

Rydegran, E. (2018). "Fjärrvärme." Available: https://www.energiforetagen.se/energifakta/fjarrvarme/

Sjunnesson, H. and E. Helldorff (2012). Dædalus : Tekniska museets årsbok. Årg. 81(2013) 100 innovationer. 51-100 Metallbearbetning-Ångmaskinen / [redaktörer: Helene Sjunnesson och Elisabeth Helldorff]. Stockholm, Bilda.

Statens energimyndighet (2005). Resultatredovisning av 1997 års energipolitiska åtgärder på kort sikt för hela programperioden 1998-2002, Energimyndighetens förlag.

Statista. (2023). "Average monthly electricity wholesale price in Sweden from January 2019 to January 2023." Available: https://www.statista.com/statistics/1271491/sweden-monthly-wholesale-electricity-price/

Strålsäkerhetsmyndigheten. (2023). "Kärnkraft." Retrieved 2023-03-10. Available: https://www.stralsakerhetsmyndigheten.se/omraden/karnkraft/

Summerton, J. (1992). District heating comes to town : The social shaping of an energy system Doctoral thesis, monograph, Linköpings universitet.

Svensk Fjärrvärme (2009). Fjärrvärme - A Real Success Story. Available: https://www.energiforetagen.se/globalassets/energiforetagen/om-oss/fjarrvarmens-historia/fjarrvarme_story.pdf

Sveriges Riksdag (2018). Mindre aktörer i energilandskapet – genomgång av nuläget. Stockholm.

Sveriges Riksdag (2022). Förordning (2022:336) om energimätning i byggnader. Infrastrukturdepartementet. **SFS nr: 2022:336**.

Vattenfall. (2023). "Planerarens dilemma." Available: https://historia.vattenfall.se/stories/hela-sverige-blir-elektriskt/planerarens-dilemma

Vedung, E. and D. Hansén (2019). "Oljekrisen 1973 och Sveriges tvehövdade krispolitik." Statsvetenskaplig tidskrift **121**(4): 647-679.

von Platten, J. (2022). "Energy poverty in Sweden: Using flexibility capital to describe household vulnerability to rising energy prices." Energy Research & Social Science **91**: 102746.

von Platten, J. (2023). (Dold) energifattigdom i Sverige. Ovisshetens tid. U. Andersson, P. Öhberg, A. Carlander, J. Martinsson and N. Theorin. Göteborg, SOM-institutet, Göteborgs universitet.

von Platten, J., M. Mangold and K. Mjörnell (2020). "Energy inequality as a risk in socio-technical energy transitions: The Swedish case of individual metering and billing of energy for heating." IOP Conference Series: Earth and Environmental Science **588**: 032015.

Governmental Committee Reports

SOU 1935:2. Bostadssociala utredningen. *Betänkande med förslag rörande lån och årliga bidrag av statsmedel för främjande av bostadsförsörjning för mindre bemedlade barnrika familjer jämte därtill hörande utredningar*. Socialdepartementet.

SOU 1942:20. Värmekostnadssakkunniga. *Värmekostnaden i hyreshus*. Socialdepartementet.

SOU 1945:63. Bostadssociala utredningen. *Slutbetänkande*. Socialdepartementet.

SOU 1951:32. Bränsleutredningen. *Bränsle och kraft*. Handelsdepartementet.

SOU 1966:65. Immissionssakkunniga. *Luftförorening, buller och andra immissioner*. Justitiedepartementet.

SOU 1974:65. Energiprognosutredningen. *Energi 1985 2000 Bilaga*. Industridepartementet.

SOU 1974:77. Värmeanläggningsutredningen. *Värmeförsörjning enligt värmeplan*. Justitiedepartementet.

SOU 1976:55. Utredningen om kommunal energiplanering. *Kommunal energiplanering*. Industridepartementet.

SOU 1980:43. Energihushållningsdelegationen. *Program för energihushållning i befintlig bebyggelse*. Bostadsdepartementet.

SOU 1989:21. Miljöavgiftsutredningen. *Sätt värde på miljön – miljöavgifter på svavel och klor*. Miljö- och energidepartementet.

Propositions and Regulations

Proposition 1966:128. *Förslag till lag om vissa gemensamhetsanläggningar*. https://www.riksdagen.se/sv/dokument-och-lagar/dokument/proposition/kungl.-maj.ts-proposition-nr-128-ar-1966_er31128b1/html/

Proposition 1980/81:90. *Om riktlinjer för energipolitiken*. https://www.riksdagen.se/sv/dokument-och-lagar/dokument/proposition/om-riktlinjer-for-energipolitiken_g40390/html/

Regulation 1997:634. *Förordning (1997:634) om statligt bidrag till investering för ombyggnad och anslutning av eluppvärmda byggnader till fjärrvärme*. Näringsdepartementet.

Regulation 1997:635. *Förordning (1997:635) om statligt bidrag till vissa investeringar för att minska elanvändningen i bostäder och vissa lokaler*. Näringsdepartementet.

Regulation 2014:267. *Lag (2014:267) om energimätning i byggnader*. Infrastrukturdepartementet.

Regulation 2022:1872. *Förordning (2022:1872) om elstöd till konsumenter för oktober 2021-september 2022*. Klimat- och näringslivsdepartementet.

Regulation 2023:108. *Förordning (2023:108) om elstöd till konsumenter för november-december 2022*. Klimat- och näringslivsdepartementet.

Regulation 2023:402. *Förordning (2023:402) om bidrag för energieffektivisering i småhus*. Klimat- och näringslivsdepartementet.