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Policies for accelerating fossil heating systems replacement and building renovation

Report
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Summary

In Switzerland, around 55% of the homes are still heated by oil or gas, which means that around 900.000 heating systems must be replaced by 2050 to reach the Swiss net-zero targets. Replacing those fossil-based heaters with low-carbon alternatives such as heat pumps not only reduces oil and gas consumption but is also an opportunity to reduce heating demand when accompanied by building renovations, notably insulation.

Low-carbon heating systems have lower maintenance and servicing costs, as well as lower operational costs than gas and oil heating systems. However, initial investments to install them and to carry out the renovation required for an overall energy-efficient building are high, often constituting a financial challenge for homeowners. Therefore, policy support is vital to help homeowners make the transition to low-carbon heating systems and energy-efficient buildings more broadly.

Most cantons centre their policy to promote the renewable heating systems and building renovation on direct subsidies to the homeowners. These subsidies are provided under the ***Gebäudeprogramm***, the flagship policy primarily financed through revenues from the CO_2 levy. Between 2017 and 2023, this program has granted subsidies to around 80% of the approximately 100.000 fossil fuel or electric resistance heating systems that were replaced in Switzerland. Next to subsidies, there are various regulations (e.g., in the form of building codes).

Despite this success, homeowners are still installing new fossil-based heating systems, which might then run for at least 15-20 years, which undermines the 2050 climate goals. Moreover, replacement speed is too slow. With more than 30.000 replacements of old heaters to low-carbon systems needed each year, an acceleration of almost 3 times is required compared to current figures.

This policy analysis covers three key pieces of Swiss regulation related to heating system replacements: the *Gebäudeprogramm* subsidy scheme, the Federal Model Provisions of the Cantons (MuKEn2014), and complementary measures by the Cantons, including oil and gas heating bans. By analysing those regulations and comparing renovation and heating system replacement trends among the cantons, we identify common patterns, key barriers and success factors to inform policy of how to accelerate heating system replacement and renovation.

Our analysis shows that the Swiss policy approach based on a combination of ambitious renovation standards (sticks) and subsidies for energy-efficient renovations (carrots) is generally working. However, it should be strengthened and improved to increase its effectiveness. One critical improvement is an increased harmonisation of standards among the cantons. Despite efforts for harmonisation and coordination through the Model Provisions of the Cantons (MuKEn), regulations for heating system replacements and subsidies are still fragmented. For instance, MuKEn2014 asks for a 10% minimum share of renewable energy in new heating installations, but the cantons have implemented minimum shares varying from 10% to 100%.

Our analysis also shows that there is large potential for peer-to-peer learning among the cantons to increase the effectiveness of the policy instruments related to renovation and heating systems replacement, considering that there is large variability in performance /efficiency indicators such as: the speed of heating system replacements, a combination with deeper building renovation measures, or the amount of private capital leveraged by the subsidies. Some of these differences can be explained by structural differences among cantons (e.g., existing building stock, socio-economic realities and administrative capacities), but local implementation strategies also play a role.

For example, a detailed comparison of the bans a fossil-heating bans and quasi-bans implemented by some frontrunner cantons reveals interesting insights: On the one hand, the effectiveness of bans in triggering installations of renewable-based heating systems is confirmed across all frontrunner cantons. On the other hand, downsides of bans are observed, including a trade-off between the investments made in heating system replacements and investments in overall building renovation, or last-minute installations of new oil-heating systems in anticipation of the ban. These downsides point to 1) the potential of quasi-bans, exceptions, targeted treatment of hardship cases, and information management measures as

relevant complements to increase the effectiveness of the policy, and 2) to the important role that frontrunner cantons can play in sharing their learnings with other cantons.

Other key areas for improvement include: harmonising standards, simplifying processes, and enhancing public communication of the benefits of the standards. The revised MuKEn (to be issued in 2025) promise stricter energy efficiency and renewable energy requirements compared to MuKEn2014, thereby opening an important window of opportunity for more ambition and more harmonisation in the building sector.

While the improvements in the proposed MuKEn2025 are welcome, a critical point for the swift adoption of these standards by the cantons and their successful implementation will be guaranteeing the financing of renovation projects. However, the future of the *Gebäudeprogramm* subsidies is uncertain because the Federal Council announced in 2025 its plans to cancel its contribution to the program, which represents two-thirds of the total budget of the program. Discontinuation or scaling down of this federal funding would be disastrous for the implementation of MukEn2025.

Moreover, even if the full sum of federal funding were to be guaranteed, this is still a fairly small sum relative to the scale of the conversion required to meet Switzerland's climate goals, pointing out the continued importance of mobilizing additional financing sources and models, and harmonizing the incentives and objectives of those programs with the public subsidies schemes to ensure maximum efficiency gains.

We conclude that the policy approach to fossil heating replacements and energy efficiency renovations in Switzerland is working overall. It should be strengthened and improved instead of being scaled down. In our report, we provide concrete recommendations for policies and measures, as well as desirable design features, to improve the implementation of existing and forthcoming policies, like the MuKEn2025 guidelines, to support political decisions to accelerate the necessary transformation.

Zusammenfassung

In der Schweiz werden noch immer rund 55 % der Haushalte mit Öl oder Gas beheizt, was bedeutet, dass bis 2050 circa 900.000 Heizungsanlagen ersetzt werden müssen, um die Schweizer Netto-Null-Ziele zu erreichen. Der Ersatz dieser fossilen Heizungen durch klimafreundliche Alternativen wie Wärmepumpen reduziert nicht nur den Öl- und Gasverbrauch, sondern bietet auch die Möglichkeit, den Heizbedarf zu senken, insbesondere wenn gleichzeitig Gebäudesanierungen wie z.B. Dämmmassnahmen durchgeführt werden.

Klimafreundliche Heizsysteme haben geringere Wartungs- und Instandhaltungskosten sowie niedrigere Betriebskosten als Gas- und Ölheizungen. Die Anfangsinvestitionen für die Installation und die für ein insgesamt energieeffizientes Gebäude erforderlichen Renovierungsmassnahmen sind jedoch hoch und stellen für Hausbesitzer oft eine finanzielle Herausforderung dar. Daher ist politische Unterstützung unerlässlich, um Hausbesitzern den Übergang zu klimafreundliche Heizsystemen und energieeffizienten Gebäuden im Allgemeinen zu erleichtern.

Die meisten Kantone konzentrieren ihre Politik zur Förderung erneuerbarer Heizsysteme und Gebäudesanierungen auf direkte Subventionen für Hausbesitzer. Diese Subventionen werden im Rahmen des **Gebäudeprogramms** gewährt, welches hauptsächlich aus den Einnahmen der CO2-Abgabe finanziert wird. Zwischen 2017 und 2023 wurden im Rahmen dieses Programms rund 80% der etwa 100.000 fossilen oder elektrischen Widerstandsheizungen, die in der Schweiz ersetzt wurden, subventioniert. Neben den Subventionen gibt es verschiedene Bestimmungen (z.B. in Form von Bauvorschriften).

Trotz dieses Erfolgs installieren Hausbesitzer immer noch neue fossile Heizsysteme, die dann mindestens 15 bis 20 Jahre lang betrieben werden könnten, was die Klimaziele für 2050 untergräbt. Darüber hinaus ist die Austauschgeschwindigkeit zu langsam. Da jedes Jahr mehr als 30.000 alte Heizungen durch kohlenstoffarme Systeme ersetzt werden müssen, ist eine Beschleunigung um das 3-fache gegenüber den aktuellen Zahlen erforderlich.

Die vorliegende Analyse von Politikinstrumenten befasst sich mit drei wichtigen Schweizer Politikinstrumente im Zusammenhang mit dem Austausch von Heizungsanlagen: dem Gebäudeprogramm, den Mustervorschriften der Kantone (MukEn2014) und ergänzenden Massnahmen der Kantone, darunter Verbote für Öl- und Gasheizungen. Durch die Analyse

dieser Instrumente und einem Vergleich der Trends in den Kantonen bei Renovierungen und Heizungsaustausch identifizieren wir gemeinsame Muster, zentrale Hindernisse und Erfolgsfaktoren, um politische Entscheidungen zur Beschleunigung der notwendigen Transformation zu unterstützen.

Unsere Analyse zeigt, dass der politische Ansatz der Schweiz, welcher auf einer Kombination aus ehrgeizigen Renovierungsstandards (Vorschriften) und Subventionen für energieeffiziente Renovierungen (Anreizen) basiert, im Allgemeinen gut funktioniert. Er sollte jedoch gestärkt und verbessert werden, um seine Wirksamkeit zu erhöhen. Eine wichtige Verbesserung ist eine stärkere Harmonisierung der Standards zwischen den Kantonen. Trotz der Bemühungen um Harmonisierung und Koordinierung durch die Mustervorschriften der Kantone (MuKEn) sind die Vorschriften für den Austausch von Heizungssystemen und die Subventionen nach wie vor fragmentiert. So verlangt beispielsweise MuKEn2014 einen Mindestanteil von 10 % erneuerbarer Energien in neuen Heizungsanlagen, aber die Kantone haben Mindestanteile zwischen 10 % und 100 % umgesetzt.

Unsere Analyse zeigt auch, dass die Kantone ein grosses Potenzial haben, voneinander zu lernen, um so die Wirksamkeit der Politikinstrumente zu erhöhen, da es grosse Unterschiede bei den Leistungs-/Effizienzindikatoren gibt: z.B. die Geschwindigkeit des Austauschs von Heizungssystemen, eine Kombination mit umfassenderen Gebäudesanierungsmassnahmen oder die Höhe des durch die Subventionen mobilisierten privaten Kapitals. Einige dieser Unterschiede lassen sich durch strukturelle Unterschiede zwischen den Kantonen erklären (z.B. Gebäudebestand, sozioökonomische Gegebenheiten und Verwaltungskapazitäten), aber auch lokale Umsetzungsstrategien spielen eine Rolle.

So liefert beispielsweise ein detaillierter Vergleich der von einigen Vorreiterkantonen eingeführten Verbote (bzw. Quasi-Verbote) fossiler Heizsysteme interessante Erkenntnisse: Einerseits bestätigt sich die Wirksamkeit von Verboten fossiler Heizsysteme in allen Vorreiterkantonen. Andererseits gibt es auch Nachteile von Verboten, darunter etwa ein Zielkonflikt zwischen Investitionen in den Austausch von Heizsystemen und Investitionen in die Gesamtsanierung von Gebäuden, oder kurzfristige Vorzieheffekte einer Installation neuer Ölheizungen in Erwartung des Verbots. Diese Nachteile weisen auf 1) das Potenzial von Quasi-Verboten, Ausnahmen, gezielten Massnahmen für Härtefälle und Informationsmanagementmassnahmen als relevante Ergänzungen zur Steigerung der Wirksamkeit der Politik und 2) auf die wichtige Rolle hin, die Vorreiterkantone beim Austausch ihrer Erfahrungen mit anderen Kantonen spielen können.

Weitere wichtige Bereiche, in denen Verbesserungen erforderlich sind, sind die Harmonisierung von Standards, die Vereinfachung von Prozessen und die Verbesserung der öffentlichen Kommunikation über die Vorteile der Standards. Die überarbeitete MuKEn (die 2025 veröffentlicht werden soll) verspricht strengere Anforderungen an die Energieeffizienz und erneuerbare Energien als die MuKEn2014 und eröffnet damit wichtige Chancen für höhere Ambitionen und mehr Harmonisierung im Bausektor.

Die Verbesserungen der MuKEn2025 sind vollumfänglich zu begrüssen, doch ein entscheidender Punkt für die rasche Übernahme dieser Standards durch die Kantone und ihre erfolgreiche Umsetzung wird die Finanzierung von Renovierungsprojekten sein. Die Zukunft der Gebäudeprogramm-Subventionen ist leider ungewiss, da der Bundesrat 2025 angekündigt hat, seinen Beitrag zum Programm, der zwei Drittel des Gesamtbudgets des Programms ausmacht, zu streichen. Die Einstellung oder Kürzung dieser Bundesmittel wäre für die Umsetzung von MukEn2025 verheerend.

Selbst wenn die gesamte Bundesfinanzierung garantiert würde, wäre dies verglichen mit dem zur Erreichung der Klimaziele erforderlichen Umfang immer noch eine relativ geringe Summe. Dies unterstreicht die Bedeutung der Mobilisierung zusätzlicher Finanzierungsquellen und -modelle sowie der Harmonisierung der Anreize und Ziele dieser Programme mit den öffentlichen Subventionssystemen, um maximale Effizienzgewinne zu erzielen.

Wir kommen zu dem Schluss, dass der politische Ansatz für den Ersatz fossiler Heizungen und energieeffiziente Sanierungen in der Schweiz insgesamt funktioniert, gleichzeitig aber gestärkt und verbessert werden sollte, anstatt zurückgefahren zu werden. In unserem Bericht geben wir konkrete Empfehlungen für Strategien und Massnahmen sowie wünschenswerte Gestaltungsmerkmale, die die Umsetzung bestehender und künftiger Strategien wie der MuKEn2025-Richtlinien verbessern könnten, um den Austausch von Heizungsanlagen und Gebäudesanierungen zu beschleunigen.

1 Introduction

In June 2023, almost 60% of Swiss voters supported the Federal Act on Climate Protection Objectives, Innovation and Enhancement of Energy Security (the Climate Protection Act), which enshrines the net-zero emissions target for Switzerland by 2050 in law and sets interim and sectoral targets (The Federal Council 2023). A key sector to achieve this net-zero emissions target is the building sector, which was responsible for 23% of Switzerland's GHG emissions in 2022 (FOEN 2024). The Climate Protection Act provides benchmarks for emissions reduction from buildings by 82% below 1990 by 2040 and 100% by 2050 (The Federal Council 2023). To achieve these benchmark reductions, the Federal Council targets halving building energy consumption by 2050, employing measures such as legal requirements for building construction and renovation, a CO_2 tax, and support programs (e.g. the building renovation subsidies program *Gebäudeprogramm*).

Within the building sector, the focus on heating systems is important since heating systems have an average lifetime between 15 and 30 years. Therefore, decisions on the heating technology installed in new buildings or the replacement of fossil-based heating systems in the context of building renovations can have an impact on the energy consumption, emissions, and energy bills of households for up to three decades. In Switzerland, heat pumps are on the rise and already the main heating source in new buildings, heating in total 18,5% of all homes in Switzerland in 2022 (up from only 4.1% in 2000), district heating is also showing an upward trend, albeit at much lower levels (3.8% in 2022) (Federal Statistical Office 2024). However, around 39% of homes were still heated by oil heating systems and 18% by gas systems in 2022 (Federal Statistical Office 2024), which highlights the need to focus policy interventions on the replacement of heating systems in old buildings.

To achieve the 100% fossil-free heating supply system benchmark, around 900.000 heating systems must be replaced by 2050. This means that even if all new heating systems installed are fossil-free, more than 30.000 fossil-based heating systems must be replaced yearly until 2050. Replacing those fossil-based heating systems in old buildings with low-carbon alternatives (e.g. heat pumps) does not only reduce oil and gas demand directly but also is a key vehicle to increase energy efficiency. When upgrading heating systems, the scope of the renovation usually extends beyond mere heating replacement and includes renovations of various aspects of building infrastructure, notably insulation, to minimise heat losses that could undermine the efficiency gains achieved through heating system upgrades (Galimshina et al. 2024).

There are no exact estimates of how many fossil heating systems are replaced yearly in Switzerland. However, preliminary estimates suggest that the country remains significantly behind the replacement rate necessary to meet its 2050 benchmark. Between 2017 and 2023, the replacement of around 80.000 fossil fuel or electric heating systems has been supported by the national building sector subsidies program (*Gebäudeprogramm*). Additional 20.000 heating system replacements are estimated to occur outside this program (IEA, 2023), which would amount to an approximate of 100.000 fossil heaters being replaced since 2017. This means that there needs to be an acceleration of around 3 times in fossil-based heating systems replacement to be able to reach the 2050 benchmarks. Failing to meet this benchmark would require stronger and faster emission reduction in other sectors like transport or electricity.

Low-carbon heating systems have lower maintenance and servicing costs, as well as lower running costs, than gas and oil heating systems. However, the initial investment to install them and carry out the renovation works required for their efficient operation is high, constituting an important barrier for homeowners to decide in favour of those alternatives. Therefore, policy interventions are required to help homeowners make the transition to low-carbon heating systems. The *Gebäudeprogramm* is one of those policies. However, so far, it has been insufficient to ensure that no new fossil-based heating system is installed, which would be the first step required for the acceleration needed to meet the 2050 benchmarks. Moreover, it is known that renovations (beyond simple heater replacement) are influenced by a broad policy mix from different areas, which should be properly aligned to provide the right incentives for effective renovation measures (Petkov et al. 2021). This shows the need for additional incentives and regulations to accelerate climate action in the building sector.

For instance, to increase the effectiveness of the heating systems replacement strategy, several Cantons in Switzerland have implemented oil and gas heating systems "bans" for the replacement of old heating systems, which ensure steering homeowners into the right replacement technologies for their heating systems once they reach the end of their technical lifetime. The federal system of Switzerland allows cantons to play a central role in the design and implementation of policy instruments in this sector. This offers a valuable experimentation field for policy design and implementation that opens important windows of opportunity for climate ambition, with more ambitious cantons enacting more stringent policies.

With this background, this report aims to examine policies implemented in Switzerland related to the renovation of buildings and the replacement of heating systems. It will focus on the implementation of three key pieces of regulation related to heating system replacements: the *Gebäudeprogramm* subsidy program, the Federal Model Provisions of the Cantons (MuKEn2014), and complementary measures by the Cantons (e.g. oil and gas heating bans). By comparing the renovation and heating system replacement trends among the cantons, we identify common patterns, key barriers and success factors.

In the next sections, we provide an overview of the current status of heating system installations and replacements in Switzerland, including the policies and financing options in place, as well as historical trends in heating system replacement. Following this overview, we conduct a comparative analysis of the cantonal regulations, financing and replacement trends, which allows us to distil broad lessons learned and extract actionable policy recommendations that can inform future policy design, implementation, and evaluation efforts. Based on this analysis, we identify techno-economic, social and regulatory barriers, and reflect on the best practice measures and policy mixes observed until 2024. Finally, we provide policy recommendations for the "Bund" and the cantons going forward, focusing on the design and implementation of the MuKEn2025 and its complementary measures.

2 Status quo

In this section, we provide an overview of the current status of heating system replacements in Switzerland, including the policies and financing options in place, as well as historical trends.

2.1 Policy context

The Swiss regulatory ecosystem related to heating systems and emissions reduction is complex[1]. Some regulations are applicable only at the Federal and Cantonal levels (e.g. Climate Protection Act, and Cantonal energy laws), some at all levels including municipalities (e.g. Federal Energy Act and Ordinance - EnG and EnV and Energy Strategy 2050), and some only at the cantonal level (e.g. Model Provisions of the Cantons in the energy sector– MuKEn), or only at the municipal level (e.g. Municipal energy concept, Municipal energy plan) voluntarily (Energie Schweiz 2019). This complex regulatory ecosystem aims at reaching national and cantonal targets, based on some standards and recommendations, but leaves much room to the municipalities and cantons on measures and strategies chosen to contribute to the federal targets.

The consequence of this multi-layered regulatory approach is many regulations targeting similar issues, with high degrees of variation between Cantons and even between municipalities. While research on energy efficiency standards reveals evidence of increasing convergence among regulatory instruments across the cantons, harmonisation has occurred over several decades, and stringency levels for specific elements remain highly heterogeneous (Schmid et al. 2021).

Regarding the building sector, including heating systems replacement and renovations, the main instruments at the federal level are the 2014 Model Provisions of the Cantons (MuKEn2014) – intended to guide the Cantons but not legally binding – and the benchmark emissions reduction target for the building sector for 2040. Consequently, there is still no federal legal requirement to replace old heating systems with low-carbon ones. This means that heating policy implementation relies almost entirely on Cantonal regulations, with a risk of regulatory fragmentation. The MuKEn, jointly developed by the EnDK

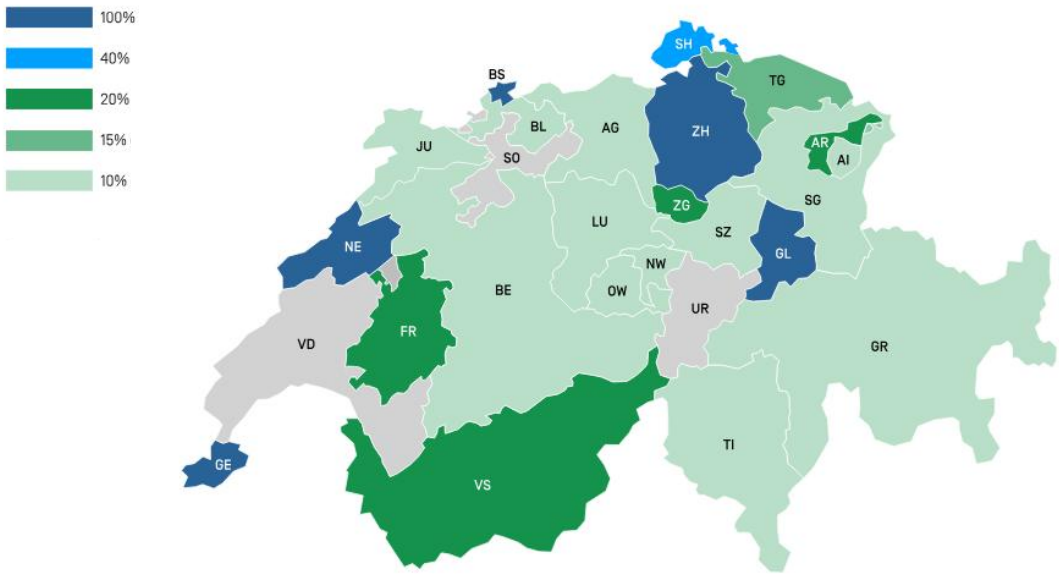
[1] In general terms, three categories can be distinguished depending on the stringency level: legal foundations of energy and climate policy (Gesetzliche Grundlagen), their corresponding recommendations (Richtwerte für gesetzliche Grundlagen) and voluntary instruments for managing decarbonization (Freiwillige Planungs- und Umsetzungsinstrumente) (Energie Schweiz 2019).

(Energy Directors' Conference), aims to coordinate and harmonise cantonal regulations not only in the building sector, but also in the energy sector in general. Despite these efforts, regulations, including heating systems replacement regulations, are still fragmented.

For instance, the MuKEn2014 includes a recommendation for a requirement of a 10% minimum share of renewable energy in new heating installations if fossil gas[2] and oil heating systems are replaced. This requirement often leads to homeowners changing their heating systems to non-fossil ones because of the difficulty in proving the minimum RE energy share. Figure 1 shows that most Cantons adhere to or exceed this guidance (green and blue colours), and some ignore it (grey colour) (BFE and BAFU, n.d.; Chauffezrenouvelable 2024).

Figure 1 - Comparison of minimum mandatory share of renewable energy requirements for heating systems replacement installations across Swiss Cantons (April 2025).

Source: Adapted from "Boiler Replacement Requirements in Your Township | Heat Renewable (chauffezrenouvelable.ch)".



Research has shown that even if the MuKEn2014 minimum share were implemented in all cantons, the CO_2eq target of the Energy Strategy 2050 could still be missed by around 30%, requiring additional or more restrictive regulations, especially for the replacement of oil and gas heating systems by the cantons (Sulzer et al. 2020), such as the ones in the cantons highlighted in blue in Figure 1.

In 2017, Basel-City was the first canton to enact a more ambitious policy, by effectively banning the installation of new oil heating systems not just in new but also in existing buildings. Since then, comparable regulations banning the installation

[2] The use of biogas is allowed under the MuKEn. However, this requires a biogas plant or a connecting pipeline directly between producer and consumer, which is a very difficult condition to fulfil. In some cantonal regulations (e.g. Lucerne) alternatives for the use of biogas "supplied by the gas grid" are considered conditional on the gas supplier being able to secure a certain amount of biogas being fed into the pipeline network elsewhere (e.g. with biogas "certificates") for the average lifetime of a heating system (e.g. 20 years) (Energie Schweiz 2019). Monitoring and control of this type of model however is complicated.

(except under exceptional circumstances) have been adopted in other cantons: Basel-Country, Zurich[3], Glarus, Neuchatel, and Geneva. These bans affect only heating system replacements, and there are no bans on operating fossil fuel heating systems (Torné and Trutnevyte 2024).

In 2016, the Federal Council proposed a national ban on fossil-fuel-based heating systems from 2029, in the event that building sector emission reduction targets would not be met by 2027. This policy proposal was rejected one year later (Torné and Trutnevyte 2024). Revised cantonal energy regulations beyond the minimum federal standards have been proposed by several Cantons, but most have been rejected or watered down after public referenda (e.g. in Solothurn and Aargau)(Meyer 2023).

The revised MuKEn are expected to be issued in 2025, with current drafts showing the introduction of stricter energy efficiency and renewable energy requirements compared to the MuKEn2014, opening an important window of opportunity for greater ambition and harmonisation in the building sector.

Textbox 1 – MuKEn2025 vs MuKEn2014

The MuKEn2025 standards (expected to be finalised in 2025) introduce stricter energy efficiency and renewable energy requirements compared to the MuKEn2014. These updates aim to accelerate Switzerland's progress toward achieving its 2050 climate goals, with a stronger focus on energy self-sufficiency, renewable energy, and greenhouse gas reductions in the building sector. The timetable for the MuKEn2025 aims for implementation by 2030. Based on the existing draft (**version 30.08.2024**), important changes regarding building renovations and heating systems replacement are expected.

On the positive side, while MuKEn2014 largely focused on new construction, MuKEn2025 aims to address energy improvements in existing buildings, aligning with recommendations made by scientists to the EnDK (Schwarz et al. 2020). This includes new mandates for upgrading insulation, windows, and ventilation systems to modern efficiency standards, as well as policies to reduce "grey energy" or the embodied energy in materials used in renovations. Moreover, the 2025 standards prioritise renewable energy in heating systems, particularly targeting a shift away from fossil fuel heating, with more stringent requirements for utilising renewable sources for space and water heating. The new text for heating systems reads as follows:

"In 2050, heat generation in heated buildings should take place without the combustion of fossil fuels such as heating oil or natural gas. New buildings should therefore be equipped with renewable heating systems. The existing boilers that still run on fossil fuels boilers still running on fossil fuels are to be replaced by renewable systems at the end of their service life. The normal service life of a heat generator is 20 years. From 2050 at the latest, all buildings are to be operated without CO_2 emissions from fossil fuels".

On the negative side, for existing decentralised electric heating systems, Module 6 of the MuKEn2014 stipulated a renovation obligation within 15 years of the amendment to the law taking effect. An appeal against the corresponding amendment to the law in the canton of Zurich was made to the Federal Court. (Judgment 1C_37/2022 of March 23, 2023), which led to the new MuKEn2025 to change the renovation obligation to allow for lifetimes aligned with a table published jointly by the Swiss Homeowners' Association and the Swiss Tenants' Association, according to which the lifetime of these heating systems to 40 years. While individual cantons are free to adopt more stringent regulations than the MuKEn guideline, and most decentralised electric heating systems will have reached a 40-year lifetime by 2030, this example shows the litigation risks that potential oil and gas heating bans could face, including rollbacks and watering down.

[3] In 2022, Zurich implemented the most stringent ban to date, with new oil heating systems only being allowed if the alternatives are technically unfeasible or more than five per cent cheaper over their entire life cycle. The most recent ban enacted is in the Canton of Basel-county, where a ban starting in 2026 has been established in the Energy Act, which has been in force since October 2024.

In addition to the MuKEn, the Flagship program of the Climate Protection Act in this area (***Gebäudeprogramm***), which started in 2010 and aims at funding the replacement of fossil-fuel and electric resistance heating systems with renewable alternatives and improving building energy efficiency. The program receives an annual budget of up to CHF 400 million from the Federal Government, financed from resources collected from the CO_2 levy. Until 2016, the subsidies were provided by the national government and only a subsidy for insulating individual components was available, but since 2017, the subsidies are provided by the cantons and include a subsidy for extensive renovation (Hondeborg et al. 2023).

Subsidy details and minimum requirements are defined by the Federal Council[4] but enforcement is carried out by the cantons. Currently, the cantons provide around one-third of the budget (CHF 170-200 million) for the Gebäudeprogramm, and the federal government provides the remaining two-thirds. The federal funds are paid to the cantons in the form of a basic contribution per inhabitant and considering the cantons' previous efforts in the building sector, but the specific policy design is up to the cantons, apart from some general guidelines[5]. In a recent controversy, as part of the planned fiscal relief package, the Federal Council announced its plans to cancel its contribution to the program (SRF 2025a), which the cantons have also resolutely opposed. Currently, the Bund and the Cantons are trying to find a compromise with the cantons, examining whether and, if so, how the contributions to the program could look in the future (Lignum 2025).

While there are several policies aiming to encourage the switch to renewable-based heating systems, which include information and consulting services (e.g. National Program «Impulsberatung erneuerbar heizen»), tax benefits, energy efficiency requirements for renovations, and expansion of the district heating network, most cantons centre their policy to promote the change of heating systems and building renovation on direct subsidies to the homeowners. Direct subsidies account on average for 10-15% of the cost of energy-efficiency-related renovations and the replacement of old heating systems. However, as it will be shown in the next section, the size of the subsidies differs significantly across cantons.

Subsidies for heating system replacements are usually requested together with subsidies for other renovation measures targeting energy efficiency. A positive aspect is that there is harmonisation among all cantons regarding the standards to measure energy efficiency and emissions of buildings, making use of the Swiss cantonal energy certificate for buildings (GEAK), which evaluates the quality of the building envelope, the overall energy balance and direct CO_2 emissions of buildings ('GEAK', n.d.). This promotes a positive correlation between subsidy size and energy efficiency improvements. However, the overall efficiency of the subsidies policy in terms of energy efficiency has been questioned by research that estimates that retrofits financed by the subsidies reduce average energy use by 10–20% [6] and that the achieved savings through subsidised and non-subsidized retrofits do not differ significantly, suggesting free-riding and other inefficiencies of the subsidy program (Hondeborg et al. 2023).

2.2 Finance sources for building renovation and heating systems

While direct subsidies considerably facilitate the financing of a change in heating systems, most of the cost still needs to be carried by the homeowner, with the high investment cost being one of the main constraints to the uptake of heat pumps in residential buildings (Zapata Riveros et al. 2024). This highlights the importance of complementary funding sources to trigger renovation measures in addition to the right selection of technology for the replacement of heating systems. Other funding sources available include the KliK Foundation and special finance lines from commercial banks, which are described briefly in this section. A more detailed explanation of these financing sources can be found in **Annex 1**. While some of the funding sources listed here are also available for institutional actors such as heating network operators and institutional owners, we focus on private homeowners.

[4] https://www.fedlex.admin.ch/eli/fga/2022/2403/de

[5] For instance, the subsidies for heating systems replacement should not exceed 50 per cent of the eligible costs, with the exception of pilot plants and projects with a low level of technological maturity and high financial risk, which can be subsidised up to 70 per cent.

[6] This same evaluation found that deep (comprehensive) retrofits reduced energy consumption by 24%, compared to 7% and 15% for retrofitting one and two elements, respectively.

2.2.1 Foundation for Climate Protection and Carbon Offset KliK

Several financing programs supported by the KliK Foundation aim to accelerate the transition from fossil fuel-based to renewable heating systems in Switzerland. The "Climate Premium" program, administered by Energie Zukunft Schweiz, offers subsidies for voluntary replacements of fossil heating systems with renewable options such as heat pumps or wood-based systems. This premium (CHF 1,80 per litre of heating oil or cubic meter of natural gas saved) is calculated based on the previous fossil fuel consumption and can be a substantial financial incentive (Energie Zukunft Schweiz 2024). The MyClimate program similarly targets rented residential buildings, offering subsidies for heat pumps in the output range from 15 to 400 kW. Both programs exclude projects where renewable heating is already mandated by law, in an effort to ensure that subsidies are truly additional. Finally, the "Heating Networks" program supports the development and decarbonisation of district heating systems. These subsidies are paid directly to network operators and vary by canton, based on the volume of CO_2 emissions reduced.

These programs are among the most significant in Switzerland; however, their exclusion clauses and limited support for building envelope renovation raise concerns about their broader effectiveness. Specifically, they may inadvertently discourage comprehensive energy efficiency improvements or canton-level regulatory action. These challenges question the overall effectiveness of the Klick Foundation programs in comparison with the cantonal subsidy programs, particularly in encouraging overall renovation rates. We did not find any studies that have evaluated the effectiveness of this approach. However, we identified the evaluation of trade-offs and synergies with direct subsidies as a core priority for future research, which should be at the heart of the decision on the continuation/modification of these programs beyond 2025.

For a full overview of program conditions, limitations, and strategic implications, please refer to **Annex 1.**

2.2.2 Energy saving (Energiespar)-Contracting (ESC)

Energy Saving Contracting (ESC) is a financing and service model increasingly used in Switzerland to promote energy efficiency in building renovations, particularly for heating system upgrades. In ESC, an Energy Service Company (ESCO) finances and manages energy-saving measures—like heating system replacement, pipe insulation, and control optimisation—while the building owner repays the investment through shared energy cost savings (SWISSESCO 2024). This setup is especially attractive because it minimises upfront costs, transfers performance risks to the ESCO, and ensures access to technical expertise and operational support over the long term. ESC also facilitates comprehensive renovations by integrating a broader scope of measures beyond just heating, contributing to deeper building efficiency improvements (SWISSESCO 2016).

However, ESC has some drawbacks that may limit its suitability for smaller or short-term projects. Contracts typically span 5 to 15 years, which can be restrictive for owners seeking flexibility or facing upcoming ownership changes. Additionally, heating systems may remain under ESCO ownership during the contract, reducing the owner's control, and overall project costs may be higher compared to conventional financing. Despite these limitations, ESC is particularly well-suited for large or complex buildings with substantial energy-saving potential (e.g. large old public buildings or multi-family buildings). While the Swiss ESC market remains relatively small compared to countries like Germany, its adoption is growing, especially in institutional and urban projects (Opitz et al. 2021).

For more details on the ESC model, implementation examples, and its potential role in Switzerland's renovation landscape, please refer to **Annex 1.**

2.2.3 Targeted finance lines from commercial banks

Commercial banks in Switzerland are playing a growing role in supporting energy-efficient building renovations through targeted financing products. While government subsidies can ease the financial burden of such projects, they are often not disbursed in time for bank loan evaluations, reducing their immediate utility in securing credit. To address this, the Swiss Bankers Association (SBVg) introduced binding guidelines in 2022—effective from January 2023—to encourage member banks to offer preferential financing terms for sustainable renovations (SBVg 2022). These include favourable interest rates, tailored loan structures, and new "green-loan" products tied to energy efficiency standards like Minergie. Many banks also

provide complementary services, such as energy efficiency consultations and guidance on accessing public subsidies, making them important intermediaries between homeowners and government support schemes.

Despite these positive developments, concerns remain about the neutrality and comprehensiveness of bank-provided energy advice, which may be influenced by product promotion or internal criteria. For more impartial and tailored guidance, independent consultants and cantonal energy advice offices are better positioned to provide in-depth audits and evaluate a wider array of renovation options. While the SBVg's new standards represent a significant improvement in aligning financial institutions with climate goals, greater collaboration between banks and independent advisory services is essential to streamline renovation efforts, avoid redundancies, and maximise both financial and environmental outcomes.

For further details on banking products, policy developments, and coordination challenges, please refer to **Annex 1.**

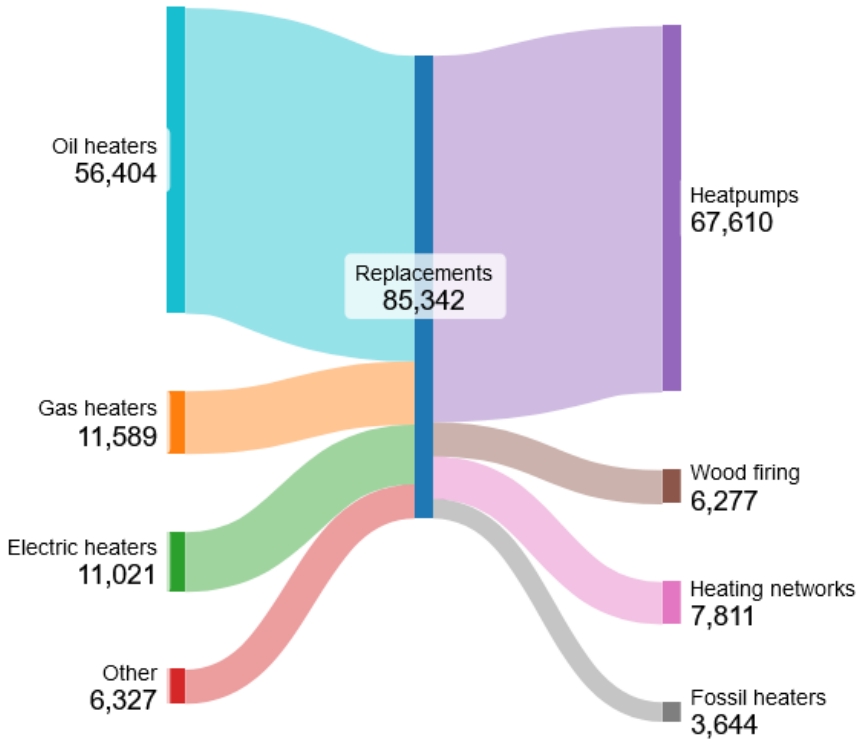
2.3 Renovation and heating system replacement trends

There are no exact numbers on how many fossil heating systems are replaced in Switzerland each year. However, subsidies provided by the Gebäudeprogramm allow for some estimates. As shown in Figure 1, between 2017 and 2023, the replacement of around 85.000 fossil fuel or electric heating systems has been supported by the national building sector subsidies program (*Gebäudeprogramm*), with most of the boilers being replaced by heat pumps. Additional heating system replacements that occur[7] outside the subsidies program are estimated to be a fifth of the total replacements (IEA, 2023), which means that approximately 100.000 fossil heaters were replaced since 2017. This means that there needs to be an acceleration of almost 3 times in fossil-based heating systems replacement to be able to reach the 2050 benchmarks.

Figure 2 –

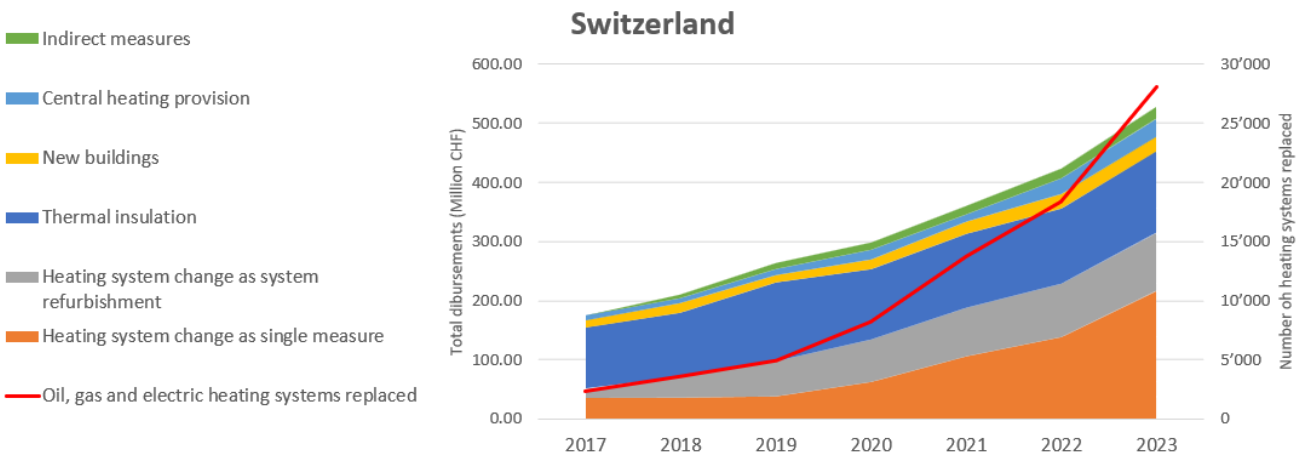
Source: Own elaboration based on Gebäudeprogram statistics using SankeyMatic tool

a) Amount and type of heating systems replacement that have received subsidies between 2017 and 2023



[7] This is based on government estimates for 2020, which show 25.000 heating system installations, of which around 5.000 did not benefit from the subsidy.

b) Evolution of subsidy disbursements and heating systems replacement in the context of the Gebäudeprogramm



As shown in Figures 2a and 2b the number of heating systems replaced in Switzerland has been growing exponentially since the inception of cantonal funding in the Gebäudeprogram in 2017, and most of the replacements have gone from fossil-based heating systems to low-carbon alternatives, showing the overall effectiveness of the program. Further looking at the expenses of the Gebäudeprogram, as shown in Figure 2b, it becomes clear that a significant amount of the subsidies is going to the replacement of heating systems either as a single measure or as part of a larger refurbishment, which accounts for an average since 2017 of 44% of the disbursements at the national level, followed by other renovations measures, mainly a thermal isolation of buildings, which accounts for an average of 42% of the disbursements at the national level.

However, the disbursements of the *Gebäudeprogram* also show that there seems to be a trade-off between heating system replacement and other, or additional, building renovation. This can be seen in the fact that the share of "heating system change as part of system refurbishment", which is when the heating system replacement is made in the context of a larger renovation, accounts for only 9% of the cases, representing 19% of the disbursements. In contrast, heating system replacement as a single measure accounts for 91% of the cases and 25% of the disbursements. Making sure that building renovations are accompanied by a heating system replacement and vice versa is an important feature to improve the effectiveness of the program. Indeed, recent research has shown that conventional building renovation without fossil-based heating system replacement is not beneficial in terms of life cycle GHG emissions (Galimshina et al. 2024), confirming that the most influential parameter in building renovation is the heating system (Pannier et al. 2018).

In summary, these trends show that the policy approach to fossil heating replacements and energy efficiency renovations in Switzerland is generally working, but should be strengthened and improved instead of being replaced as suggested by the planned fiscal relief package of the Federal Council. In addition to an acceleration of the heating system replacement, better incentives are required for achieving deeper building renovation that guarantees the maximum efficiency gains.

3 Analysis

To get some insights on how the strengthening and improving of the existing policy approach could look like to accelerate heating system replacements, in this section, we compare the cantonal regulations, financing and heating systems replacement trends. Based on this analysis, we identify techno-economic, social and regulatory barriers, and reflect on the best practice measures and policy mixes observed until 2024.

3.1.1 Cantonal renovation and heating system replacement trends

As mentioned in previous sections, while the federal government has provided general guidelines and policies aiming to encourage the switch to renewable-based heating systems, such as the MuKEn directives and the *Gebäudeprogram,* most of the implementation details are the responsibility of the cantons, generating substantial differences in the implementation

of the same policies. For instance, as shown in section 2.1, the minimum mandatory share of renewable energy requirements for heating systems replacement across Swiss Cantons is very heterogeneous, varying from 10 to 100%.

Similarly, direct subsidies for the replacement of fossil heating systems vary considerably from canton to canton. This results in the same measure being subsidised very differently depending on the Canton, as shown in Figure 3, which provides an overview of the direct subsidy for heating system installation across all cantons (as of 2024), to highlight the large differences among cantons. It is a simplified version for visualisation purposes[8]. For a full overview of the subsidies, please refer to Table A2.1 in **Annex 2.**

Figure 3 - Overview of the direct subsidies (in CHF) for heating system installation across all cantons (as of 2024).

Source: Own elaboration based on cantonal regulations

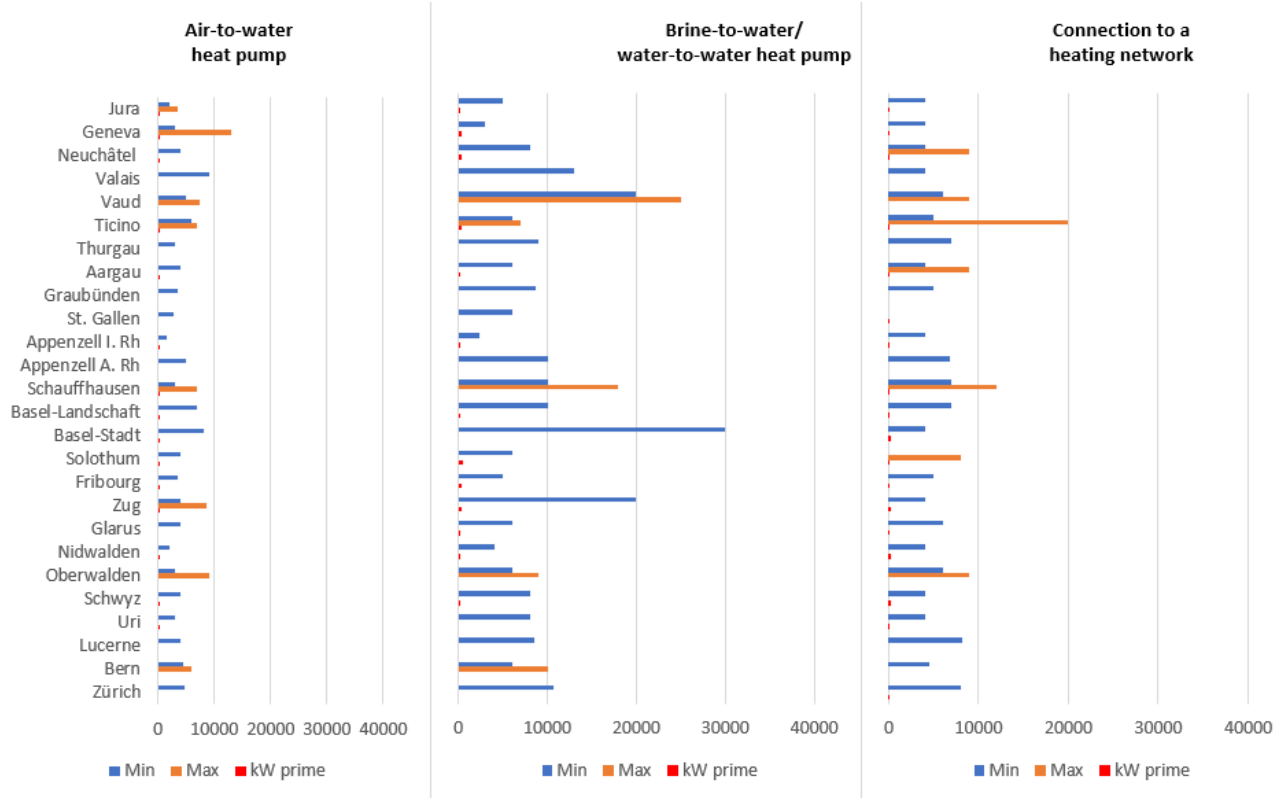


Figure 3 clearly illustrates the substantial disparities in subsidy levels for heat pump installations across Swiss cantons, with some cantons offering significantly higher financial incentives than others. For instance, the installation of a brine-water heat pump receives more than double the national average subsidy in cantons such as Basel-Stadt or Zug (CHF 30.000 and from CHF 25.000, respectively, compared to a national average of around CHF 10.000). Differences in subsidies design also favour certain technologies for specific renovation projects. For instance, Vaud offers particularly generous subsidies for large-scale brine-to-water systems, with contributions reaching up to CHF 100.000 + 320 CHF/kWth for installations over 200 kW_{th}—highlighting a strong focus on supporting high-capacity systems, likely aimed at multi-family or institutional

[8] Minimum subsidy refers to the amount received, regardless of the size of the project, which is available for all cantons. The Kw prime depicts the additional subsidy that is dependent on the size (capacity) of the heating system, which is provided only in some cantons. The maximum subsidy depicts the cap some cantons have established for the maximum amount of subsidy a single heating system installation can receive. Some cantons establish an absolute threshold for heating system size, instead of a relative one related to the exact capacity of the heating system. For those cases, the minimum depicts the subsidy for the lower end of the spectrum and the maximum the subsidy for the higher end of the spectrum.

buildings. In contrast, Ticino uses a tiered system based on heat output, providing CHF 6.000 + 100 CHF/kWth for the same type of technology in systems larger than 15 kWth, while smaller systems (<15 kWth) receive CHF 7.000 + 400 CHF/kWth, suggesting a targeted approach to support smaller-scale renovations.

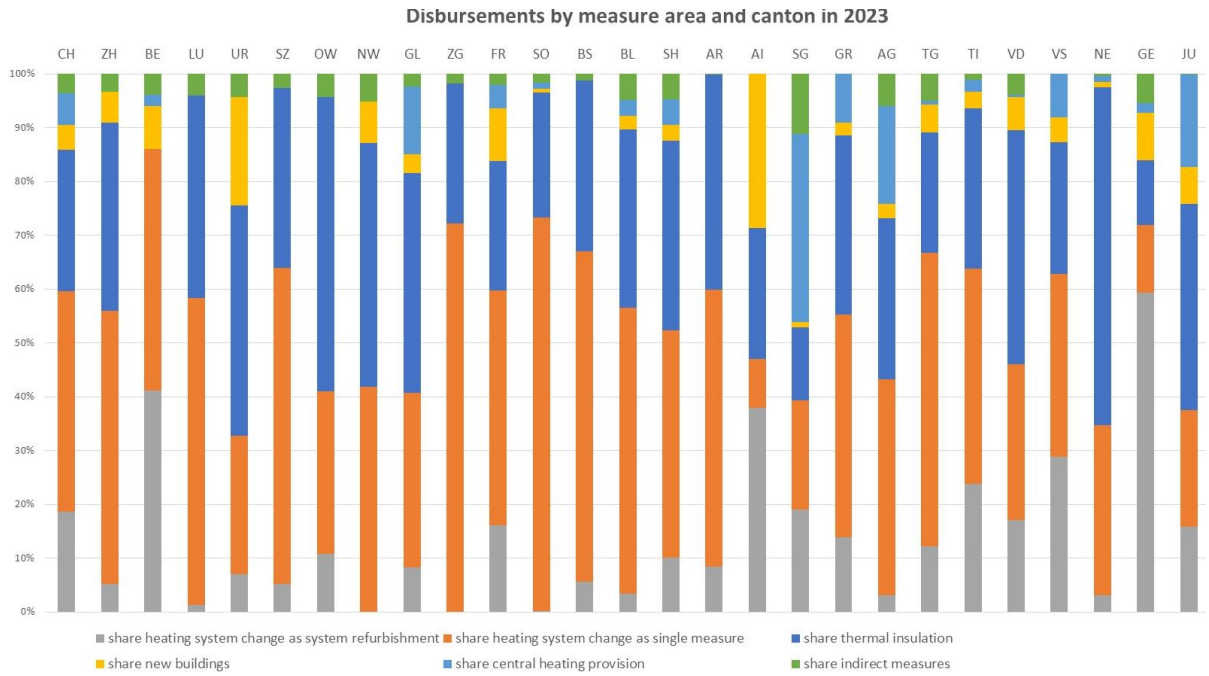
These differences in structure—not just in total subsidy amounts—reveal how cantons prioritize different building types and project scales, potentially shaping regional adoption trends and the market for specific heat pump technologies. These discrepancies also raise important questions of social justice and acceptance, as cantons that allocate disproportionately higher subsidies to large-scale systems or high-consumption users risk implementing more regressive policies—where wealthier property owners or institutions benefit more from public funds than average homeowners with smaller renovation needs.

Moreover, cantonal support for heating network connections also varies widely, often depending on whether the connection is made to a renewable-based network. For example, in Geneva, the subsidy for heating network connections reaches up to CHF 40.000 and is paired with generous support for the initial installation of the distribution system (CHF 3.000 + 400 CHF/kW), indicating a strong commitment to centralised renewable heat. Similarly, cantons like Ticino, Schaffhausen and Solothurn offer robust support, providing layered subsidies that include bonuses for new network construction. On the other hand, the canton of Obwalden provides more modest subsidies (6.000-9.000 CHF), limiting support to wood heating technologies. These divergences in financial support structures may lead to significant regional differences in the attractiveness and feasibility of connecting to heating networks, especially in dense urban versus rural settings.

The disbursements of the *Gebäudeprogram* in 2023, shown in Figure 4a., also show significant differences among cantons in the among of heating systems replacements achieved and the triggering of investment beyond the heating system replacement (e.g. in substantial building renovation). The bars show the share of each category of subsidies provided in the cantonal disbursements of 2023. The federal and cantonal building programme grants financial contributions in the following areas:

- **Thermal insulation** of existing buildings**.**
- **Installation of efficient building services in existing buildings:** mainly heating systems that run on renewable energy, as well as ventilation systems with heat recovery (In German “Haustechnik”, here translated as heating system change as a single measure).
- **"System refurbishments",** i.e. comprehensive building refurbishments and energy refurbishments in larger stages (In German: “Systemsanierung”, here translated as heating system change, as system refurbishment).
- Construction and expansion of systems for the **centralised heat supply** of buildings with heat from renewable energies or waste heat (local and district heating)
- Highly efficient **new buildings** (Minergie-P buildings and new buildings with the highest GEAK classification).
- From 2018, the building programme will also provide funding for **indirect measures**, i.e. projects in the areas of quality assurance, advice, information, events, training and further education.

Figure 4 – Comparison of disbursements of the *Gebäudeprogramm* across all cantons.
Source: Own elaboration based on the statistics of the Gebäudeprogramm **.**

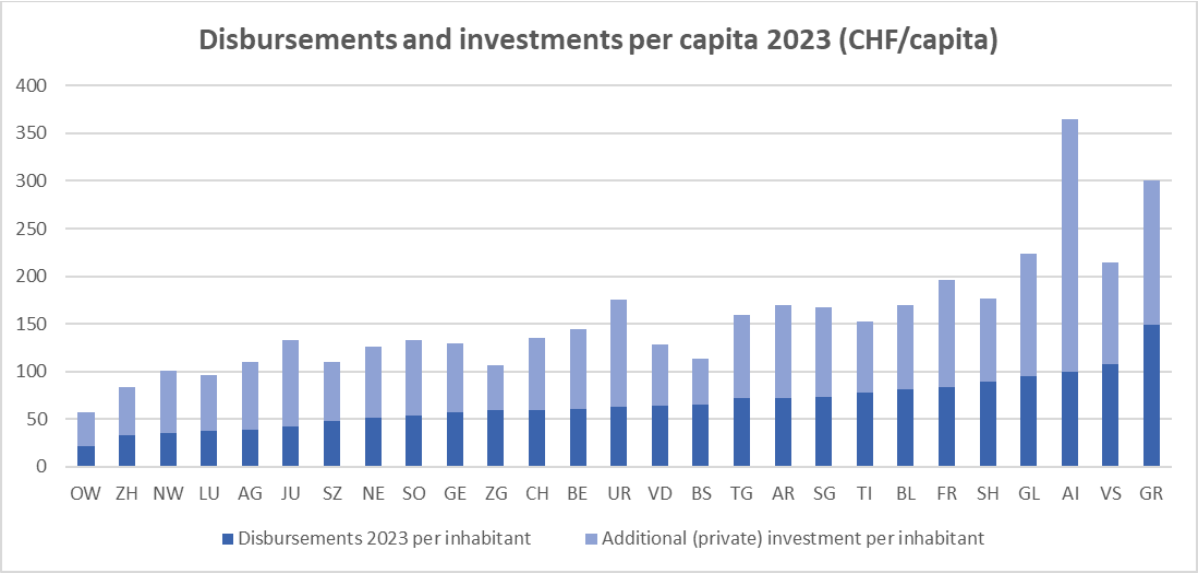


While the subsidy disbursements only tell a part of the full story, since many renovations take place without receiving subsidies, the very different shares of subsidies going to the different categories of disbursements (shown in Figure 4) indicate different priorities among cantons regarding the type of renovations taking place. In some cantons, such as Schwyz (59%), Basel-Stadt (61%), Solothurn (73%), and Zug (72%), the majority of their disbursements went to heating systems replacement as a single measure, indicating a prioritisation of technical system upgrades over full-building renovations. In contrast, in other cantons like Bern (41%) and Appenzell Innerrhoden (38%), significant shares of the subsidies went to system refurbishments, indicating more holistic refurbishments taking place.

Another interesting difference between the cantons is the amount of additional private investment that the subsidies can leverage, as well as the cost of the program on a per capita basis. The *Gebäudeprogram* disbursement data indicates that the size of the disbursement per capita can leverage very different amounts of private investment, depending on the cantonal regulations and context, as shown in Figure 5. Understanding why such wild differences are observed among cantons would require much more detailed data on the disbursements (such as the type of owner, etc.), which is not available. Nonetheless, we would like to highlight these stark differences in performance indicators of the subsidy programs among the cantons.

Figure 5 - Comparison of disbursements and investments per capita in the context of the *Gebäudeprogramm* across all cantons.

Source: Own elaboration based on the statistics of the the Gebäudeprogramm



From these simple comparisons, we can conclude that peer-to-peer learning among the cantons has huge potential to help the cantons increase the effectiveness of the subsidies disbursement systems in variables such as increasing the amount of replacements, while incentivising deeper building renovation, and maximising the private capital leverage. Several follow-up questions emerge from these cantonal comparisons, regarding the characteristics of cantonal regulations that are more successful in triggering investments in substantial building renovation or private investments together with heating system replacement. Answering those questions would require much better data availability, as well as an in-depth analysis of the cantonal regulations and policy mixes enacted for surrounding building renovations and heating system replacements, which fall outside the scope of this report. However, interesting insights can be gained from a comparison of the bans a heating bans (analysed in the next section) and the case study of the front-runner Canton Zurich, which can be found in **Annex 3.**

3.1.2 Bans & Quasi bans (of new fossil heating systems installation)

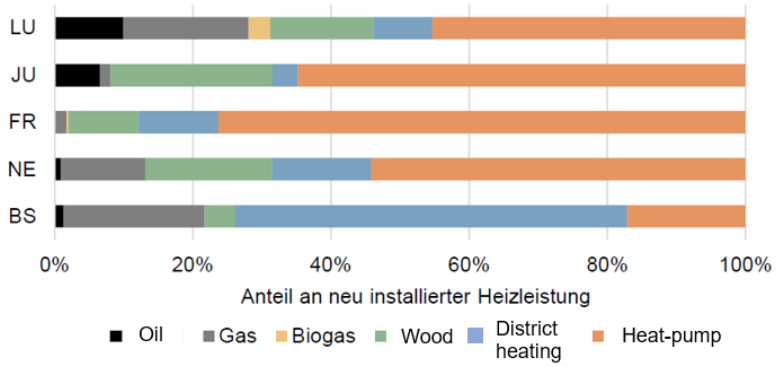
As mentioned in the introduction, in 2017, Basel-City was the first canton to effectively ban the installation of new oil-fired heating systems in older properties, mandating their replacement at the end of their service lifetime with climate-neutral alternatives. Since then, comparable regulations banning the installation (except under exceptional circumstances) of new fossil heating systems have been adopted in other cantons: Basel-Country, Zurich, Glarus, Neuchâtel, and Geneva. These bans relate only to new installations, and there are no existing bans on still-operative fossil fuel heating systems (Torné and Trutnevyte 2024). Other cantons like Fribourg, Aargau, and Schaffhausen have taken a softer approach, which is based on implementing oil and gas heating replacement regulations (in the context of MuKEn and the Gebäaudeprogramm) with minimum renewable energy shares that go beyond, sometimes far beyond, the minimum federal standard of 10%. While those do not represent a total ban, we consider them a quasi-ban, since meeting the standards is very difficult without switching to a fossil-free alternative, which steers owners to low-carbon alternatives when replacing fossil-based heating systems.

A study by the Conference of Cantonal Energy Services (EnDK) shows, with the example of the cantons of Fribourg, Jura, Lucerne, Basel-City and Neuchâtel, which have implemented oil and gas heating replacement regulations that go beyond the minimum federal standards that this approach is very effective, with around 90% of new heating systems installed in

residential buildings after the ban running on renewable energy or waste heat (EnDK 2022). This study also found, in all the cantons analysed, a striking difference between single-family houses and multi-family buildings, with the former reaching 95% average share of replacements with renewable heating systems, while the latter reached only 78% average shares (EnDK 2022). This is explained by the fact that multi-family buildings are often located in high-density urban areas, where renewable alternatives are more limited unless renewable-based district heating networks are considerably expanded.

The same study finds that while the overall effectiveness of the policy is good in terms of replacement with renewable energy-based systems, but the differences between the cantons are remarkable, with some Cantons reaching much higher replacement rates than others (Lucerne 75%; Basel-Stadt 88%; Neuchâtel 91%, Jura 92% and Fribourg 99%), even when the minimum share required is not 100% (de-facto a ban), like in the case of Fribourg. These differences can be explained by the different minimum renewable energy shares in the replacement regulations and exceptions allowed for the replacement, the composition and condition of the building stock, as well as local potential for renewable energies and waste-based district heating (EnDK 2022). Despite these differences, as shown in the graph below, heat pumps play a central role in all cantons. In contrast, the role of wood, biogas and district heating is generally rather low (except for Basel-Stadt where district heating is dominant).

Figure 6: Share of heating solutions after a heating system replacement per canton by newly installed heating capacity



Source: EnDK, 2022

More recent experiences like the canton Zurich confirm the effectiveness of the fossil heating systems bans. Before the change in the regulation, more than every second oil or gas heating system was replaced by a new oil or gas heating system at the end of its service life. After the regulation change, the overwhelming majority being replaced by non-fossil alternatives (see Annex 3 for more details). However, as shown in the section before, there are downsides to the regulation, including a trade-off between the investments made in heating system replacements and investments in overall building renovation. Other downsides of the bans are observed in the case of the canton Basel-country, in which the ban for new oil heating systems which will operate from 2026 onwards, has unleashed a series of installations of new oil-heating systems, in anticipation for the entry into force of the ban (SRF 2025b), pointing at a degree of re-bound effect of the bans.

From the experience of the cantons that have implemented bans or quasi-bans on new fossil heating system installations so far, we can conclude that binding rules that ban the new installation of fossil heating systems are effective in aligning the investment decisions of homeowners with the national emissions reduction targets by promoting the installation of low carbon heating system. Research has estimated that if implemented in all the country, a ban on all gas and oil boilers would be highly efficient to achieve residential heating CO_2 emissions reductions of 80-90% by 2050 (Iten et al. 2017).

The MuKEn2025 standards move in the direction of a federal ban for new fossil fuel heating systems stating that *"The existing boilers that still run on fossil fuels boilers still running on fossil fuels are to be replaced by renewable systems at the end of their service life. The normal service life of a heat generator is 20 years. From 2050 at the latest, all buildings are to*

be operated without CO_2 emissions from fossil fuels". However, the experience of the cantons also show certain trade-offs and re-bound effects, highlighting the need for fossil heating bans resulting from the implementation of MuKEn2025 to be accompanied by much stronger incentives for further renovation measures and measures to avoid rebound effects, such as panic-installation of new fossil heating systems (e.g. by including exceptions and rules for hardship cases).

3.2 Barriers to the implementation and acceleration of fossil heating system replacements

In this section, we identify techno-economic, social and regulatory barriers, and reflect on the best practice measures and policy mixes observed until 2024 related to the replacement of fossil heating systems in Switzerland, both at the national and cantonal levels.

3.2.1 Techno-economic

In 2024, the *Gebäudeprogramm* operated with a substantial budget of CHF 607 million, jointly sourced from both the Swiss federal government (CHF 336 million) and cantons (CHF 271 million). Starting in 2025, an additional CHF 150–200 million will be introduced annually through a new climate incentive program as part of Switzerland's recent Klima- und Innovationsgesetz (Climate and Innovation Act). This funding aims to accelerate projects such as heating system replacements and other energy-efficiency improvements over a ten-year period. However, the future of the *Gebäudeprogramm* subsidies is uncertain because as part of the planned fiscal relief package, the Federal Council announced in 2025 its plans to cancel its contribution to the program(SRF 2025a).

Moreover, even if the full sum of federal funding were to be guaranteed, this sum is still fairly small relative to the scale of the conversion required to meet Switzerland's climate goals. If 10% of the roughly 1.8 million dwellings in Switzerland burning fossil fuel wanted to convert in a given year, there would only be enough for a CHF 1,111 subsidy per conversion, which is not enough to incentivise homeowners to switch, considering the average investment costs of fossil heating systems vs the alternatives, summarised in the Table 1.

Table 1 - Cost comparison graph for different heating technologies

Source: own elaboration based on multiple sources described in the note.

Technology	Average cost of heating system change (incl. installation)	Average removal and disposal cost of the old system	Average running cost yearly
Oil	7.000 CFH (only replacing boiler)	n.a.	4.400 CHF
Gas	15.000 CFH	4000-8000 CHF	4.500 CHF
Air-Air Heat Pump	32.500 CHF	4000-8000 CHF	1.500 CHF
Air-Water Heat Pump	40.000 CHF	4000-8000 CHF	1.400 CHF
Brine-Water Heat Pump	50.000 CHF	4000-8000 CHF	1.150 CHF

Notes:

1. Average cost are provided for an average single-family home.
2. Source Heat Pumps estimates. **https://en.houzy.ch/post/replace-oil-heating-costs** and cost calculator: **https://en.houzy.ch/tools/heating-calculator**
3. Source oil and gas estimates: https://www.ubs.com/ch/en/private/mortgages/information/magazine/2022/heating-replacement.html

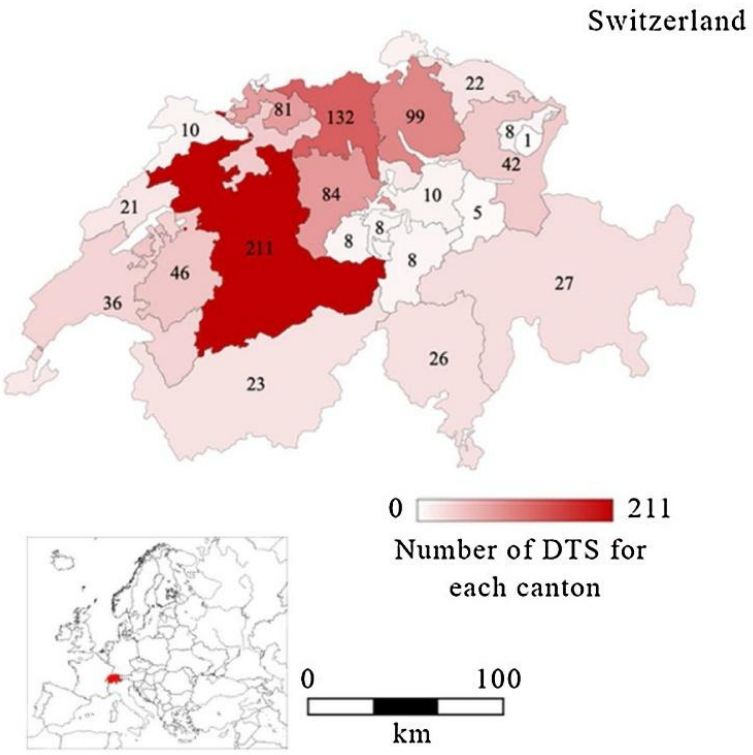
In addition to the replacement of the heating system, homeowners face additional cost for renovation measures, in a context for growing building and construction costs. Between October 2020 and April 2023, Swiss building construction costs rose by 13.9%, faster than general inflation (Le News 2023). This highlights the need for additional measures that aim at decreasing the financial cost (e.g. interest rates) of undertaking building renovation measures.

Similar findings have emerged in the context of legal analysis of the District Heating Supply (Fernwärmeversorgung) regulations (Abegg and Musliu 2022), which are some of the key potential solutions that homeowners should consider before investing in new individual heating systems. While these systems currently represent only about 6% of the heating market, this share is forecast to reach 38% by 2050, delivering a significant share of the decarbonisation targets of the building sector (Caputo et al. 2021; Mennel et al. 2023). Modelling exercises have further shown that this solution is viable for 50-80% of urban areas and 50% of densely populated areas in Switzerland, with positive cost results compared to individual solutions (Sulzer et al. 2020), but optimal long-term planning of district energy systems with building sizes resolution is required to maximize the energy and decarbonisation wins (Lerbinger et al. 2023).

As shown by Figure 7, the starting situation of different cantons regarding District Heating Systems (DHSs) (also known as District Thermal Systems – DTS) is very different, resulting in different levels of expertise on the design, construction and administration of DHS among cantons and municipalities.

Figure 7 - Geographical distribution of district Thermal Systems (DTS) in Switzerland.

Source: (Caputo et al. 2021)



Better coordination between federal, cantonal and municipal authorities regarding the design, approval, and construction of DHSs would considerably reduce the uncertainty of homeowners regarding the solutions available for heating and facilitate investment decisions on renovations and heating systems exchange. Moreover, since DHS imply big investments, the mandatory connection of public buildings to DHSs could help substantially to improve the economic feasibility of DHSs. Considering that the obligation to sign binding and long-lasting contracts in advance scares final users and other

stakeholders from committing to DHSs, having public actors commit first can reduce uncertainty for private stakeholders while improving the economic prospects for network building and operation.

Finally, another economic barrier to the increase in the speed of heat pump installations and the overall renovation rate of buildings in Switzerland is the shortage of workers with the adequate knowledge and qualifications to carry on the installations and renovation work. Estimates point to a gap of at least 300,000 installers, despite the attractive pay conditions, leading to long waiting lists for the energy renovations for large buildings (Herzog 2022). As a response to these large skills gaps, the government launched in late 2021 a roadmap for the "training offensive for buildings", which aims to increase the skilled workforce for building refurbishment, solar PV and heat pump installations, among others (Ecoplan 2021). The training offensive includes industry associations, educational institutions, and federal agencies such as the Conference of Cantonal Energy Services to ensure a systemic and coordinated approach to the training programs and labour market needs.

3.2.2 Social

As discussed in in previous sections, while direct subsidies considerably facilitate the financing of a change in heating systems, most of the cost still needs to be carried by the homeowner. High investment cost (summarized in Table 1 in the previous section) remains one of the main constraints to the uptake of heat pumps in residential buildings (Zapata Riveros et al. 2024), and raise some social concerns such as potential rent increases for tenants resulting from home owners trying to recover their investment(Petkov et al. 2021). This is an important concern, considering that almost 75% of rented homes use fossil fuel-based heating systems, as opposed to 59% for owner-occupied homes (IEA 2023).

This issue is not dealt with in the cantonal building renovation policies, because the cantons do not have the authority to amend federal civil law like the tenancy law, which stipulates that renewal of a heating system should generally be classified as value-enhancing and thus would justify a rent increase (Camprubi Hüser 2024). Indeed, to incentivise more renovations of rental units, in 2020 Switzerland amended the regulation on residential and commercial rents to allow landlords, under certain conditions, to pass on the cost of renovation and heating systems refurbishment to tenants over a maximum of ten years (IEA 2023).

For individual or small-scale renovations, this concern is limited, considering that tenant protection regulations cap the increase of rent prices in many Cantons[9]. However, the actual impact of this measure on renovation rate acceleration or rental prices has not been evaluated yet. While the extent of the increase in rent prices could be partially or fully compensated by lower energy costs for heating, it is reasonable to think that substantial renovation measures could result in considerable increases in rent prices, in particular in areas with high demand for residential buildings.

For larger-scale renovations of buildings, the impact can be higher since property owners have incentives to opt for combining the installation of new heating systems with general refurbishments of buildings (and their redesign), which can force tenants to move out of their houses/apartments, terminating some old contracts with favourable price conditions for tenants. However, if building redesign targets affordability and/or densification, deeper refurbishment projects can lower the impact on individual households (Petkov et al. 2021). This can be achieved, for instance, by increasing the number of tenants in a building, improving apartment design, and decreasing heating costs over the long run thanks to increased energy efficiency and the installation of renewable heating systems.

As mentioned in previous sections, the MuKEn2025 moves into the direction of a national ban for new fossil heating systems installation. This would accelerate renovations considerably, but also would make the concern about rental price increases more central to the implementation of the policy. Research estimates that such a national ban would affect 54.4% of Swiss households, but if policy design is done in a way that targets boilers only in the most energy-intensive dwellings or exempts low-income households, the distributional and social impacts of this type of policy can be considerably mitigated (Torné and Trutnevyte 2024). Alternative policy design, targeting hardship cases (e.g. low-income households, people living alone as tenants and older couples of dwelling owners) can also be used to mitigate some of the negative social impacts of the bans,

[9] Geneva: Demolition law, and Renovation of Dwelling Houses /Residential Renovation Measures for tenants and employment) (rsGE L 5 20), or Basel-City: Federal Housing Act (SG 861.500) and Housing Protection Ordinance (SG 861.540).

for instance, investing in district heating in the areas where the worse-off are concentrated. Moreover, an approach based on integrated policy mixes, which includes instruments indirectly influencing retrofits, such as those targeting affordability or densification are critical to minimise potential negative social impacts of the new retrofitting policies (Petkov et al. 2021).

3.2.3 Regulatory

Evaluations of cantonal energy regulations for the building sector (e.g. heating systems renovation) show that the current approach, based on general federal guidelines (soft-law approach), creates a complex regulatory system spanning the various levels of government and different types of norms (Meyer 2023). The MuKen have been somewhat successful in creating harmonisation of the cantonal regulations and providing a good avenue to link the federal and cantonal levels in the building sector regulatory environment (Trajkova, forthcoming). However, this complex regulatory ecosystem has some disadvantages that can slow down implementation and make it very difficult to achieve the national target of fossil-free heating in Switzerland by 2050.

For instance, tools for the monitoring of the balancing of final and primary energy demand and greenhouse gases at the municipal and cantonal levels are key for the monitoring and review of energy and climate policy measures like the heating systems transformation. However, instead of mandating a single tool and methodology, there are at least three different tools and methodologies (Energie Schweiz 2016), making aggregation, comparison, capacity building, and monitoring difficult among municipalities and cantons.

Similarly, for procedures like the geothermal probes, required for the installation of certain types of heat pumps, the licensing requirements and practices are very different among cantons, with some always requiring a license, many requiring one under special circumstances and some not requiring a license (EnergieSchweiz 2017). Among those requiring licenses, the authority in charge is sometimes at the canton level, and sometimes at the municipality level. In most cases, there are regional limitations on the depth limit of the drilling, different required minimum distances to the neighbouring properties, among many other specificities (EnergieSchweiz 2017), which complicates creating standardized procedures and delays the deployment of geothermal-based solutions.

Another regulation that has represented an obstacle to the installation of heat pumps is the Noise Abatement Ordinance, which is supposed to protect the immediate neighbourhood from potential noise contamination from the heat pump. According to these regulations, noise limits and the precautionary principle must be observed when installing and operating heat pumps, meaning that measures are taken as far as possible to keep noise emissions to a minimum. In 2023, a revision of this Ordinance was approved, which standardizes and simplifies the handling of these precautionary measures when installing heat pumps for project planners, building owners, authorities, and courts (BAFU 2023).

In brief, this revision mandates clear measures to be tested for the installation of the heat pump, including the indoor installation, the selection of a system with a low sound power level, the optimisation of the installation location and the activation of whisper mode at night. These measures must achieve a level reduction of at least 3 dB and may not exceed 1% of the investment costs. The revision, which entered into force on November 1, 2024, applies to air/water heat pumps that are used for space heating or heating drinking water (BAFU 2023). It strengthens legal certainty and simplifies the switch from oil and gas heating systems to heat pumps, becoming a good example of how standardisation and simplification of building regulations can promote the acceleration of the heating systems replacement and the increase of renovation rates.

As shown by these examples, to achieve national decarbonisation targets, “soft law” approaches regarding the energy regulations of the building systems are likely to be insufficient and will need to increasingly be replaced by "hard law" approaches, which must be enacted in the cantonal legislative procedures. While politically controversial considering the strong federation political culture of Switzerland, legal analyses of the issue point out the feasibility of such an approach, based on the need for such emission reduction measures to comply with the constitutional principles of sustainability (Nachhaltigkeit) and precaution (Vorsorgeprinzips) (Meyer 2023). Moreover, increasing harmonisation of cantonal regulations via the MuKEn guidelines has proved to be an effective vehicle to link the federal and cantonal levels, which moved into the direction of implementing hard-law approaches that increase the alignment with national emission reduction targets.

The revised MuKEn are expected to be issued in later in 2025, with current drafts showing the introduction of stricter energy efficiency and renewable energy requirements compared to the MuKEn2014, opening an important window of opportunity for more ambition and deeper standardisation in the building sector. However, swift and harmonised implementation of the MuKEn by the cantons is required to increase the impact of the new guidelines in renovations that will start before 2030.

4 Conclusion

The analysis presented in this report shows that Switzerland's policy approach to fossil heating system replacements and energy efficiency renovations is overall effective. It should therefore be strengthened and refined rather than replaced. The literature consistently demonstrates that combining different policy instruments into coherent policy mixes is the most promising way to increase the effectiveness of interventions in energy efficiency and emissions reduction (Boza-Kiss et al. 2013; Labandeira et al. 2020; Petkov et al. 2021).

Going forward, we propose that the policy mix for fossil heating system replacement in Switzerland should prioritize two main objectives:

1) Accelerating fossil-based heating systems replacement in old buildings with fossil-free alternatives.
2) Catalysing investments beyond heating system replacement—for example, in insulation and other energy efficiency measures within broader building renovations.

Our analysis identified techno-economic, social, and regulatory barriers to achieving these objectives. The following paragraphs outline how some of these barriers can be addressed in the implementation of the upcoming regulatory framework for heating system replacements and summarise the main findings from our study, which draws on quantitative and qualitative analysis of cantonal and national statistics from the *Gebäudeprogramm* (2017–2023), a literature review, and expert interviews.

First of all, we conclude that to achieve national decarbonisation targets, "soft law" approaches regarding the energy regulations of the building systems are likely to be insufficient and will need to increasingly be replaced by "hard law" approaches, which must be enacted in the cantonal legislative procedures. Increasing harmonisation of cantonal regulations regarding building renovations via the MuKEn guidelines has proved to be an effective vehicle to link the federal and cantonal levels, which moves in the direction of implementing hard-law approaches that increase the alignment with national emission reduction targets.

Regarding the phase-out of oil and gas boilers, the current MuKEn2014 requirement—that at least 10% of the energy used by a new system come from renewable sources—has proven insufficient to drive transformational change. A move toward a national ban, aligned with the MuKEn2025 draft (30.08.2024), represents a stronger and more coherent approach. While all cantons have endorsed the new draft, they must still individually transpose it into cantonal law. Swift implementation of the updated guidelines could achieve effects comparable to a national ban on oil and gas boilers and is therefore strongly recommended.

Technical simulations confirm the large mitigation potential of a national ban on fossil heating systems (Sulzer et al. 2020). By incorporating careful policy design—such as exempting low-income households or providing targeted support for hardship cases—the distributional and social impacts can be significantly mitigated (Torné and Trutnevyte 2024). Measures such as investing in district heating in areas with concentrations of vulnerable households can further enhance fairness and acceptance

Moreover, to be both cost-efficient and effective, fossil heating bans must be accompanied by measures that ensure access to appropriate alternatives and accelerate renovation rates. A key measure in this respect is the expansion of District Heating Systems (DHSs), which could supply 50–80% of the urban population at costs 20–25% lower than individual system (Sulzer et al. 2020). Better coordination between federal, cantonal, and municipal authorities in planning, approval, and

construction is needed to reduce homeowner uncertainty and support investment decisions. Given the scale of investment required, mandatory connection of public buildings to DHSs could significantly improve their economic feasibility.

Second, our analysis confirms earlier research showing that the quality of retrofits accompanying heating system replacements is crucial for emissions reduction and must be a priority in the policy mix. Both the speed and the depth of retrofits need to be increased (Hondeborg et al. 2023). This calls for updated incentives that place greater emphasis on comprehensive renovation packages rather than isolated measures. For example, adopting a life-cycle approach, building standards could require sustainable materials (such as thick bio-based insulation) alongside fossil system replacement, thereby reducing the carbon payback time compared to conventional materials (Galimshina et al. 2024).

Here, the new version of the MuKEn moves in the right directions, with new mandates for upgrading insulation, windows, and ventilation systems to modern efficiency standards, as well as policies to reduce "grey energy" or the embodied energy in materials used in renovations. Swift implementation of the new MuKEn guidelines by the cantons can therefore also increase the renovation depth and is recommended. However, a critical point for the swift adoption of these standards by the cantons and their successful implementation will be guaranteeing the financing of renovation projects, which is at odds with the planned fiscal relief package announced by the Federal Council. Discontinuation or scaling down of federal funding for the *Gebäudeprogramm* would be disastrous for the implementation of MukEn2025.

Third, the uneven implementation of MuKEn2014 across cantons provides valuable lessons for MuKEn2025. Key areas for improvement include harmonising standards, simplifying administrative procedures, and strengthening communication about the benefits of the standards. Greater harmonisation would reduce inefficiencies and create a more predictable environment for homeowners, builders, and investors. Simplification of administrative processes, for example, through digital platforms, could lower barriers to compliance, while expanding the role of local energy advisors would further facilitate adoption. Targeted awareness campaigns highlighting the benefits of energy-efficient renovations—such as lower bills and improved comfort—would also enhance public acceptance.

Fourth, effective renovation policies depend on robust financial solutions. Incentivising new financing models and ensuring better alignment between public subsidies and private financing schemes are crucial. For large-scale projects, Energy Savings Contracting (ESC) can create positive correlations between heating replacements and deeper renovations, as energy savings offset costs. For smaller projects, the 2022 guidelines of the Swiss Banking Association represent a step forward, but stronger coordination with cantonal energy advice offices (Kantonale Energieberatung) is needed to streamline processes, improve user experience, and maximise both cost-effectiveness and climate benefits. Scaling up the role of cantonal energy advice offices is particularly important, as they provide independent, personalised guidance, full energy audits, and support in comparing renovation options and costs.

Fifth, we highlight that regular monitoring and reporting on MuKEn2014 outcomes were lacking in some areas, limiting the ability to assess impacts and adjust policies. For MuKEn2025, establishing standardised data collection practices across cantons could help evaluate effectiveness, optimise future updates, and track progress towards national climate and energy targets.

Finally, drawing on lessons from Swiss and international climate policies, we confirm that successful policy design must combine environmental effectiveness with social acceptance. This requires ensuring that building sector decarbonization also strengthens resilience, stimulates economic development (e.g., through job creation and lower energy bills), and distributes costs and benefits fairly across society.

As an illustration of how a policy mix for renovations and heating system replacements could look for Switzerland going forward, **Annex 4** presents an overview the core policy instruments implemented so far in Switzerland around these areas, together with a selection of best practices and desirable design features that could accompany those core instruments to maximise the above mentioned policy objectives and operationalises the learnings from the implementation of MukEn2014 and international experiences.

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RENOWAVE

RENOWAVE's objective is to reduce the CO_2 emissions in the Swiss built environment by addressing building retrofit and switching from fossil fuels to renewable energies. The technical, financial and organisational challenges related to large-scale and efficient retrofits are numerous, interrelated and transdisciplinary.

RENOWAVE addresses building retrofit in a process of co-construction between researchers from various fields and implementation partners representing the various stakeholders involved in the complex process chain of renovation. Therefore 46 implementation partners and 16 research groups from industry, research and public authorities collaborate on 16 topics related to the retrofit of the building stock.

The University of Geneva (UNIGE) and the Eastern Switzerland University of Applied Sciences (OST) provide the management and administrative support to RENOWAVE.

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Annex 1 - Finance sources for building renovation and heating systems

Foundation for Climate Protection and Carbon Offset KliK

The Climate Premium

The Energie Zukunft Schweiz Climate bonus for replacing heating systems is an additional subsidy available for replacing a fossil fuel heating system with a renewable one. The uniform nationwide subsidy program supports the replacement of heating systems with a "Climate Premium" of CHF 1,80 per litre of heating oil or cubic meter of natural gas saved (calculated based on previous fossil fuel energy consumption), which corresponds to CHF 360 per kilowatt of the new heating system, with no upper limit. The funding comes from the Climate Protection and CO_2 Compensation Foundation KliK and one of the largest and most comprehensive programs in the area of renewable heating systems replacement.

The most important funding conditions[10] are the voluntary replacement of an oil or gas heating system with a wood heating system or a heat pump (not valid for cases where there is an absolute legal obligation for renewable, or absolute ban on fossil heating system replacement due to cantonal regulation), that the replacement has not yet been awarded CO_2 reductions elsewhere, and that the new heating system is "uneconomical" compared to a fossil heating system (based on calculations by Energie Zukunft Schweiz when the application is reviewed)(Energie Zukunft Schweiz 2024).

The program is expected to run until the end of 2025, and it aims to accelerate the switch of fossil fuel-based heating systems to renewable-based ones.

MyClimate Program

The Myclimate subsidy program for heat pumps offers subsidies for the replacement of old heating oil and gas heating systems in rented residential properties. The nationwide subsidy applies to geothermal, water and air heat pumps in the output range from 15 to 400 kW. The amount of the subsidy is calculated based on the previous annual energy consumption (after registering for program). This subsidy program is also financed by the KliK Foundation.

Funding criteria include that the main purpose of the rental property is residential use, that the property is not in condominium ownership or building cooperatives, that there is no double funding with other federal, cantonal, municipal or private financial aid, and that the property is not located in a jurisdiction where there is an absolute legal obligation for renewable heating or absolute ban on fossil heating system replacement.

While double funding is not allowed, the subsidies from this program are sometimes higher than those from the cantonal subsidy programs and could be attractive for owners or rented residential properties in Cantons where direct subsidies are not very attractive or generous.

Heating networks

An additional program of the KliK Foundation that is relevant for the replacement of heating systems in Switzerland is the Heating Networks (Wärmeverbünde) program, which promotes heating networks powered by renewable energy sources or waste heat that are newly constructed or expanded, as well as the conversion of existing heating networks from fossil fuels to renewable energy sources or waste heat. Unlike the other programmes of the KliK foundation, which are paid to the homeowners, the Wärmeverbünde subsidies are paid out to the heating network operator and range between CHF100-160

[10] Additional funding conditions exclude the replacement of electric resistance heating systems, heating systems in new buildings, heat generation for greenhouses, fossil bivalent systems (e.g. gas and heat pump) if the renewable component is less than 50 kilowatts. Also, from April 2024, if a heat pump replaces a natural gas heating system, it must have an output of at least 50 kW to be fundable, while there is no lower limit for heat pumps that replace oil or wood heating systems.

per reduced tonne of CO_2 until 2030. The subsidy rate per tonne of CO2 is determined according to the Canton where the project operates, as summarized in the table below:

Table X - Overview of KliK Foundation Wärmeverbünde subsidy across all cantons

AG	AI	AR	BE	BL	BS	FR	GE	GL	GR	JU	LU	NE
120	100	100	100	120	160	120	120	120	160	160	100	100

NW	OW	SG	SH	SO	SZ	TG	TI	UR	VD	VS	ZG	ZH
100	100	160	160	120	100	160	100	100	120	160	100	100

Source: KliK | Programm Wärmeverbünde | Förderbeitrag

Contributions are only paid out after commissioning based on the proven emission reductions achieved after the end of a calendar year. Payment is made at the end of the following year. However, there is no obligation to connect new users to the system nor legal restrictions for continued fossil fuel operation, which points out to the need to coordinate these expansions with municipal plans encouraging homeowners to connect to district heating solutions. To ensure additionality to existing policies, both the "Climate Premium" and the "Myclimate" subsidies exclude funding for replacements that are already dictated by law. The downside of this clause however is that it represents a discouragement to cantons considering implementing complete fossil fuel bans regulations in the short term, since having an official ban can result in pulling out financial resources from the Klick Foundation to finance some heating system replacement in their canton. Moreover, while both programs encourage owners to renovate the building envelope when renovating the heating system, to optimize the running costs of the new heating system, they do not provide funding for additional renovation measures. This, as well as the exclusion clause of funding for economically competitive renewable-based heating systems of the "Climate Premium", can create perverse incentives for homeowners to change the heating system without additional renovation measures for energy efficiency, which is the opposite of what is required.

Energy saving (Energiespar)-Contracting (ESC)

Energy savings-Contracting in (ESC) refers to a financial and operational model designed to promote energy efficiency in buildings, particularly in heating system replacements and renovations. It is an increasingly popular mechanism in Switzerland for improving energy efficiency in older buildings, in which a contractual agreement between a building owner (or operator) and a specialised energy service company (ESCO) is made (SWISSESCO 2024). The ESCO finances the upfront costs of measures to reduce energy consumption (e.g. renewing heating systems or undertaking renovations to improve energy use), and the building owners (or operators) repay over the contract duration. The payment is usually expressed as a share of the energy cost savings thanks to the investments, often guaranteeing financial neutrality or savings for building owners (SWISSESCO 2024).

Regarding heating and cooling of buildings, the standard measures covered by ESC (SWISSESCO 2016) are:

- **Replacement of boilers or heat pumps**
- Improved insulation of pipes and distribution systems
- Installation of new control elements
- Hydraulic balancing
- Control of the room temperature (e.g. using thermostatic valves)
- Individual room control
- Optimisation of operation

- Heat recovery systems
- **Measures on the building envelope (windows, etc.)**

This model is very attractive to building owners, since it minimises their initial investment, which is an important barrier for renewable heating systems installation. Moreover, since the ESCO brings high technical and financial expertise, high-quality installations can be ensured, and the burden of renovation management on building owners is reduced. This is also an important factor, considering that lack of know-how has been found to be a significant obstacle to renewable heating system installations (Zapata Riveros et al. 2024).

Also, the scope of services offered by the ESCO go beyond the initial renovation phase (e.g. energy audits and consulting, planning and execution, etc.) and covers maintenance and monitoring of the systems installed (SWISSESCO 2016). This means there is a risk transfer from the building owner to the ESCO: there are guaranteed energy savings in the contract and if the promised energy savings aren't achieved, the ESCO typically compensates for the difference. The ESCO financing can be complemented with other financial sources, such as government subsidies, increasing the financial attractiveness of the projects (SWISSESCO 2016).

There are however, also some disadvantages of ESC contracts compared to alternative financing options. First, ESC contracts typically last 5 to 15 years (SWISSESCO 2016), binding building owners to the ESCO, which is not very suitable for owners looking for flexibility or short-term projects (e.g. when the property is planned to change owner or main tenant in the next few years after the renovation). Second, the heating system may remain the property of the ESCO until the end of the contract, which could limit the building owner's control. Third, while the ESCO assumes financial and technical risks, this is factored into the pricing, making ESC likely more expensive than other financing options over the long term. Taken all together, these disadvantages make ESC is more suitable for larger or complex projects where significant energy savings are achievable (e.g. large old public buildings or multi-family buildings). Small-scale projects may not generate enough savings to justify the model.

Regarding the correlation between heating system replacements and deeper building renovation, ESC is an ideal model, since it often includes holistic upgrades to optimize energy savings, such as building insulation or smart energy management systems, alongside heating replacement, increasing overall efficiency (SWISSESCO 2024). While the portfolio of energy-saving measures that can be covered with this model is limited, the ESCO usually offer the option for building owners wishing to undertake deep refurbishment or renovation measures that go beyond classic energy-saving contracting to self-finance the measures that go beyond their portfolio (SWISSESCO 2016). In cases where the project involves large-scale renovations where significant savings can offset costs, ESC can be of great advantage in reducing the overall upfront investment and leveraging the expertise in energy efficiency and renovation projects management of the ESCO.

Switzerland’s ESC market is smaller than in countries like Germany, where it is more established and widely adopted. However, Switzerland's strong focus on sustainable building renovations make ESC a growing trend, particularly in urban areas and for institutional projects(Opitz et al. 2021). Continued government support and increasing awareness are likely to drive further adoption of ESC in the coming years, however, the focus is likely to continue being large project with big energy efficiency savings potential.

Targeted finance lines from commercial banks

While subsidies increase the financial capability of the homeowner to replace their heating systems, generally they are not paid out at the time of the loan assessment and approval with a bank, which means their payment is not 100% certain for the bank, which means the subsidies may not be considered when granting credits. To improve the coordination among credit institutions in this regard and reduce bottlenecks, the Swiss Bankers Association (SVBg) created in 2022 their guidelines for providers of funding to promote energy efficiency, which entered into force on January 1, 2023, with a transition period until January 1, 2024 for the adjustment of internal bank processes (SBVg 2022).

These guidelines are mandatory for the member banks of the SBVg and include, among other, a commitment to structure their loan conditions (e.g. affordability, amortisation, and interest rate) in such a way that favours financing for sustainable renovations, and to develop further offers that serve the goal of improved energy efficiency (Art 3).

In addition to these preferential financial conditions, investments in renovation measures in existing buildings can be deducted from taxable income for direct federal taxes (only for the part that was not subsidized with grants). Similar to the subsidy requirements, the list of measures that are deductible from the taxes varies from canton to canton.

In Switzerland, several major banks offer financing solutions tailored for home renovation projects, which typically fall into the following categories: home equity loans, renovation mortgages, and personal loans. Home equity loans are secured loans that allow homeowners to borrow against the equity they have built up in their property, and generally allow borrowers to access 50% to 80% of their home's current value. Renovation mortgages are specifically designed to finance property upgrades, refurbishments, and renovations, and often function as an extension of an existing mortgage. Finally, personal loans can be used for smaller renovation projects where homeowners might not want to borrow against their property.

Following the SBVg guidelines, some Swiss banks offer specific loans with favourable terms for energy-efficient renovations, like solar panel installations, insulation upgrades, or other improvements like fossil heating systems replacement. These "green-loans" usually not only offer interest rate reductions (by up to 0.5%.) for green renovation projects certified under Swiss energy standards (like **Minergie**), but also offer additional services such as energy efficiency consultations, or connect clients to government subsidies or grant to complement the financing. Because of these services, private banks can become important brokers between home owners and municipalities offering subsidies for green renovation projects. While the energy efficiency consultations offered by the bank can be useful to promote green renovations, there is a risk that it is designed to support their loan products rather than offer fully comprehensive or independent individualized guidance.

For instance, banks may limit their recommendations to contractors who align closely with their loan conditions or their favoured energy efficiency criteria, or might provide too generic advice compared to an independent energy consultation. Independent energy efficiency consultants, or the cantonal energy advice offices (Kantonale Energieberatung) can offer more unbiased and personalized advice, a thorough home energy audit, consider a wider range of renovation options, and help citizens compare costs, energy savings, and long-term benefits.

In conclusion, private banks provide crucial financing for energy for building renovations and are increasingly involved in promoting eco-friendly renovations. A considerable step forward to improve the coordination among credit institutions in this regard is the creation of the 2022 standards of the Swiss Banking Association. However, increasing coordination with other actors like the cantonal energy advice offices is still needed to improve the user experience, avoid redundancies or inefficiencies in the process of home renovations, and ensure maximisation of cost efficiency and climate-benefits of the renovation processes.

Annex 2 - Comparison of subsidies for heat pumps and heating network connections among cantons

Table A2.1 - Overview of the direct subsidy for heating system installation across all cantons (as of 2024).

Canton	Subsidy for heating system installation			Complementary policies description
	Air-to-water heat pump	Brine-to-water/water-to-water heat pump	Connection to a heating network	
Aargau	CHF 4000 + 60CHF/kW	CHF 6000 + 180CHF/kW	CHF 4000 + 20.-/kW - 9000 + 10.-/kW	New construction/expansion of heating network and heat generation system CHF 40 - 130 (Mwh per year)
Appenzell Innerrhoden	CHF 1600 + 60 CHF/kW	CHF 2400 + 180 CHF/kW	CHF 4000 + 20 CHF/kW	Initial installation of a heat distribution system (CHF 1600 + 40 CHF/kW)
Appenzell Ausserrhoden	from CHF 4850	from CHF 10000	from CHF 6750	Initial installation of a heat distribution system (from CHF 4500)
Bern	CHF 4500 - 6000	CHF 6000 - 10000	from CHF 4500 (must be a RE heating network)	Additional contribution for initial installation of heat distribution system (CHF 3000 - 6000+ 500 CHF replacement of electric boiler only)
Basel-Landschaft	CHF 7000 + 100 CHF/kW	CHF 10000 + 200 CHF/kW	CHF 7000 + 100 CHF/kW	Initial installation of a heat distribution system (from CHF 2000)
Basel-Stadt	from CHF 8000 + 250 CHF/kW	CHF 30'000	from CHF 4000 + 200 CHF/kW	Initial installation of a heat distribution system (CHF 3000 + 200 CHF/kW)
Freiburg	CHF 3500 + 150 CHF/kWth	From CHF 5000 + 300CHF/ kWth (<100 kWth) To CHF 42400 + 100CHF/ kWth (>500 kWth)	From CHF 5000 + 30CHF/ kWth (<100 kWth) To CHF 9000 + 10CHF/ kWth (>250 kWth)	New construction/extension of heating network in new buildings (40 - 130 CHF/MWh/y)
Geneva	CHF 3000 + CHF 400.–/kW (≤50kW) CHF 13000.+ CHF 200.–/kW (>50kW)	CHF 3000 + CHF 400.–/kW (500kW) CHF 53000 + CHF 100.–/kW (>500kW)	CHF 4000 + CHF 100.-/kW Maximum: CHF 40000	Initial installation of a heat distribution system: CHF 3000 + CHF 400/kW
Glarus	4000	CHF 6000 + 250 CHF/kW	from CHF 6000 + 20 CHF/kW	Initial installation of heat distribution system for decentralized electric heating (from CHF 1'600 + 40 CHF/kW)
Graubünden	from CHF 3500	from CHF 8750	from CHF 5000	Initial installation of a heat distribution system (from CHF 5000)
Jura	CHF 3500 (≤15kW) CHF 2000.+	CHF 5000 + CHF 100.-/kW	CHF 4000 + CHF 20.-/kW	Initial installation of a heat distribution system: CHF 5000 + 100 CHF/kW

	CHF 100.–/kW (>15kW)			
Luzern	from CHF 4000	from CHF 8500	from CHF 8200	Initial installation of a heat distribution system (CHF 9000)
Neuchâtel	CHF 4000 + CHF 200/kWTh	CHF 8000 + CHF 400/kWTh (< 500 kWth) CHF 45,000 + CHF 100/kWTh (≥ 500 kWTh)	CHF 4000 + CHF 20/kWTh (< 500 kWth) CHF 9000 + CHF 10/kWTh (≥ 500 kWTh)	*Initial installation of a heat distribution system: CHF 4000 + 100 CHF/kW
Nidwalden	CHF 2000 + 100 CHF/kW	CHF 4000 + 250 CHF/kW	ab CHF 4000 + 250 CHF/kW	Initial installation of a heat distribution system (CHF 1'600 + 40 CHF/kW)
Obwalden	CHF 3000 - 9000	CHF 6000 - 9000	from CHF 6000-9000 (must be a wood heating)	
St. Gallen	from CHF 2800	from CHF 6000	130 - 150 CHF/MWh	Initial installation of a heat distribution system (from CHF 2500)
Schaffhausen	CHF 3000 - 7000 (+ 200 CHF/kW)	CHF 10000 - 18000 (+ 300 CHF/m²)	CHF 7000 - 12000 (+ 75 CHF/kW)	New construction/extension of heating network in new buildings (50 - 200 CHF/MWh/y) Hydraulic heat distribution (CHF 2500 - 4000)
Solothurn	CHF 4000 + 150 CHF/kW	CHF 6000 + CHF 450/kWTh (< 500 kWth) CHF 42,400 + CHF 100/kWTh (≥ 500 kWTh)	CHF 8000 + CHF 40/kWTh (< 500 kWth) CHF 18,000 + CHF 20/kWTh (≥ 500 kWTh)	Initial installation of a heat distribution system (from CHF 1600 + 40 CHF/kW) New construction/extension of heating network in new buildings (40 - 130 CHF/MWh/y)
Schwyz	CHF 4000 + 200 CHF/kWth	CHF 8000 + 200 CHF/kWth	CHF 4000 + 200 CHF/kWth	Initial installation of a heat distribution system (CHF 3000)
Thurgau	from CHF 3000	from CHF 9000	from CHF 7000	New construction/extension of heating network in new buildings (50 - 200 CHF/MWh/y) Hydraulic heat distribution (CHF 4000 per single house, CHF 2500 per apartment)
Ticino	CHF 7000 + CHF 400/kWTh (< 15 kWth) CHF 6,000 + CHF 100/kWTh (≥ 15 kWTh)	CHF 7000 + CHF 400/kWTh (< 15 kWth) CHF 6,000 + CHF 100/kWTh (≥ 15 kWTh)	CHF 5000 + CHF 50/kWTh (< 500 kWth) CHF 20,000 + CHF 20/kWTh (≥ 500 kWTh)	Initial installation of a heat distribution system: CHF 4000 New construction/extension of heating network in new buildings (CHF 5000+ 100 CHF/MWh/y)

Uri	CHF 3000 + 60 CHF/kW	from CHF 8000	CHF 4000 + 20 CHF/kW	Initial installation of a heat distribution system (CHF 10000 + 40 CHF/m²)
Vaud	CHF 5000-7500 (< 15 kWth) CHF 400-600/kWTh (≥ 15 kWTh)	From CHF 20000-25000 (<20 kWth) To CHF 100000 + 320CHF/ kWth (>200 kWth)	From CHF 6000-9000 (<20 kWth) To CHF 24800 + 20CHF/ kWth (>500 kWth)	Initial installation of a heat distribution system: CHF 10,000 flat-rate (between 100 and 400 m2) + 500 CHF/kWTh)
Wallis	CHF 9000 (single houses) and 45 CHF/m² (apartments)	CHF 13000 (single houses) and 65 CHF/m² (apartments)	CHF 4000 + 9 CHF/m²	New construction/extension of heating network in new buildings (15 - 130 CHF/m²)
Zug	from CHF 8500	from CHF 20000 + 400 CHF/kW	ab CHF 4000 + 200 CHF/kW	
Zürich	from CHF 4650	from CHF 10650	CHF 8000 (<15 kWth) CHF 8000 + 20CHF/ kWth (>25 kWth) (must be from RE heating system)	Initial installation of a heat distribution system (CHF 1'600 + 40 CHF/kW)

Source: Own elaboration based on cantonal regulations.

Annex 3 - The case of Canton Zurich

The Canton Zurich plans to reach a fossil-free heating systems by 2040. This requires replacing the around 120,000 oil and gas heating systems that are in operation in the Canton, and are responsible for 40 percent of the Canton CO_2 emissions, to fossil-free alternatives. In the citiy of Zurich for instance, it is envisioned the replacement is made by thermal networks (45 percent), geothermal probes (27 percent), air/water heat pumps (23 percent) and wood and biogas firing systems (5 percent) (Camprubi Hüser 2024).

Following the amendment of the cantonal Energy Act and the introduction of the climate protection article in the canton in 2021 and 2022, which were approved by a clear majority of the people in public consultation, the city of Zurich approved the net-zero climate protection target for 2040 by in May 2022, also backed up by a majority of voters. The amendment to the Energy Act passed by the Cantonal Council on April 19, 2021 stipulates that oil and gas heating systems must be replaced by a climate-neutral heating system at the end of their service life. Heat pumps, district heating or wood heating systems are considered as climate-neutral heating systems. Biogas solutions are also permitted. This new regulation entered into force on September 1, 2022.

Switching to a climate-neutral system is only mandatory if it is technically possible and financially viable. If the life cycle costs[11] are more than 5 percent higher compared to a new oil or gas heating system, an oil or gas heating system may be installed again. This is intended to prevent high additional costs for homeowners and tenants. If replacement with a fossil-free heating system is not technically possible or is too expensive, a new fossil heating system may be installed during the renovation but it must be ensured that 10 percent of the energy consumption is saved or replaced by renewable energy sources. If a homeowner is unable to bear the investment costs of a switchover, the hardship rule applies. This provides for a deferral of the obligation to convert until maximum 3 years after the next change of ownership. This ensures that no one has to sell their owner-occupied home because they are unable to finance the costs of the conversion. Finally, both new and existing buildings may be connected to a heating network if at least 70 percent of this is supplied from renewable energies, leaving some room for not fully decarbonized heating networks.

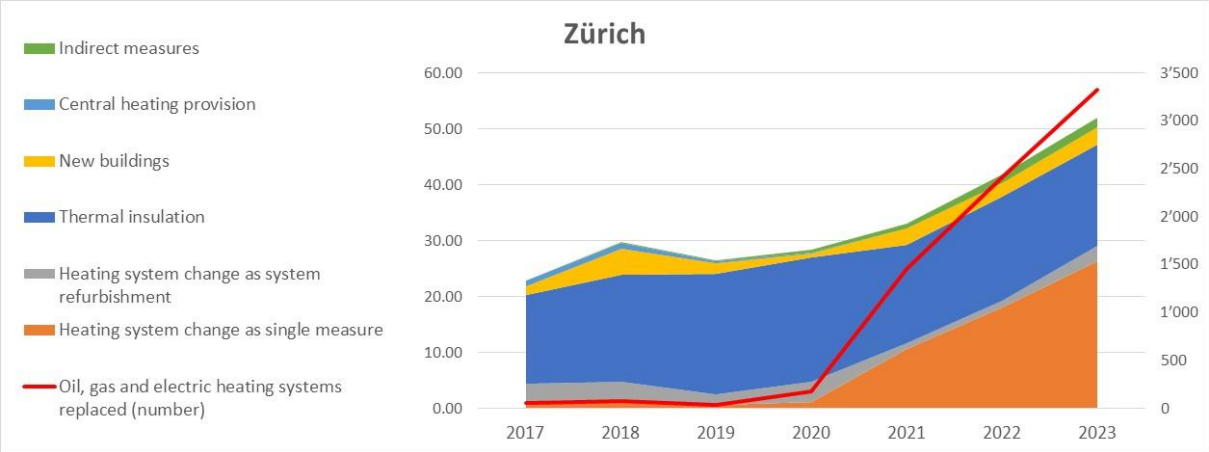
The amendment to the law came together with an increase the total annual cantonal amount for subsidies in the energy sector from CHF 8 million to CHF 15 million. Together with the federal funds, this means that around 65 million CHF will be available each year, which represents an increase of 20 million CHF compared to the previous regulation. It must be noted that compensation in connection with the obligations of the new regulation is not provided for either the building owners or the suppliers of fossil fuels (Camprubi Hüser 2024).

Compensation however will be required in hardship cases where the individual exceptions apply to instal a new fossil-based heating system or continue running it, but the gas network supplying the building is ordered to be shut down by the state under cantonal law. This is provision increases the compatibility of the regulation related to the individual heating system replacement under building renovation, with the regulation regarding the decommissioning of the gas network that are regulated by the Heat Supply Ordinance (Wärmeversorgungsverordnung) of March 16, 2022 (Camprubi Hüser 2024).

Regarding the effectiveness of the fossil heating systems ban, before the change in the regulation, more than every second oil or gas heating system was replaced by a new oil or gas heating system at the end of its service life**.** After the regulation change, the overwhelming majority being replaced by non-fossil alternatives. However, this ban also had an unintended effect: after the ban, the share of replacements that were made as a single measure increased even further, as shown in Figure A3.1. There is no way to infer with the data available what the reason behind this unintended effect is, but a likely explanation is that the higher investment cost of renewable-based heating systems reduces the capacity of homeowners to invest in additional renovation measures, even after accounting for the subsidies.

[11] The law defines life cycle costs as the investment costs and operating costs over the service life.

Figure A3.1 - Evolution of subsidy disbursements and heating systems replacement in the context of the *Gebäudeprogramm* in Canton Zurich since its inception



Source: Own elaboration based on the statistics of the Gebäudeprogramm

From the experience of the canton Zurich, we can conclude that binding rules that ban the new installation of fossil heating systems are effective in aligning the investment decisions of homeowners with the national emissions reduction targets by promoting the installation of low carbon heating system. However, from the experience of this canton, it also becomes obvious that there is a certain trade-off between the investments made in heating system replacements and investments in overall building renovation. This highlights the need of fossil heating bans to be accompanied by much stronger incentives for further renovation measures.

Annex 4 – Sample policy mix for heating system replacement and renovations

Based on the comparative analysis of the cantons, the literature review presented in the previous sections, and informal expert interviews, the table below presents an overview of best practices and desirable design features that could accompany the core policy instruments implemented in Switzerland around the replacement of fossil heating bans and building renovations.

Table 2 – Overview of best practice policies and their design features

	Core policies	Important design features	Complementary policies
Direct subsidies	Gebäudeprogramm	Incentivize not only speed but also depth of renovation (e.g. through fast adoption of MuKEn2025 standards in the cantonal subsidy programs). Offer services that go beyond the initial renovation phase (e.g. energy audits and consulting, planning and execution, etc.)	Support for hardship cases. Measures to pursue a fair distribution of the cost and benefits of the building renovation project among landlords and tenants.
Indirect subsidies	Tax deductions Complementary financing programs for special renovation projects (e.g. buildings under historical protection)	Aim for synergies instead of competition with direct subsidies, and avoid perverse incentives for cantons to slow down ambition to reduce the burden of direct subsidies.	
Promotion of additional financing alternatives	Carbon Offsets Programm, etc. Energy savings-Contracting in (ESC)	Coordinate these (usually, private sector driven) initiatives with cantonal and municipal plans/initiatives (e.g. district heating connection incentives) to avoid competition, duplication, or perverse incentives.	Scaling up of Information channels (e.g. Kantonale Energieberatung) and guidelines to mitigate the risk that private actors provide biased advice that favours their products, improve the user experience, avoid redundancies or inefficiencies in the process of home renovations, and ensure maximisation of cost efficiency and climate-benefits of the renovation processes.
Regulations and standards	Speed up the standardisation of building construction and renovation standards among the federation and the cantons (e.g. like in the 2023 revision of the Noise Abatement Ordinance)	Provide the right financial and legal incentives to cantons for a swift and harmonized implementation of the MuKEn2025.	
Oil and gas heating bans	Make mandatory replacement after lifetime end with a RE system.	Include strong incentives for the replacement of the heating system to be accompanied by further renovation measures, considering the risk of investment displacement.	Support for hardship cases.

Promotion of District Heating Systems	Planning, design, and construction of District Heating Systems (DHSs) in suitable areas with high population density (e.g. urban areas).	High coordination between federal, cantonal and municipal authorities regarding the design, approval, and construction of DHSs. Providing adequate financial incentives (e.g. subsidies) to favour connections to DHSs over individual heating solutions (e.g. heat pumps) to increase the number of private users that decide in favour of this option.	Mandating the connection of public buildings to DHSs in appropriate locations, to increase the economic feasibility of DHSs.
Information and behavioural change instruments	Information campaigns and portals, financing options calculators, technology comparison calculators, renovation cost calculators, energy efficiency counselling offices, etc.	Focus on free-riders and minimizing the rebound effect of energy use after the building renovation.	Renovation consultations and advice at low cost or for free for homeowners.
Tackling scaling-up bottlenecks	Labour force training, skilling and re-skilling programs, focused on sustainable and holistic renovation.	Training for operators in the whole heating systems value chain.	

Source: Own elaboration based on analysis presented in the previous chapters, expert interviews, and literature review.

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