KEYS TO UNDERSTANDING

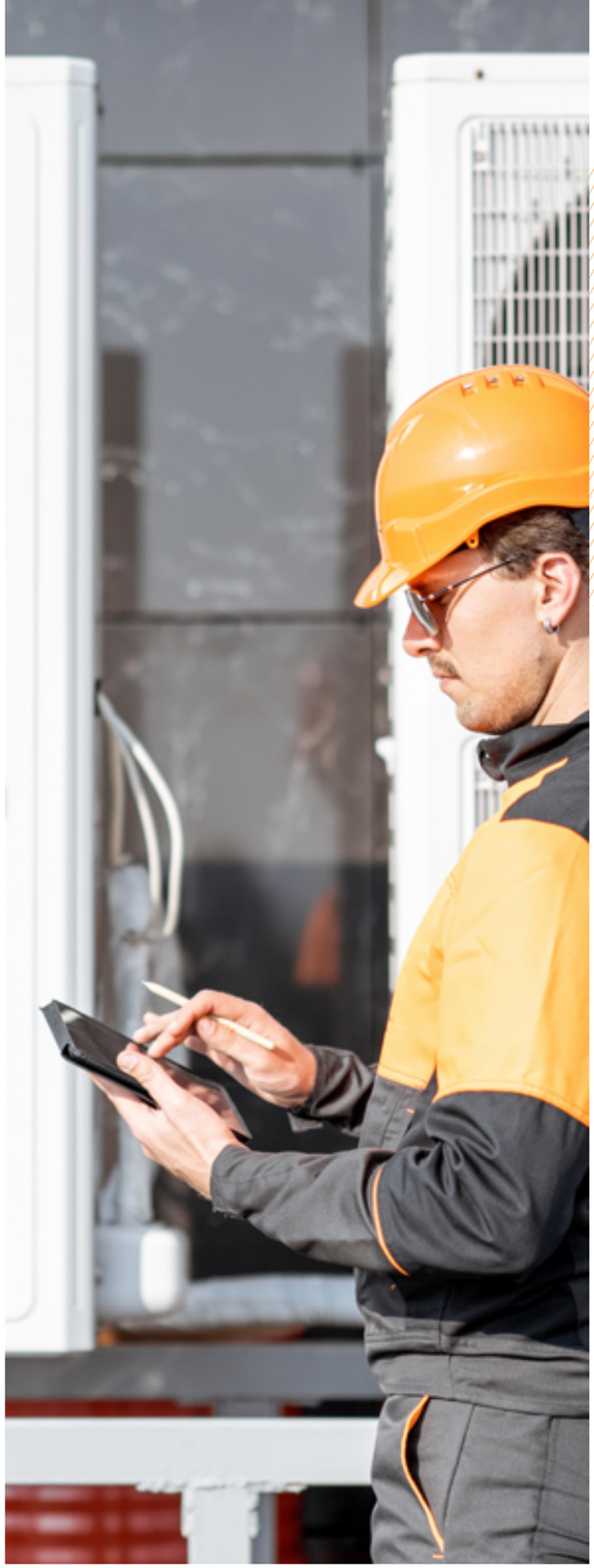
Heat pumps and deep renovations, A win-win combination

Guidance note on the conditions required for heat pumps to play an efficient role in building decarbonisation.

CLER RÉSEAU POUR LA TRANSITION ÉNERGÉTIQUE

ASSOCIATION négaWatt

SUMMARY



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CLER RÉSEAU POUR LA TRANSITION ÉNERGÉTIQUE

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January 2023 – Update april2023

“ Deep renovation is a prerequisite for the optimal operation of heat pumps ”

The acceleration of building decarbonisation is one of the key objectives of the European Union’s Fit For 55 climate package. With the energy crisis, this acceleration has become a priority. As a result, many stakeholders are now calling for the implementation of ambitious heat technology decarbonisation legislation, to enforce an immediate ban on the installation of new gas and oil-fired boilers and the massive replacement of existing boilers with heat pumps. The adoption in the forthcoming revised Ecodesign legislation and Energy Performance of Buildings Directive (EPBD) of a complete and European-wide phase-out of fossil-fuelled heating systems in buildings by 2035 is currently under discussion. Likewise, the French government has been implementing a proactive policy to replace fossil-fuelled boilers by heat pumps, and - as part of its National Recovery and Resilience Plan and Energy Sufficiency Plan - has announced the reinforcement of MaPrimeRénov’ grants* and Energy Savings Certificates (*Certificats d’économie d’énergie*- CEE in French) for such replacements. The négaWatt Association and the CLER-Réseau pour la transition énergétique (Network for Energy Transition) regard the role of heat pumps in both building decarbonisation and the energy transition as essential. However, the two organisations are sounding an alarm concerning appropriate heat pump installation conditions. A technical study conducted by the négaWatt Association in 2022 on the operational and installation requirements of heat pumps installed to replace fossil fuel boilers in ‘leaky homes’ demonstrated that conducting a deep renovation is a prerequisite for optimal heat pump operation. Based on the main lessons drawn from this study and the conclusions of a working group composed of CLER-Réseau pour la transition énergétique members, the two organisations have formulated several national and European level policy recommendations to support the combined implementation of deep renovation and heat pump installation in order to achieve climate neutrality and complete fossil fuel phase-out in the building sector.

*Public scheme set up to support the energy renovation of homes

CONTEXT

Presentation of the négaWatt Association study

Conducted at the end of 2022, the négaWatt Association's study[1] entitled *"Rôle de la pompe à chaleur dans la stratégie de rénovation"* (Role of heat pumps in the renovation strategy) analyses the operating conditions required for a heat pump to replace a boiler in energy performance class F and G homes and clarifies optimal installation conditions.

The study quantifies the impact of several different heat pump installation scenarios (Scenarios without renovation: installation of ordinary, stand-alone heat pumps, heat pumps combined with electric heaters, heat pumps with a backup boiler, hybrid heat pumps or high-temperature heat pumps; Scenarios with deep renovation coupled with the: installation of air/water or water/water heat pumps) in class F and G homes currently heated by oil or gas. The study examines three analysis criteria: greenhouse gas (GHG) emissions, peak electricity demand, final and primary energy consumption[2].
The study modelled heat pump operation for 50% of France's class F and G oil-or-gas-heated residential sector building stock. The sample was composed of approximately 1.4 million dwellings considered as 'leaky homes'. Decarbonising these buildings is considered a priority because of the magnitude of their energy consumption and GHG emissions, and the associated fuel poverty issues. This sample was selected because addressing these buildings within a 2023-2028 time frame means renovating 287,000 homes a year, a number in large measure compatible with the objectives defined for this time horizon in France's roadmap, the Multiannual Energy Plan (Programmation pluriannuelle de l'énergie - PPE in French).

1.https://www.negawatt.org/IMG/pdf/2211_pac_strategie_renovation.pdf

2.Primary energy is the energy contained in energy resources as found in their raw state in nature (oil, gas, coal, uranium, wind, sun, biomass, etc.), while final energy is the energy consumed by the end user.

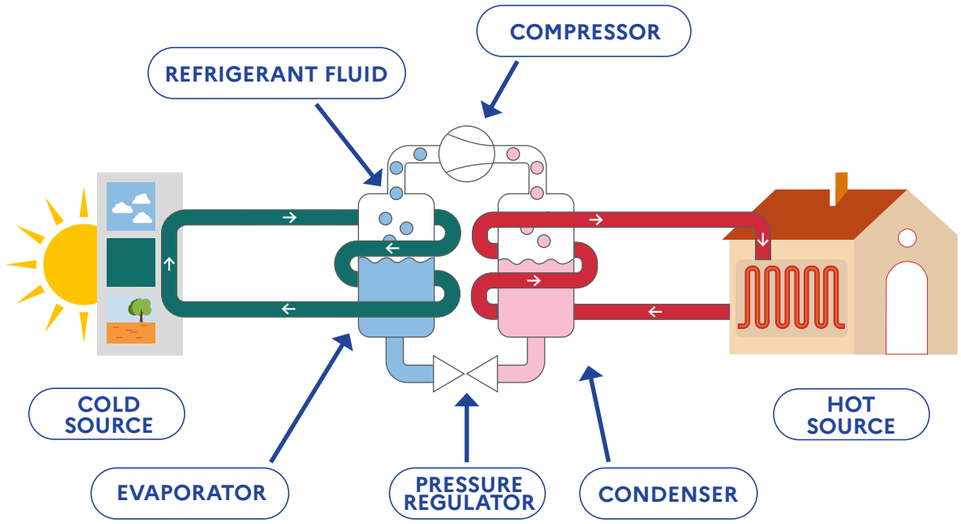
ZOOM

How do heat pumps work?

Heat pumps function differently to boilers. Heat pumps can raise the temperature of an energy by means of an intelligent thermodynamic cycle and a relatively low expenditure of energy. They are a "bi-source" technology, that functions by exchanging heat between two sources: a cold source from which heat is taken and a hot source to which this heat is released once its temperature has been increased.

Thus, a heat pump extracts a given quantity of energy from the environment via the evaporator, increases the temperature of this energy in the compressor by means of an expenditure of electricity, and then releases the energy into the home via the condenser.

The balance of these physical energy flows is expressed through the coefficient of performance (CoP), whose value quantifies the installation's efficiency and optimisation. One of the key rules to remember when installing a heat pump is that its performance is strongly correlated to the hot and cold source temperatures: the lower the temperature difference, the higher the performance;, the higher the temperature difference, the lower the performance.



The working principle of a heat pump

KEY CONSIDERATIONS

Three major lessons of the study

Based on the study's results, the following three key lessons were drawn by the négaWatt Association and CLER-Réseau pour la transition énergétique:

1 / If no energy renovation is performed, a heat pump installed in a leaky home cannot heat the dwelling properly.

In F and G energy performance class buildings (often old, predating 19753), replacing boilers with ordinary, stand-alone heat pumps4 is inappropriate if heat pump installation is not combined with energy renovation. Because heat pumps operate differently to boilers, they can be installed if (and only if) the operating temperature of the building's existing radiators is compatible with the supply temperature the heat pump is able to provide (lower than 55°C-60°C in most cases). However, old homes are often equipped with radiators that, in very cold weather, require supply temperatures between 75°C and 90°C. As a result of insufficient outlet temperatures, heat pumps cannot provide sufficient power to a dwelling when outdoor temperatures are below 5°C or 9°C (depending on the region), and therefore cannot properly heat the dwelling. As a result, indoor temperature is insufficient, cannot exceed 14°C in very cold weather, and generates significant thermal discomfort.

3.https://www.statistiques.developpement-durable.gouv.fr/enquete-performance-de-lhabitat-equipements-besoins-et-usages-de-lenergie-phebus

4.Low and medium temperature heat pumps, which are the best-selling technologies on the market.

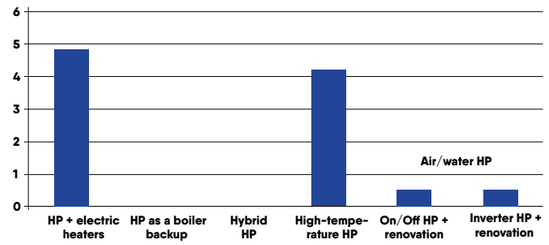
2 / If no energy renovation is performed, installation of high-temperature heat pumps or heat pumps backed by an additional heating system generates a significant increase in electricity consumption and peak electricity demand, and does not sufficiently reduce greenhouse gas (GHG) emissions.

The installation of high-temperature heat pumps (with an operating temperature above 60°C) or of heat pumps coupled with another heating technology (i.e. coupled with electric heaters, a backup boiler or hybrid heat pumps[4]) are solutions available on the market for the installation of heat pumps in poorly insulated and/or old homes, without conducting prior or simultaneous energy renovation. However, the study shows that these solutions create several damaging kickback effects:

- High-temperature heat pumps, and in particular heat pumps coupled with electric heaters, generate extra electricity consumption and power demand that create considerable problems and challenges in terms of power grid management (peak electricity demand) and household-borne cost.

- Heat pumps with backup boilers and hybrid heat pumps do not sufficiently reduce GHG emissions, as they keep fossil energy consumption elevated over the long term, and generate high heating costs (dual gas and electricity subscription charges paid by the consumer).

Electrical power demand (GWe) for outdoor temperature of -5°C

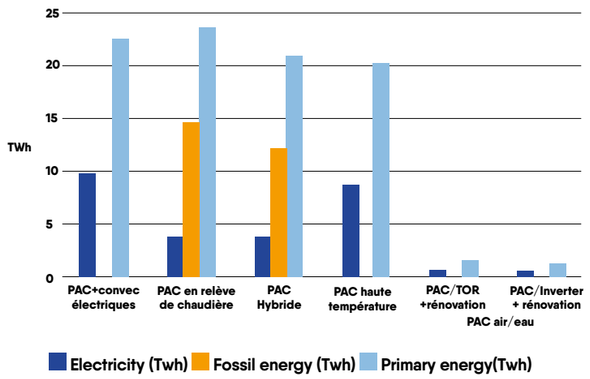


* The other heating technology takes over when the heat pump cannot operate.

The installation of a high-temperature heat pump or a heat pump coupled with an electric heater significantly reduces GHG emissions. However, such installations generate a high power demand. Compared to current demand, high-temperature heat pumps increase peak electricity demand by +4.2 GWe, while heat pumps coupled with electric heaters increase peak electricity demand by +4.8 GWe. Such increases are hard to manage and would require the commissioning of gas-fired power plants generating significant GHG emissions.

On/Off and Inverter designate the two possible heat pump regulation modes: on or off, or with variable compressor speed.

Electricity, fossil energy and primary energy consumption (TWh)

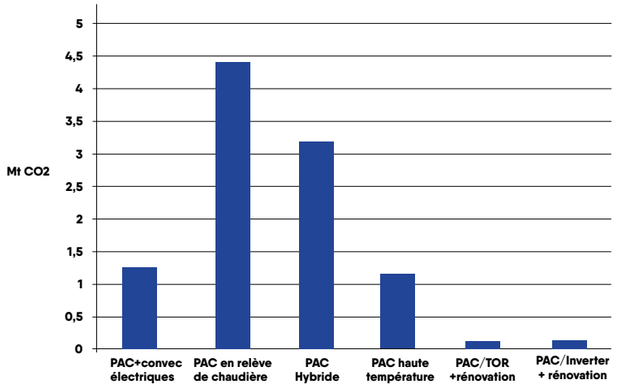


Current consumption levels of 50% of class F and G oil-or-gas-heated dwellings:
- Electricity: 0 TWh
- Fossil energy: 26.3 TWh
- Primary energy: 25.3 TWh

In the studied sample, in the absence of prior energy renovation, the installation of heat pumps coupled with electric heaters generates a sharp increase in electricity consumption (+9.8 TWh). For heat pumps with backup boilers, the increase in electricity consumption is 3.9 TWh, with 14.7 TWh of fossil energy consumption remaining (reduced to 12.1 TWh for hybrid heat pumps) of the original 26.3 TWh. Finally, the installation of high-temperature heat pumps still leads to an electricity consumption of 8.8 TWh, ultimately reducing household bills by only 9%. In a scenario with combined deep renovation, electricity consumption is reduced to 0.5 TWh.

Source : All diagrams are taken from the négaWatt Association's study, and the evaluation perimeter is 50% of oil-or-gas-heated class F and G homes. . (www.negawatt.org/IMG/pdf/2211_pac_strategie_renovation.pdf)

Greenhouse gas emissions (Mt CO_2)



Current emission levels of 50% of class F and G oil-or-gas-heated dwellings: 7,02 Mt

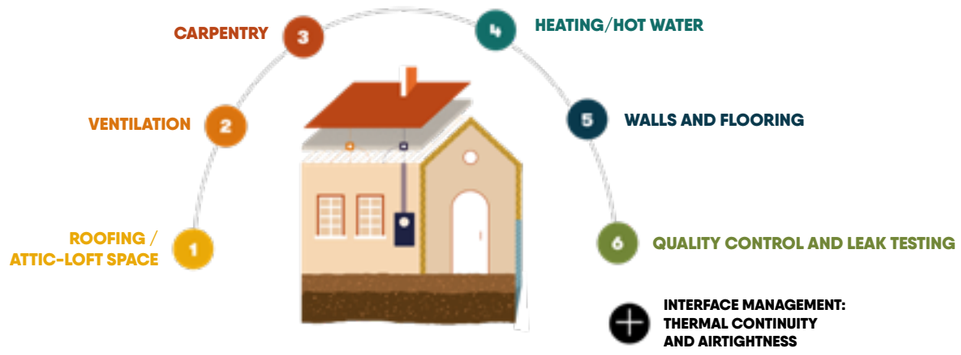
When an air/water heat pump coupled with a backup boiler is installed without any combined energy renovation works, gas consumption remains high (14.7 TWh/year compared to today's 26.3 TWh/year) and does not permit removal of the fossil-fuelled heating system from the building. GHG emissions reductions are limited to 37%, whereas they reach 99% for the installation of an air/water heat pump with combined deep renovation. In the case of a hybrid heat pump, performance is improved but remains significantly below that of deep renovation scenarios: GHG emissions are reduced by 54% compared to today, but annual gas consumption remains at 12.1 TWh/year.

ZOOM

Boiler replacement, comprehensive renovation: What first?

For an energy renovation to achieve a sufficient level of performance (i.e. the French regulatory objective of building stock renovation to BBC (*Bâtiment Basse Consommation* - Low Energy Building) standard by 2050 or the zero-emission building objective under discussion in the EPBD), there must be excellent coordination between all parts of the renovation project, and therefore between all intervening professionals. Judicious back-to-back scheduling and planning of work are therefore key. Indeed, multiple studies[5] and work site feedback show that superposition of disorganised interventions over time, without prior planning of their juxtaposition, at best generates extremely mediocre results in terms of energy gains, and frequently generates disorders (pathologies, mould) and overconsumption (and therefore extra costs). If a boiler is changed before a home is insulated, once the insulation is completed the boiler will be oversized, leading to additional costs. Potential energy savings will also be amputated. In the case of heat pumps, it is impossible to lower emitter operating temperatures if heating needs have not been reduced by limiting losses, and insufficient supply temperature will cause a technical incident.

5. ADEME, janvier 2021 : https://librairie.ademe.fr/cadic/4952/rapport-renovations-performantes-par-etapes-2021.pdf



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3 / As part of a deep renovation programme, heat pumps are an essential tool for building decarbonisation and electricity peak demand reduction, a priority issue for France.

Although the heat pump market is today focused mainly on the construction sector, the négaWatt Association's study demonstrates that heat pump development has an essential role to play in the energy renovation market, if this development is properly managed. Proper understanding of heat pump installation requirements and integration of these rules into MaPrimeRénov and Energy Saving Certificate type aid schemes will enable optimal heat pump operation and deployment. Under these conditions, heat pumps are without a doubt one of France's key building decarbonisation solutions.

When heat pump installation is carried out as part of a BBC standard renovation (losses reduced by a factor of 3 to 4.5), results in terms of consumption, electrical power demand and GHG emission reduction are excellent. By enabling the reduction of the operating temperatures of existing radiators from 90°C to 45°C (and even 35°C for underfloor heating), deep renovation enables heat pumps to operate properly, without technical incidents and under optimal conditions.

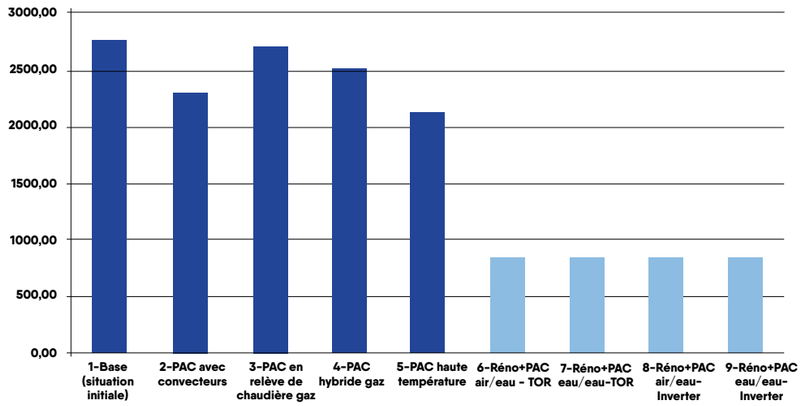
Through its analysis of the performance of air/water and water/water heat pumps, regulated by "on/off" or "inverter" (i.e. variable compressor speed) systems, the study also demonstrates that if inverter regulated water/water heat pumps can be installed, performance is further improved. In addition, the study shows that it is possible to optimise heat pump sizing rules by increasing the value selected for the load factor at minimum outdoor temperature from 70 to 87%, thereby improving performance.

ORDERS OF MAGNITUDE

100-fold reduction
of greenhouse gas emissions and 15-fold reduction of primary energy consumption

This is the potential result obtained on the sample studied, i.e. 50% of energy performance class F and G homes currently heated by fossil fuels, thanks to a combined 'heat pump installation + deep renovation' strategy. Furthermore, applying this strategy to all F and G class fossil-fuel-heated homes would require a maximum power demand of only 1.0 GWe and consume only 1.3 TWh of electricity.

Energy cost of different heat pump solutions



Energy bills include gas and electricity contract charges and consumption costs for space heating (class F), as well as household electrical consumption (2,200 kWh/year).

Reductions in household energy bills vary greatly with mode of heat pump use. Without prior renovation, heat pumps coupled with a backup boiler reduce household bills by only 1.6%, compared to 9% for hybrid heat pumps, 17% for heat pumps coupled with electric heaters6 and 22% for high-temperature heat pumps. With prior deep renovation, heat pump installation reduces household bills by 70%, thereby providing a solution that rises to the challenge of fuel poverty.

6. A kWh of electricity is more expensive than a kWh of gas. However, the hybrid heat pump configuration leads to a higher energy bill than the electric-heater-coupled heat pump configuration as it generates an additional gas contract charge.

POLICY RECOMMENDATIONS

For redirecting heat pump development

On the basis of the study's results and (operational)feedback of a working group conducted throughout 2022, composed of several actors from the energy renovation world (ALEC Métropole Marseillaise, ALEC Ouest Essonne, AMORCE, Dorémi, Enertech, Lehmann & Fils, Lorraine Énergies Renouvelables), CLER-Réseau pour la transition énergétique and négaWatt Association issue the following policy recommendations.

I. National level recommendations:

1- Restructuring of the renovation aid system to support the installation of the most efficient equipments and the deep renovation + heat pump installation' combination

• Requirement of an emitter operating temperature below 55°C for heat pump installation

In their current form, the rules defined in terms of installation requirements (emitter water/air operating temperature, insulation level) by aid schemes supporting the replacement of boilers by heat pumps (MaPrimeRénov, Energy Saving Certificates) lack clarity. This shortcoming is causing malfunctions and even serious system failures, which are beginning to be catalogued by consumer associations.[7] To avoid the multiplication of counter-references and the risk of discrediting the heat pump sector, installation aid must be made conditional upon an emitter (radiator, underfloor heating) temperature below or equal to 55°C. Germany's deep renovation programmes will be integrating a heat pump installation criterion corresponding to a maximum emitter operating temperature of 55°C. To receive aid, beneficiaries will have to provide a certificate proving the building's compatibility with this criterion.

Technical criteria could be similarly introduced into public (MaPrimeRénov') and private (Energy Saving Certificate) aid schemes in order to ensure proper functioning and optimal performance of heat pumps. CLER-Réseau pour la transition énergétique and the négaWatt Association propose that the following condition be integrated into the MaPrimeRénov' grants, as well as into the Energy Saving Certificate BAR TH 104[8] and BAR-TH-166[9] technical sheets: the water supply temperature required for operation of existing heat emitters at the minimal outdoor temperature[10] must not exceed 55°C. If this condition is satisfied, heat pump and backup (if there is one) capacity will be sized appropriately. This condition would guarantee that heat pumps are not installed in poorly insulated homes.

• Priority steering of aid towards deep renovation

Given the risks of a conventional heat pump malfunctioning when installed to replace a boiler in a non-insulated home (inability of heat pump to reach required emitter temperature) and given the considerable gains enabled by the 'BBC standard (losses reduced by a factor of 3 to 4.5) high-performance renovation + heat pump installation' combination in terms of reduced energy consumption, greenhouse gas emissions and electrical power demand, this winning combination should be given priority.

Current patterns of attribution of financial aid to energy renovation show that replacing heating systems is given precedence over building envelope insulation. For example, in its 2021 report, the French National Housing Agency (*Agence Nationale de l'Habitat* - Anah in French) writes that 70% of the 3.11 billion Euros of MaPrimeRénov' grants were attributed to heating system replacement (including a large number of heat pump installations), while 26% were attributed to insulation works. Replacing boilers and insulating dwellings are complementary interventions. However, to achieve the highest level of energy performance[11] and correct sizing of a heat pump so that it performs its primary heating function optimally - regardless of outdoor temperature - the sequencing of renovation steps must respect certain a hierarchy and certain priorities. Indeed, as already mentioned, if a boiler is replaced by a heat pump[12] before thermal insulation work is completed, the heat pump will not be able to heat the dwelling properly when the outdoor temperature drops below 5°C or 9°C (depending on the region).

To ensure renovation aid scheme effectiveness and proper functioning of installations, the State and local authorities must, whenever possible, enforce the imperative coupling of heat pump installation with deep renovation (be this a global or step-by-step deep renovation, with heating system replaced last).

With this in mind, we also propose revising the Energy Saving Certificate BAR-TH-164 'global' renovation' technical sheet and the associated financial support[13] by making the aid conditional upon the performance of envelope insulation work prior to heating system replacement. This technical sheet revision should be harmonised with the definition of the step-by-step BBC standard currently in progress, by proposing that the first step be a work package targeting both envelope insulation and ventilation

7. https://jhm.fr/vigilance-sur-linstallation-de-pompes-a-chaleur/ https://actu.fr/bretagne/loudeac_22136/cotes-darmor-gare-aux-arnaques-aux-pompes-a-chaleur_48621626.html

8. Standardised operation: Installation of an air/water or water/water heat pump.

9. Standardised operation: Installation of an air/water or water/water collective heat pump.

10. The minimum outdoor temperature is the lowest temperature recorded in a territorial department. It varies with climatic zones and altitude. For example, the minimum outdoor temperature of a dwelling in Tours is -7°C.

11. La rénovation performante par étapes, ADEME, janvier 2021 https://librairie.ademe.fr/cadic/4952/rapport-renovations-performantes-par-etapes-2021.pdf

12. Excluding high-temperature heat pumps.

13. According to aid-specific statistics, in 2022, 75% of projects included the installation of a heat pump.

items. In addition, both of these tools should respect the definition of deep renovation introduced in the "Climate and Resilience Law" of August 22, 2021.

• Incentives for the installation of water/water heat pumps when feasible
CLER-Réseau pour la transition énergétique and the négaWatt Association also propose to strengthen aids for water/water heat pump installation. Although water/water heat pumps perform better, they are still more expensive to purchase, less known and as a result less chosen. In fact, in 2021, only 3,220 water/water heat pump units were sold, compared to 253,140 air/water heat pump units[14].
Conversely, air/air heat pumps are the worst performing. And, although they no longer receive public aid, they are still well ahead in heat pump sales (758,000 units sold in 2021[15]). Nevertheless, air/air heat pump installation may sometimes be legitimate in homes originally heated by electric heaters, if associated with a simultaneous deep renovation.

• Improved supervision of the installation of heat pumps with backup heating system
Support for installation of hybrid heat pumps, high-temperature heat pumps and heat pumps coupled to an additional heating system must be better regulated and target certain situations in which this type of installation is relevant, such as buildings that cannot be deeply renovated or boiler failure and emergency replacement.

• Improved control of equipment prices and installation costs
It would also be useful to integrate heat-pump-specific price control into revised renovation aid schemes (MaPrimeRénov' and Energy Savings Certificates) in order to prevent abuses in customer invoicing. For households to be attributed aid, quotes would have to remain within a price range defined by decree. Price range could in addition include the drilling costs for geothermal heat pump installation.

2- Conditioning of heating system replacement upon a compulsory consultation with a one-stop-shop advice centre

Compulsory consultation with a one-stop-shop France Rénov' information and advice desk would allow individuals to benefit from a neutral, free and independent opinion on commercial solicitations, and thus assess whether these match their building project and are adapted to their housing situation. Advisers can assess the quality of professional quotes and the prices based on heat pump type, thereby detecting any abuse in rates applied.
Thus, households can be alerted to the risks associated with canvassing. A French law dated July 24, 2020 prohibits canvassing and telephone prospecting in the energy renovation sector. However, many people are still confronted with canvassing, as reported by one-stop-shop advisers and consumer protection associations to whom people turn for help after signing a quote for the installation of a heat pump. The one-stop-shops also recommend the utmost vigilance at trade shows and fairs, where buyers have no right to withdraw after signing a contract.

CLER-Réseau pour la transition énergétique and négaWatt Association therefore reiterate the importance of integrating trusted third-party monitoring into one-stop-shop missions, throughout the entire renovation process and with financial resources to match. In order to successfully fulfil this mission, advisers must imperatively be upskilled in heat pump installation requirements.

The role played by 'Mon accompagnateur Rénov' (renovation advisers), defined by the decree of July 22, 2022 and implemented progressively as of 2023, will also be decisive as advisers will be responsible for identifying the priority actions required for deep renovations. Support provided will primarily target low-income households, as these are the households who own most energy-hungry homes and who are directly impacted by fuel poverty. In order to guarantee high-quality support, all future renovation advisers must be upskilled in deep renovation.

3- Improvement of the Recognised Environmental Guarantor (*Reconnu garant de l'environnement* - RGE in French) label through a harmonised heat loss calculation methodology

After the initial technical visit, heat pump installation professionals must perform a room-by-room heat loss calculation to estimate dwelling heat losses, in order for the capacity of the heat pump to be sized as accurately as possible. This heat loss and heat pump sizing calculation - made mandatory since April 1, 2022 by the decree of December 17, 2021 - serves as supporting documentation as required by the BAR-TH-104 and BAR-TH-159 standardised technical sheets.

Currently, there is no harmonised methodology used by installers for heat loss calculation. Some installers use heat pump sizing software often provided by manufacturers, while other installers rely on a much rougher methodology. Empirical calculation methods, which compromise the accuracy of the results, are very widely used by certain professionals.

Harmonisation of the different heat loss calculation methodologies via suitable software could enable heat pumps and operating temperatures to be sized more accurately to fit dwellings and their emitter characteristics. Currently, the RGE label mentions a consistent operating (water) temperature for existing radiators. Therefore, both a harmonised heat loss calculation methodology and a specific operating (water) temperature not to be exceeded (55°C) could be integrated into the RGE label.

4- Reinforced communication relative to heat pump maintenance and integration of a proof of maintenance requirement in insurance contracts

Heat pump maintenance at least once every two years has been compulsory since the end of July 2020[16]. For certain types of equipment, verification of refrigerant circuit watertightness is compulsory once a year. However, there is still a lack of knowledge on the subject, and a number of professionals in the sector do not offer maintenance contracts to individuals. A communication campaign would be needed so that everyone is aware of this inspection and

14. Observ'ER 2022 – 2021 market trends for individual heat pumps http://www.energies-renouvelables.org/observ-er/etudes/Observ-ER-Marche-2021-pompes-a-chaleur-20220606.pdf

15. Ibid.

16. https://www.legifrance.gouv.fr/jorf/id/JORFTEXT000042164734

maintenance requirement. Integrating a heat pump proof of maintenance requirement into insurance contracts would be another way of encouraging individuals to set up maintenance contracts.

II. European level recommendations

1- Reinforcement of the ambition of European directives relating to the energy performance of buildings and energy efficiency

The introduction of specific criteria for heat pump installation in buildings is being discussed in the European Parliament, as part of the Energy Performance of Buildings Directive's revision process. Conditioning heat pump installation to a minimum performance threshold (e.g. an energy performance class D building) has been suggested. However, such a threshold would not guarantee proper heat pump operation. A criterion limiting maximum emitter operating temperature to 55°C would be more relevant. Generally speaking, we also believe it is essential that the revision of the EPBD directive send a clear signal: renovation policies undertaken by Member States must - as a priority - support deep renovations.
In parallel, CLER-Réseau pour la transition énergétique and the négaWatt Association request that France supports the reinforcement of the 'Energy Efficiency First'principle in discussions relating to the revision of the directive on energy efficiency.

2- Reinforcement of heat pump energy performance requirements in ecodesign-related regulations

In European ecodesign and energy labelling regulations, heat pumps are treated together with all other central heating devices. They are labelled on the same scale as gas and oil boilers and are classified between A+ and A+++ levels.

Today, this 2013 energy performance scale is widely criticised, as it allows most gas boilers to reach class A, which does not send a good message to consumers. An urgent revision is being called for. The European Commission is working on a new scale, that may revert to a simple A to G classification, with classes A and B reserved for heat pumps and other renewable energy fuelled systems. Revision of the scale could also provide an opportunity for reinforcement of required performance levels, so that only very high energy performance heat pumps are attributed the highest energy performance class. Introducing a second GHG emissions related scale would also refine the characterisation of the different heat technologies.

In parallel, ecodesign regulations are targeting gradual withdrawal of the least efficient models from the market in order to force manufacturers to gradually increase heat pump performance. Heat pump requirements are old, also dating back to 2013. For now, the European Commission has no intention of significantly modifying them. Therefore, although the best performances found on the market today exceed 150% and 200% respectively[18], minimal Seasonal Space Heating Energy Efficiency (ηs)[17] would remain at 110% for high-temperature heat pumps and 130% for low-temperature systems. In light of the above, it seems legitimate to strengthen heat pump requirements. A position that France should advocate in European discussions.

17. The Seasonal Space Heating Energy Efficiency (ηs) is an annual yield expressed in terms of primary energy. It is related to the CoP as follows: CoP = ηs x 2.5. Source : https://eur-lex.europa.eu/legal-content/FR/TXT/?uri=CELEX:32013R0813 - annexe 3

18. A list of the best heat pump models available on the French market can be consulted on the Guide Topten website www.guidetopten.fr

KEY CONCLUSIONS IN BRIEF

Summary of policy recommendations

NATIONAL LEVEL

- **Restructuring of the renovation aid system** to support installation of the most efficient devices and the "deep renovation + heat pump installation" combination;
- **Conditioning of heating system replacement upon a compulsory consultation with a one-stop-shop** advice centre to guarantee quality and neutrality of advice;
- **Improvement of the RGE label through a harmonised heat loss calculation methodology** in order to improve heat pump sizing accuracy to fit the home and its emitter characteristics;
- **Reinforced communication relative to heat pump maintenance and integration of a proof of maintenance requirement in insurance contracts.**

EUROPEAN LEVEL

- **Reinforcement of the ambition of European directives relating to the energy performance of buildings and energy efficiency** in order to guarantee better appliance efficiency and to support deep renovations;
- **Reinforcement of heat pump energy performance requirements in ecodesign-related regulations.**

CLER RÉSEAU POUR LA TRANSITION ÉNERGÉTIQUE

CLER–Réseau pour la transition énergétique is a non-profit association bringing together close to 300 organisations (non-profit associations, businesses, municipalities) committed to the implementation of an ambitious energy transition throughout France.

For further details: www.cler.org

ASSOCIATION négaWatt

Since its creation in 2001, **the négaWatt Association** has been promoting the reduction of our energy consumption. Its approach is centred on energy sufficiency, energy efficiency and renewable sources – as a threefold lever towards a society with greater respect for resources, its environment and its people. négaWatt's specificity lies in its collective ability to analyse energy issues with a global approach and to propose concrete, realistic and field experience-based solutions.

For further details: www.negawatt.org