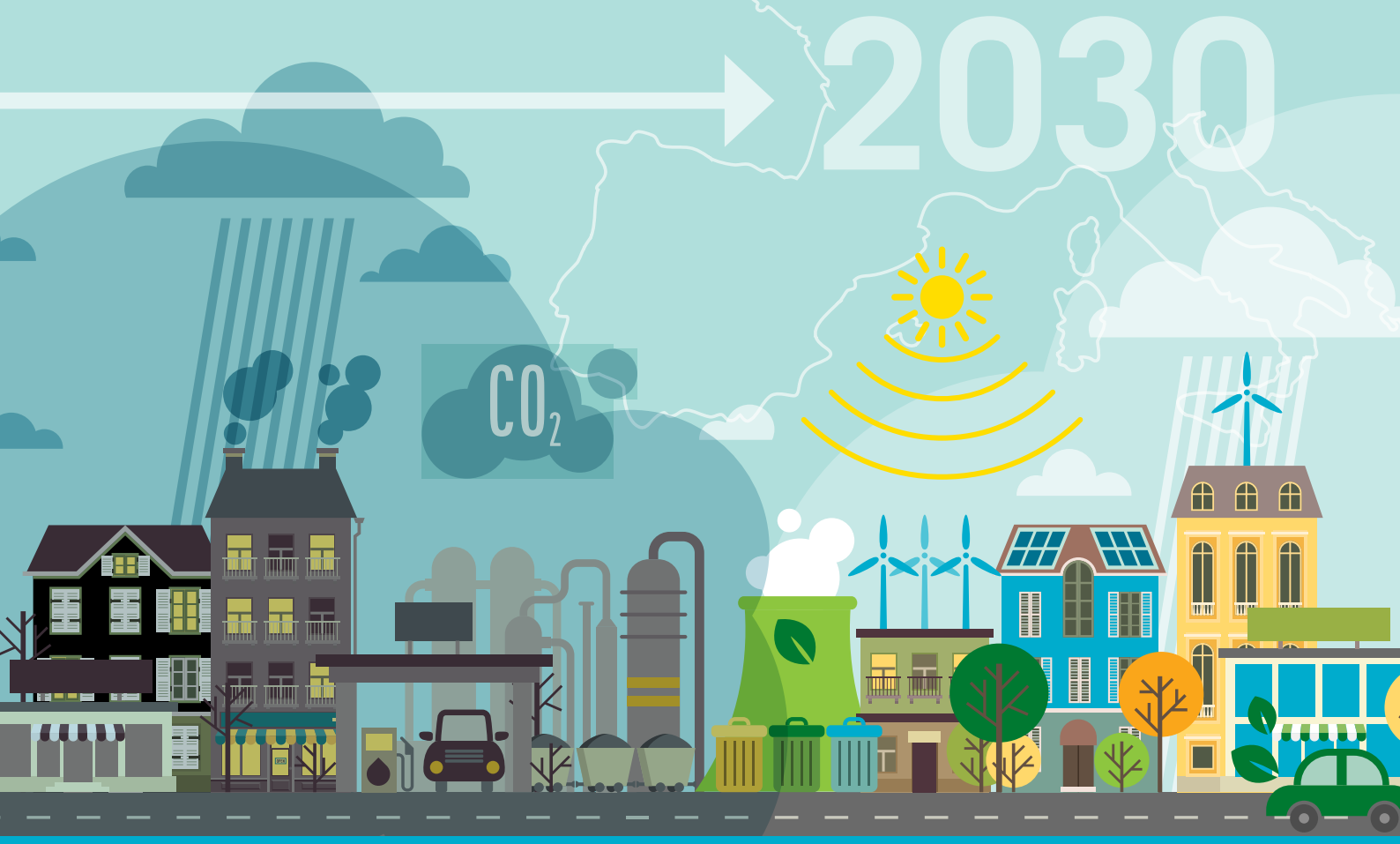
On the way to a CLIMATE-NEUTRAL EUROPE



CONTRIBUTIONS FROM THE BUILDING SECTOR TO A STRENGTHENED 2030 CLIMATE TARGET

10 YEARS BPIE

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THE CURRENT DEEP RENOVATION RATE OF 0.2% PER YEAR NEEDS TO GROW BY AT LEAST A FACTOR 10 TO 2% AND SHOULD APPROACH 3% AS QUICKLY AS POSSIBLE.

HIGHLIGHTS

To achieve its climate neutrality objective, the European Union must accelerate greenhouse gas (GHG) emissions reduction in this decade. The building sector can be a central pillar of this effort and can make a significant contribution to a strengthened 2030 GHG reduction target. Increasing actions and investment to accelerate building renovations will also lead to sustaining a green economic recovery from the coronavirus pandemic and improved living conditions for Europeans.

This paper answers the question how quickly the building sector can reduce its CO_2 emissions and what actions will be necessary to achieve this. Using the European Calculator (EUCalc) model[1], the paper presents two possible pathways of emissions reductions in the building sector to 2030 and describes the respective measures to achieve them.

The "Moderate Policy Scenario" foresees a moderate acceleration of actions compared to current trends and policies, including a doubling of the renovation rate.

The "Responsible Policy Scenario" builds on these measures but increases the depth and speed of change in the sector, and further integrates decisions to switch to more climate-aware and environmentally responsible behaviour.

Only the Responsible Policy Scenario achieves emissions reductions in the range of 60% compared to 2015, which is aligned with a 55% GHG emission cut in 2030 as supported by the European Commission and highlighted in the Renovation Wave. It requires a transformation in the sector which changes current construction and renovation practices and supports the combination of strong efficiency measures with a phasing out of fossil fuels and switch to renewable energy. The scenario delivers an energy saving of almost 25% in energy used for heating and cooling by 2030 compared to 2015, equivalent to an average energy saving of 2.5% per year.

The current deep renovation rate of 0.2%/a needs to grow by at least a factor 10 to 2% and should approach 3% as quickly as possible. The scenario describes how the share of fossil fuels in the energy mix in 2030 will decrease by 54% compared to 2015, while the renewable heat and electricity share will grow to 53% of the final energy demand.

This transformation will be possible with effective policies and support instruments. The Renovation Wave is opening the way to measures that will transform the building sector, but the implementation of policies and support instruments must become faster and more ambitious.

The Responsible Policy Scenario and its associated assumptions gives guidance for possible measures that could achieve a greater impact:

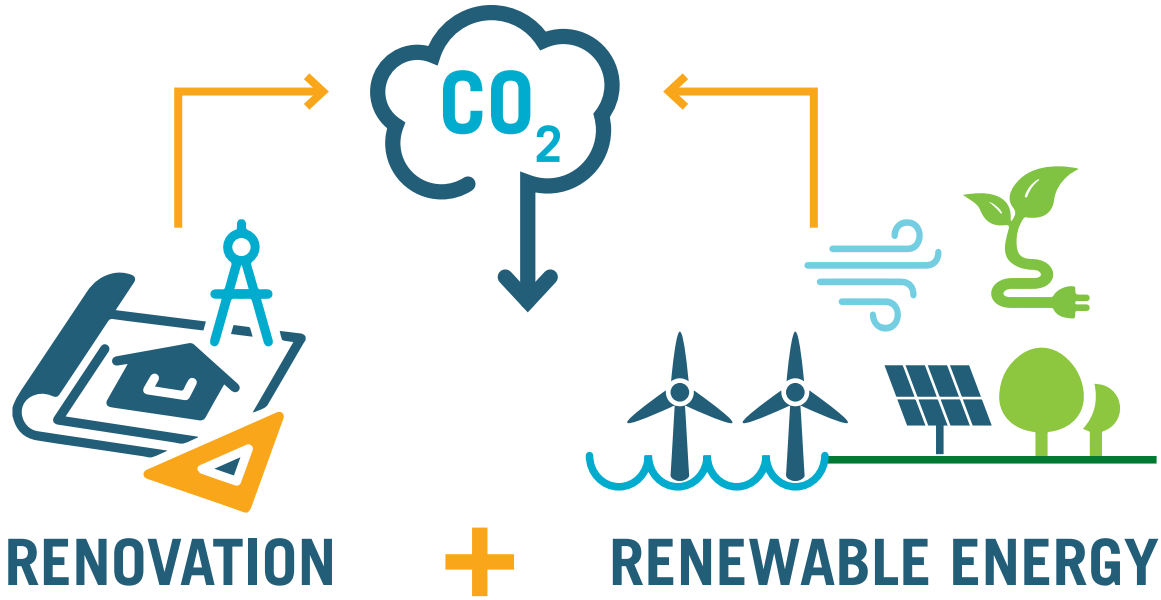
- The average rate of renovation should be increased to at least 3% per year to ensure the renovation of the full building stock by mid-century.
- Renovation practice needs to be scaled up to industrial levels. A focus on deep renovation will reduce energy demand in buildings and will replace existing heating systems with more efficient and renewables-based systems.
- All renovations should follow the nearly zero-energy building (NZEB) principle, i.e. achieving the highest efficiency level of a given building type while supplying the remaining energy demand from renewable sources.

[1] http://tool.european-calculator.eu/intro

- A strategic effort to decarbonise heating and cooling energy supply and to invest in low temperature renewable heat supply infrastructure is needed.
- The use of fossil fuels for heating and hot water in buildings should drastically decrease in the next decade. Considering that the average lifetime of heating equipment is in the range of 15-20 years, policies to discourage installation of new fossil-fuel based systems should be implemented.
- To achieve faster and deep renovations, mandatory minimum energy performance requirements can be an effective policy, as indicated in the Renovation Wave. These should be tailored to specific segments of the building stock and ownership tenures and coupled with financing and targeted advice.
- Member States should rigorously follow the NZEB principle for all new buildings. As of 1 January 2021, all new buildings in the EU must be NZEBs, combining very high energy performance with significant renewable energy supply. No new fossil fuel heating system should be installed in new construction from 2021 onwards. Any new installation of fossil fuels-based heating systems locks in CO_2 emissions for the next two decades.

The more the transformation is delayed, the higher the effort in increasing renovation rate and depth will have to be in the next decade.

The expected revisions of the Energy Efficiency Directive, the Renewable Energy Directive and the Energy Performance of Buildings Directive in 2021 are crucial opportunities to enshrine the needed changes into legislation and the increased financial support provided by the Next Generation EU must be used to help this change materialize. EU Member States need to increase the speed and effectiveness of national policies and should launch effective action on the ground by involving citizens, local authorities, investors and the construction value chain.



INTRODUCTION

Citizens in Europe are seriously concerned about climate change and support strong action.[2] The strengthening of the EU's objective to reduce GHG emissions reflects this and responds to the urgent need to act as the impacts of climate change increase in Europe and globally. To achieve the EU 2050 climate neutrality objective, we need to accelerate CO_2 emissions cuts in this decade. The policy response must ensure that all sectors are contributing to the transformation. The building sector, which is responsible for 36% of CO_2 emissions, must be a central pillar of the transformation to the climate-neutral society.

Increasing efforts to reduce emissions and direct financing to help with this transition will contribute to sustaining a green economic recovery from the coronavirus pandemic. Investing to reduce energy demand and emissions in the building sector means improving living conditions for Europeans and supporting the creation of local jobs. The recently published Renovation Wave[3] sets out a comprehensive strategy to support climate neutrality and economic recovery through actions in the building sector. It provides a detailed list of policies, measures and tools that must be put in place in the coming years to overcome existing barriers to renovation and mobilise all actors, including citizens, local authorities, investors and the construction value chain.

This paper answers the question of how quickly the sector can reduce its CO_2 emissions and what changes will be necessary to achieve this. Using the recent European Calculator (EUCalc) model[4] funded by the European Commission, the paper presents two possible pathways of emission reductions in the building sector to 2030 and describes the respective measures to achieve them.

The first scenario (the "Moderate Policy Scenario") foresees a moderate acceleration of actions compared to current trends and policies. The second scenario ("Responsible Policy Scenario") builds on these measures but increases the depth and speed of change in the sector, and further integrates decisions to switch to more climate-aware and environmentally responsible behaviour.

The analysis puts the focus on areas in which specific strong policy intervention and a fast change in technology deployment is needed. In particular, the Responsible Policy Scenario includes a turn-around of some societal trends observed in the past decades.

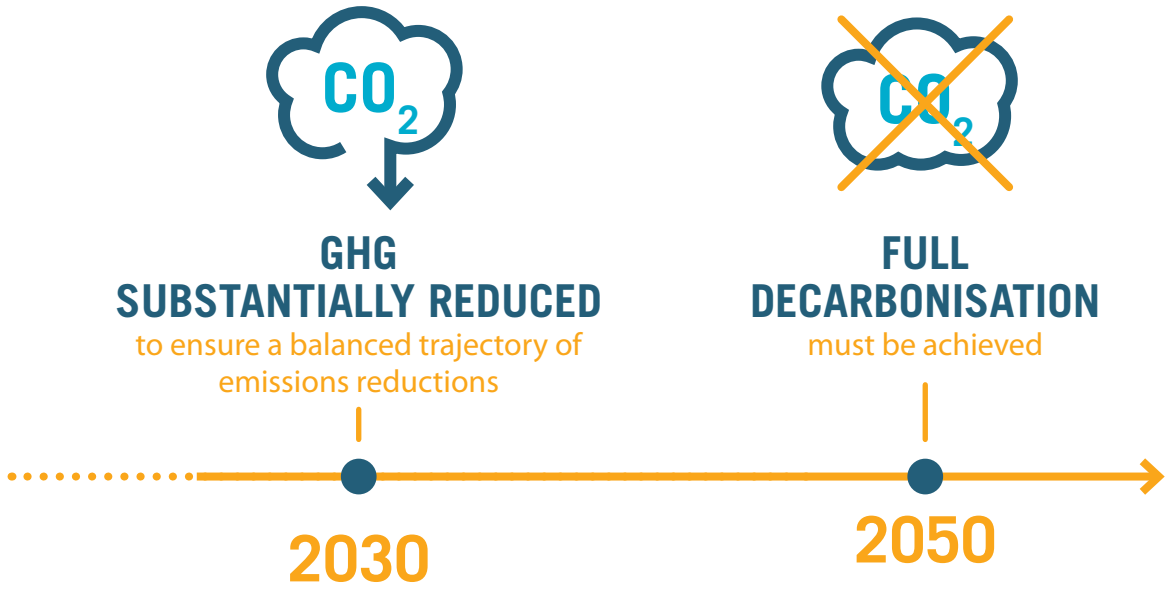
[2] See e.g. Eurobarometer report 501
[3] https://ec.europa.eu/energy/sites/ener/files/eu_renovation_wave_strategy.pdf
[4] http://tool.european-calculator.eu/intro

MODELLING CO_2 EMISSION AND ENERGY DEMAND REDUCTION POTENTIAL IN BUILDINGS

Emissions reductions in the building sector can be achieved by combining measures that reduce the energy consumption of the building stock, improve the efficiency of the energy supplied and ensure a switch of the energy used from fossil fuels towards sustainable renewable energy. While full decarbonisation must be achieved by 2050, to ensure a balanced trajectory of emissions reductions, CO_2 emissions must be substantially reduced by 2030.

The EUCalc model covers different sectors such as transport, buildings and land use in separate modules, and integrates their interactions ([1]–[3]). The pathways developed for this report are based only on the i) building module, ii) power module and iii) lifestyle module in its section related to homes. As the EUCalc building module integrates assumptions related to heating efficiency, technologies and fuel shares in heating, the pathways give a full picture of emissions reductions in the building sector achieved with a combination of demand-side energy efficiency and decarbonisation of energy supply, both in electricity and heating and cooling.

Each module has different drivers (called "levers" in EUCalc) that have an impact on GHG emissions. Each of the levers has four defined positions, from level 1 to level 4, representing the ambition of the decarbonisation effort in that sector[5]. The GHG emission figures presented in this report are expressed in megatonnes of carbon dioxide ($MtCO_2$), as defined in the EUCalc model. The scenarios take only CO_2 emissions from fuel combustion into account.



[5] A detailed description of all assumptions of the model is available in [2], [5] of the reference section.

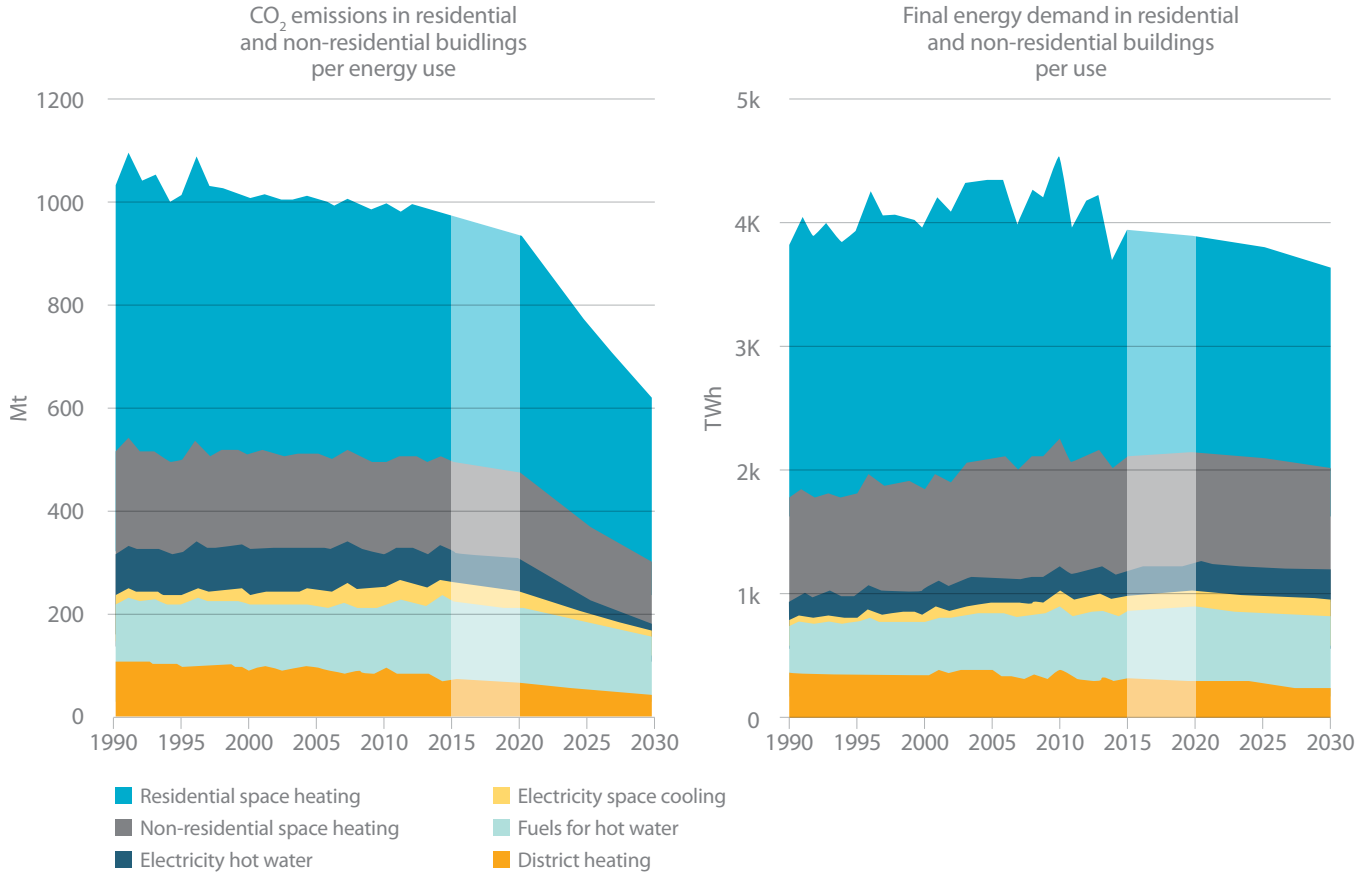
1. Moderate Policy Scenario

The Moderate Policy Scenario has been designed to capture a moderate acceleration of policies and technology deployment compared to the current regulatory framework for buildings. It has been created by setting all levers of the building module, the power module and the lifestyle module related to homes at Level 3. It assumes an annual renovation rate of 2% which is in line with the objective of the European Commission's Renovation Wave to at least double the annual energy renovation rate.

The Moderate Policy Scenario is estimated to deliver CO_2 emission reductions in 2030 of around 46% compared to 1990, or a 42% reduction compared to 2015. This means that the assumed changes in policies and technology deployment under this scenario are far from being aligned with a 55% GHG emissions reduction target (see figure 1). This is the case if we assume that all sectors should contribute equally to the achievement of the 2030 target, and even more so if we assume that the building sector should contribute further considering that there are no significant technological barriers to decarbonisation.

In this scenario, final energy demand for heating and cooling is estimated to decrease by 4% compared to 1990, which is equivalent to 8% compared to 2015 (see figure 2).[6] Energy for space heating reduces as a result of the acceleration of the renovation rate, leading to a renovation of 31% of the floor area by 2030. Energy demand for hot water slightly grows because of population growth. Energy demand for space cooling increases by 30% caused by a 14% growth in cooled floor area, both compared to 2015.

Figure 1 - CO_2 emissions (left) and final energy demand (right) in residential and non-residential buildings by energy use. Only energy uses relevant to building performance are shown (i.e. heating, cooling and hot water); energy use for lighting, appliances and cooking is not included.



[6] The final energy demand for heating and cooling in buildings covers hot water, space heating and space cooling for residential and non-residential buildings; energy for cooking, lighting and appliances is excluded.

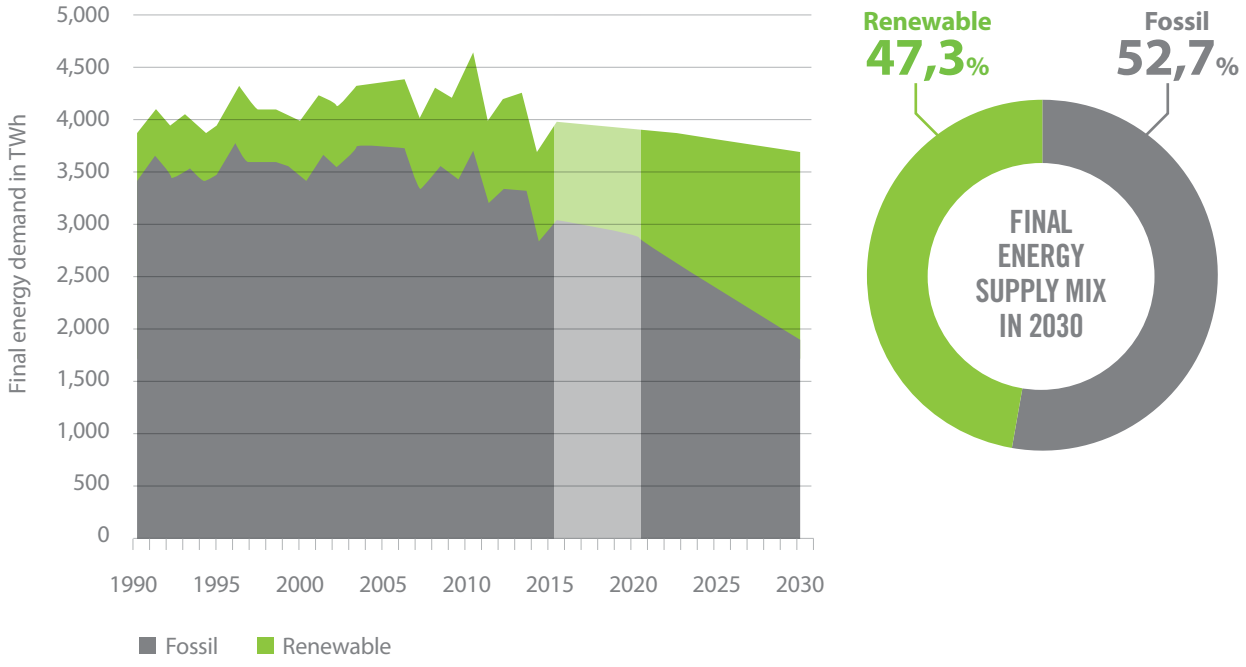
The scenario is based on a renovation rate of 2% per year on average as suggested by the European Commission in the Renovation Wave. However, as the EUCalc model increases renovation rates starting in 2015, the low observed renovation rate of 1% in the period 2015-2020 will have to be compensated with higher rates in the following years. This leads in practice to an annual renovation rate of 2.6% on average in the decade from 2020 to 2030, showing that delaying action further will require a higher level of effort at a later stage.

The scenario assumes that of all the renovations taking place, 10% are shallow renovations, 70% are medium and 20% are deep renovations. The EUCalc model defines shallow renovations as renovations that achieve a 30% reduction of energy demand in a given building, with medium renovations achieving a 40% reduction and deep renovations at least 60%.

With the assumed renovation rate, 31% of the building stock will be renovated by 2030, while 62% is left unrefurbished; 7% of the building stock in 2030 is newly built. Of the total floor area in 2030, shallow renovations cover 3%, medium renovations 22% and deep renovations 6%.

The Moderate Policy Scenario also assumes that the share of renewable energy in the final energy mix is increasing while the share of fossil fuels is decreasing (see figure 3). In the Moderate Policy Scenario the amount of energy delivered by fossil fuels will decrease by 36% compared to 2015 and is estimated to account for 52.7% of the final energy mix.

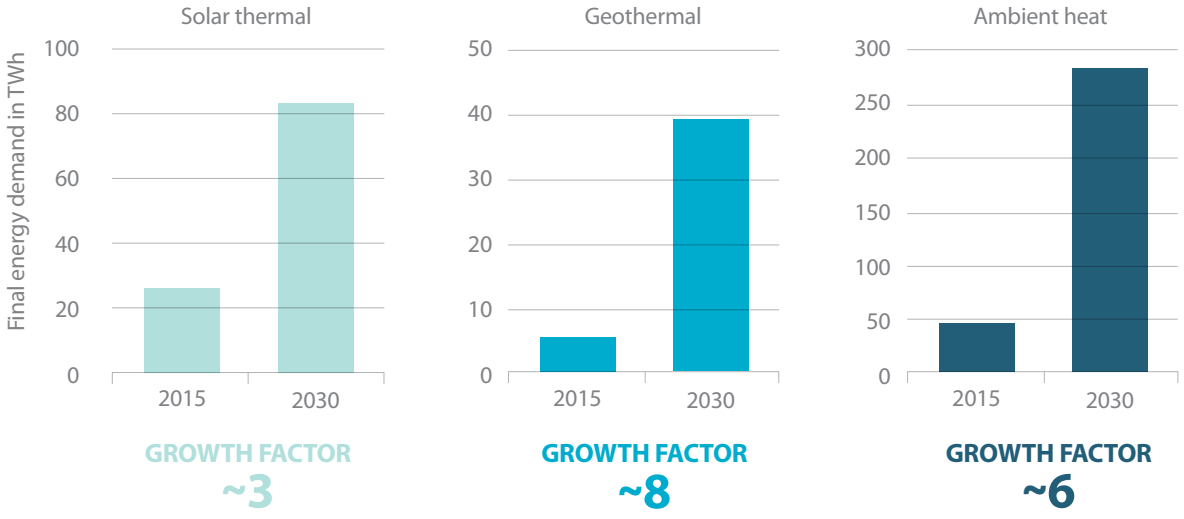
Figure 2 - Fossil fuels and renewable energy share for final energy in buildings including decentralised generation, district heating and electricity.
Left: Historic development and trajectory. Right: Final energy supply mix in 2030.



The Moderate Policy Scenario foresees an increase of decentralised renewable heat to a 27.7% share of final energy in 2030.

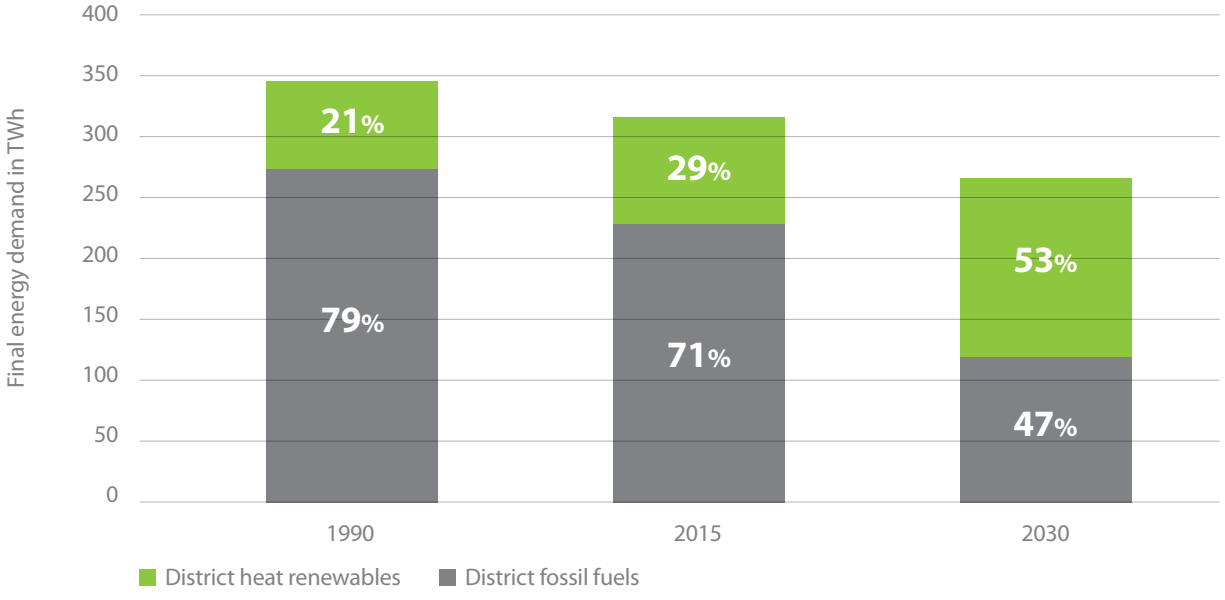
Solar thermal energy will grow by a factor of three compared to 2015, while geothermal energy will grow by a factor of eight in the same timeframe. Ambient heat generated with heat pumps is expected to increase by a factor of six.

Figure 3 - Projection of final energy supplied by solar thermal, geothermal energy and ambient heat. Note the different scales of the vertical axis in the individual graphs.



The district heating sector also sees a transformation. The total final energy demand for district heating decreases compared to 2015 levels due to a decrease in energy demand of buildings. The fuel mix of district heating changes, with fossil fuels decreasing from 71% of final energy in 2015 to 47% in 2030.

Figure 4 - Projection of final energy mix supplied by district heating, including combined heat and power (CHP).



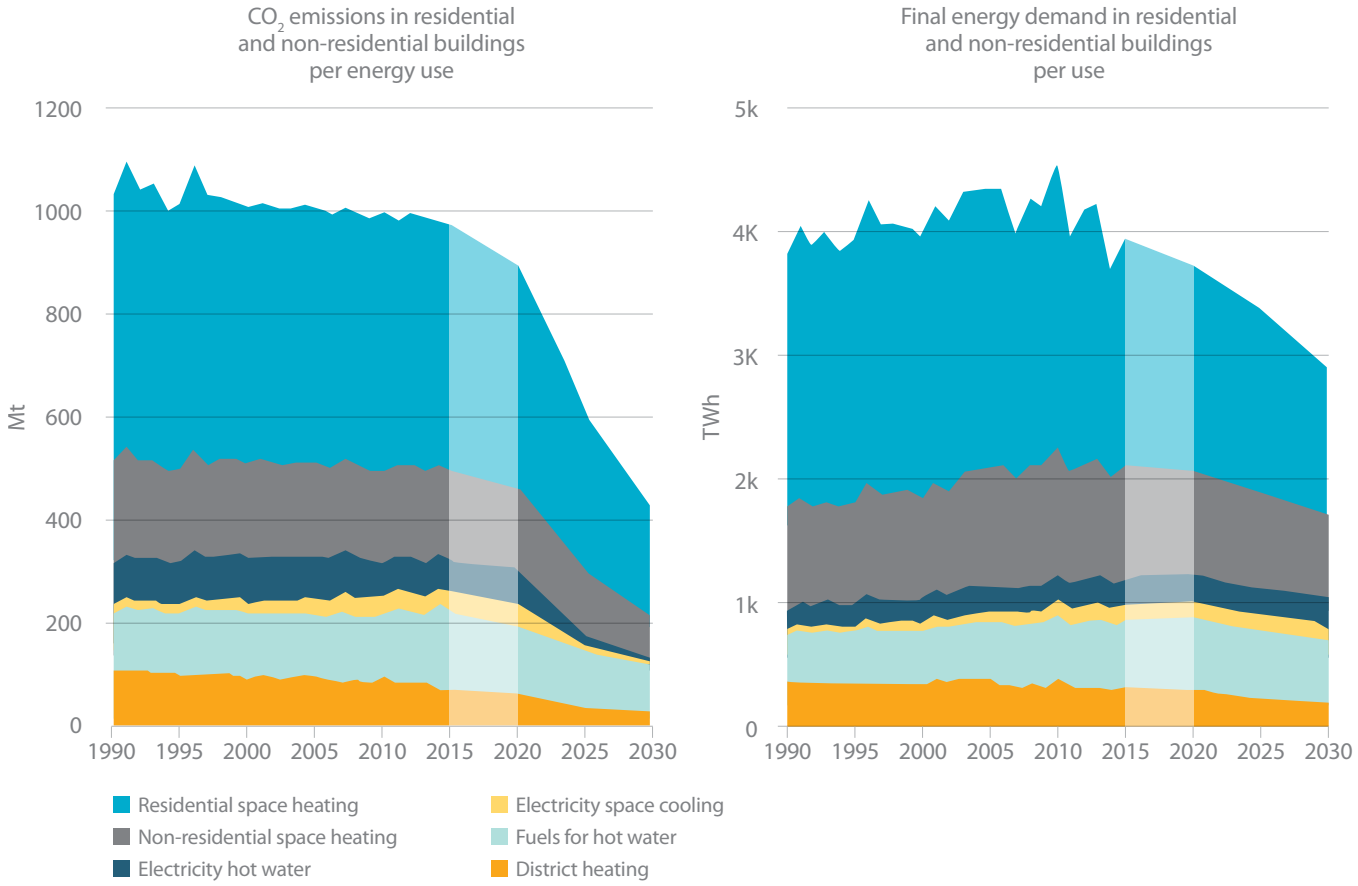
2. Responsible Policy Scenario

The Responsible Policy Scenario is transformational and requires significant efforts to change practices in the building sector. It has been created by setting all EUCalc levers in the building module, the power module and the lifestyle module related to homes at Level 4.

This scenario is estimated to achieve a CO_2 emissions reduction of 62% compared to 1990, or 60% compared to 2015. This is aligned with the EU's ambition to become climate-neutral by 2050 and the suggested reduction delivered by the building sector as stated in the Renovation Wave. It supports the achievement of the revised 2030 GHG objective with a proportionate contribution from the building sector.

Final energy demand for heating and cooling will decrease by 22.3% compared to 1990 (equivalent to 24.8% compared to 2015).

Figure 5 - CO_2 emissions (left) and final energy demand (right) in residential and non-residential buildings by energy use. Only energy uses relevant to building performance are shown (i.e. heating, cooling and hot water); energy use for lighting, appliances and cooking is not included.



The scenario is based on a renovation rate of 3% per year on average. However, as the EUCalc model increases renovation rates starting in 2015, the low observed renovation rate of 1% in the period 2015-2020 will have to be compensated with higher rates in the following years. This leads in practice to an annual renovation rate of 4.4% on average in the decade from 2020 to 2030, showing that delaying action further will require a higher level of effort at a later stage.

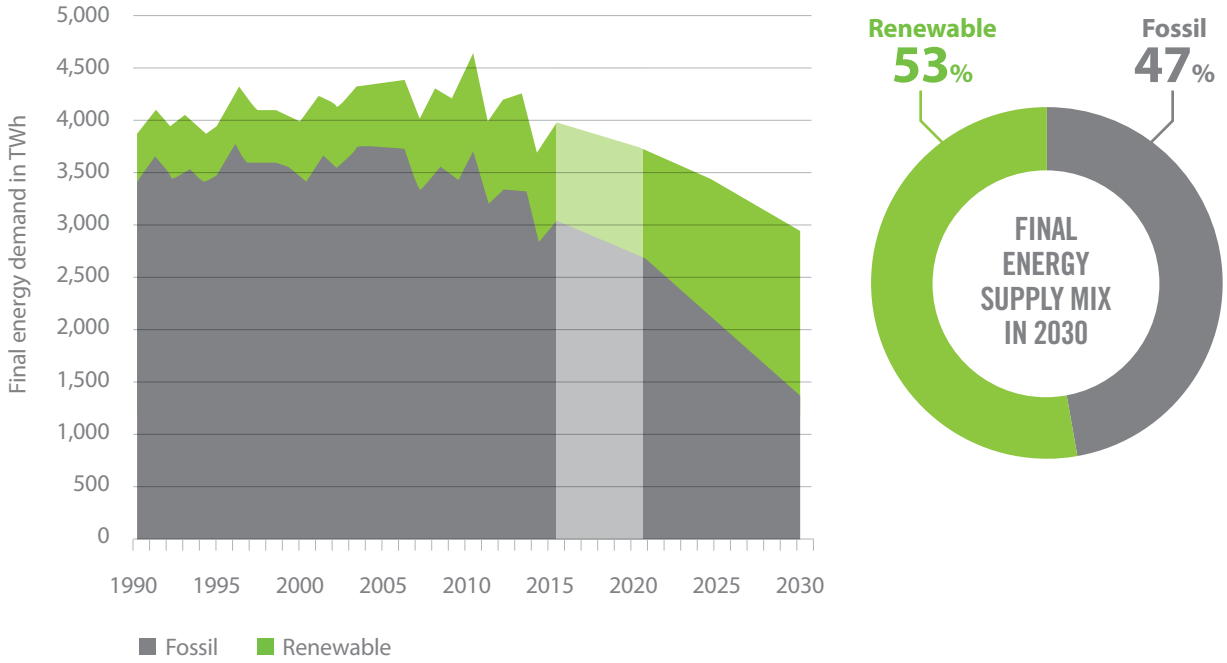
The faster pace of renovation will lead to 55% of the building stock being new or renovated in 2030, while 45% of buildings are left unrenovated. This scenario also assumes that 1% of the building stock will be demolished per year and replaced by highly efficient new buildings.

The Responsible Policy Scenario increases renovation depth, with 70% of renovations being deep and 30% medium. No shallow renovations take place during the next decade. Of the total floor area, deep renovations will cover 34%, medium renovations 15% and highly efficient new builds 6.5%.

Fossil fuels in heating and power decrease substantially. Energy for space cooling declines by 20% as systems and solutions become more efficient and the cooled floor area remains nearly constant.

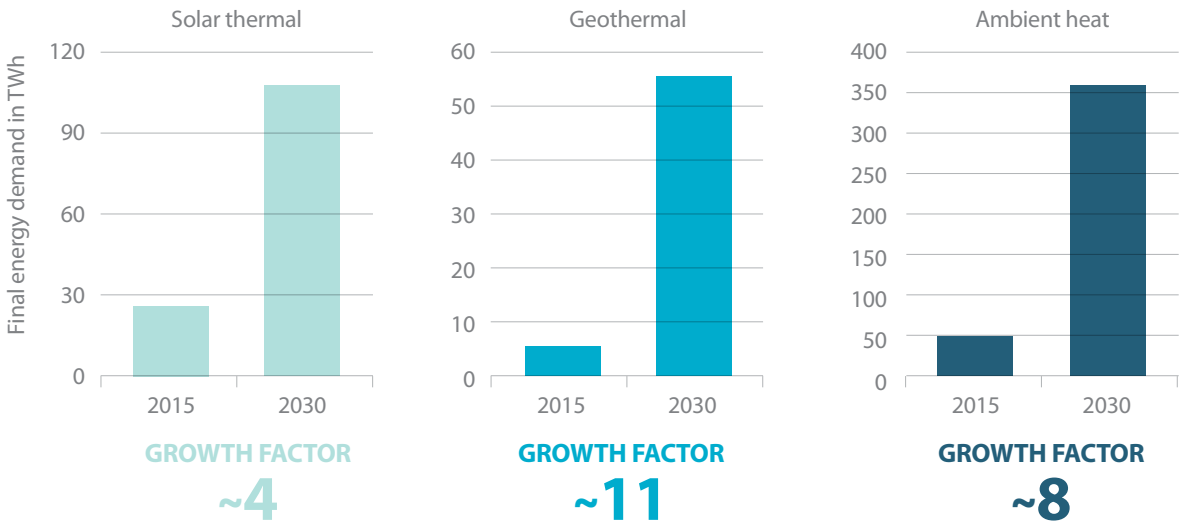
The switch from fossil fuels to renewable energy is more pronounced than in the Moderate Policy Scenario and leads to a more decarbonised fuel mix in 2030. In the Responsible Policy Scenario the amount of energy delivered by fossil fuels will decrease by 54%, resulting in an estimated fossil fuel share of 47%.

Figure 6 - Fossil fuels and renewable energy share for final energy in buildings including decentralised generation, district heating and electricity.
Left: Historic development and trajectory. Right: Final energy supply mix in 2030.



The Responsible Policy Scenario foresees an increase of renewable heat to a 32.4% share in final energy in 2030.

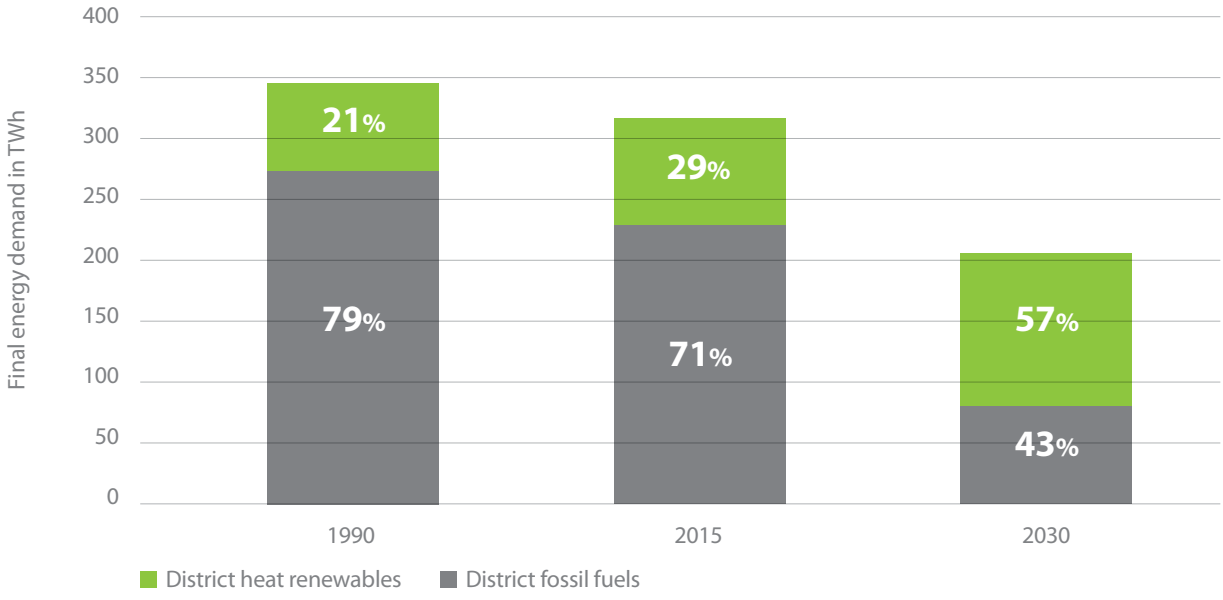
Figure 7 - Projection of final energy supplied by solar thermal, geothermal energy and ambient heat. Note the different scales of the vertical axis in the individual graphs.



Solar thermal energy will grow by a factor of four compared to 2015, while geothermal energy will grow by a factor of 11 in the same timeframe. Ambient heat generated with heat pumps is expected to increase by a factor of 8.

The district heating sector will also undergo transformation. The total final energy demand for district heating decreases by 35% compared to 2015 levels due to a reduction in energy demand from buildings. The fossil fuel share decreases to 43% in the Responsible Policy Scenario, with renewable energy dominating district heating by 2030 (See Figure 8).

Figure 8 - Projection of final energy mix supplied by district heating, including combined heat and power (CHP).



The more pronounced reduction of the district heating share in final energy consumption in the Responsible Policy Scenario can be explained with the more aggressive energy demand reduction measures in buildings due to faster and deeper renovation. However, this does not necessarily mean that the numbers of buildings connected to district heating will decrease: it could also mean that more low-energy buildings are connected to the heat network, especially when this is upgraded in line with the latest district heating technologies that supply heat at lower temperatures. It also indicates that there is an opportunity for the sector to support a business model for district heating companies to provide energy services rather than just sell energy.

Behavioural changes and lifestyle choices have a large impact on energy consumption and emissions in the building sector. Decisions about the size of buildings and comfort temperatures have an impact on floor space used per capita and on heating and cooling behaviour.

The Responsible Policy Scenario foresees a 6% decline in per capita floor space in residential buildings, resulting in 44.8m2/capita, which requires a reversal of the current trend of increasing residential floor space. The floor area of non-residential buildings is expected to remain constant until 2030. Also, the cooled area is expected to grow only slightly from 9.9% to 10.1% by 2030, whereas for the less ambitious scenario the growth is estimated to be higher.

Additionally, population development trends have an impact on energy use, but these are assumed to be equal in both scenarios.

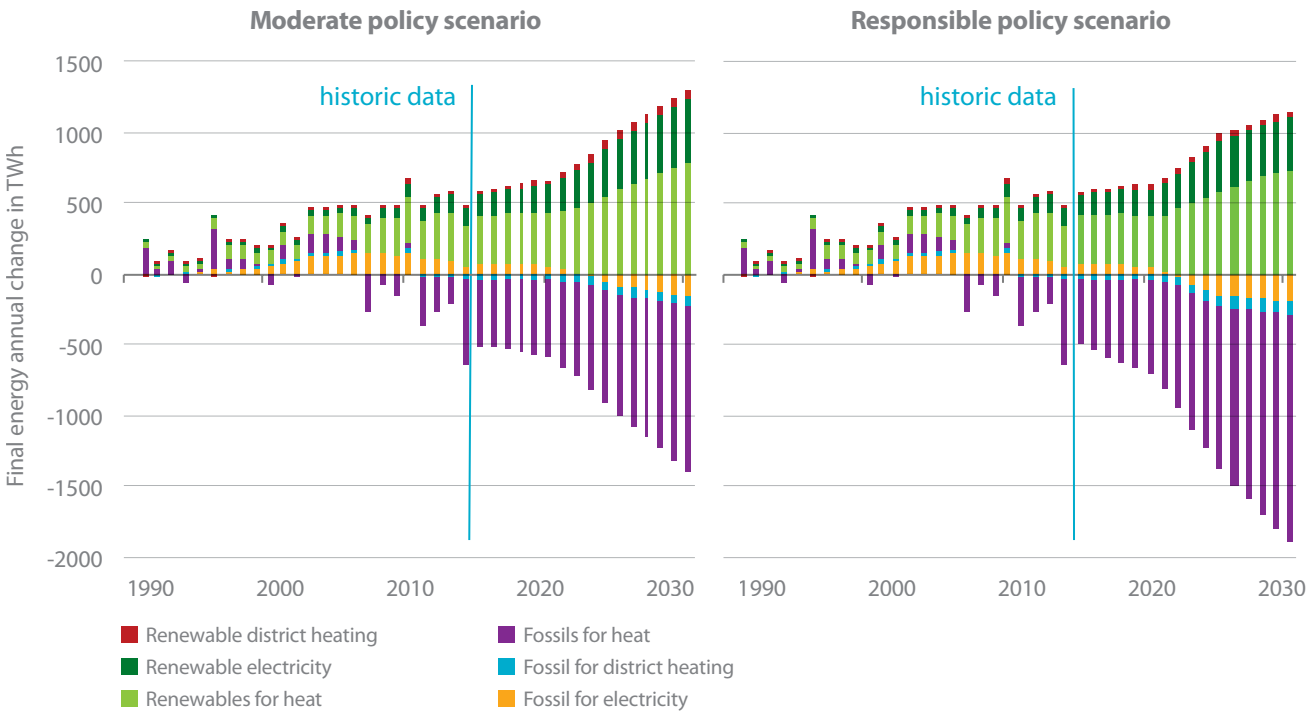
DECARBONISING THE BUILDING SECTOR: ENERGY EFFICIENCY AND RENEWABLE ENERGY GO HAND IN HAND

Both the Moderate Policy Scenario and the Responsible Policy Scenario, although at different speeds, result in a reduction of final energy consumption and an increased penetration of renewable energy to cut building sector emissions. Reducing energy used in buildings for space heating, hot water and cooling through energy efficiency measures and covering the remaining energy needs by renewable energy, both in power and heating, must be complementary pathways to decarbonise buildings.

Up to 2030, fossil fuels in the final energy demand decrease faster than the respective growth of renewable energy in both scenarios, with a much steeper decrease in the Responsible Policy Scenario. This trend accelerates each year due to the reduction of final energy demand driven by efficiency measures.

Figure 9 below illustrates for both scenarios how much of the fossil fuel demand is saved through efficiency measures and substituted by renewable heat and renewable electricity. It compares the substitution of fossil fuels (negative values) by renewables (positive values). The difference between the fossil final energy (negative values) and the renewables final energy (positive values) represents the reduction of final energy consumption, which is much stronger in the Responsible Policy Scenario.

Figure 9 - Substitution of fossil fuels with renewable energy in final energy demand.



The above shows that energy efficiency measures and renewable energy must be combined to phase out fossil fuels. This complementary strategy is necessary to achieve the targeted CO_2 reductions.

TRACKING EMISSION REDUCTIONS IN THE TWO SCENARIOS

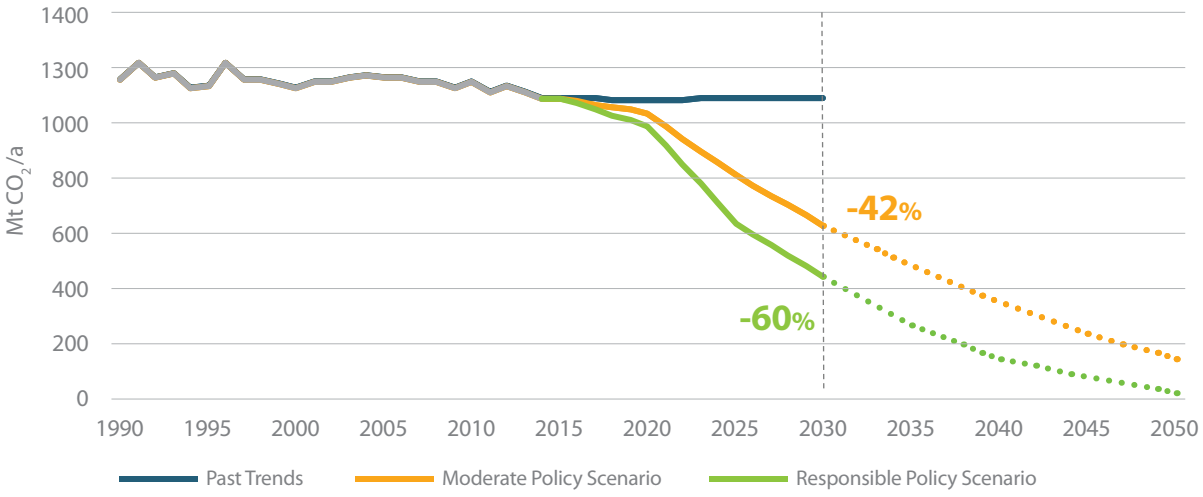
Both the Moderate Policy Scenario and the Responsible Policy Scenario present pathways that change the business-as-usual approach to building renovations, including the decarbonisation of buildings' energy supply.

The Moderate Policy Scenario, with a 42% CO_2 emissions reduction in 2030 compared to 2015, is insufficient to achieve a strengthened 2030 target of at least 55% GHG reduction, and cannot be considered a sufficient response to the urgency of the climate crisis.

The Responsible Policy Scenario, resulting in 60% CO_2 reduction in the building sector by 2030, would ensure a trajectory compatible with a strengthened 2030 objective. While this scenario requires a higher effort in this decade, it will enable a more balanced trajectory between 2030 and 2050 to achieve climate neutrality.

Figure 10 below shows the emissions reductions of the two scenarios, as well as the pathway that emissions would follow if existing practices continue with no increase in ambition (Past Trends pathway as defined by EUCalc).

Figure 10 - Emissions from buildings for heating, cooling and hot water (including electricity and district heating).



The Commission's recent communication on Stepping Up Climate Ambition and accompanying impact assessment, as well as the Renovation Wave communication, indicate that emissions reductions in the building sector would need to reach 60% by 2030 compared to 2015, in order to achieve a 55% GHG emissions reduction target across all sectors.

The Responsible Policy Scenario created with EUCalc and the modelling done for the Stepping Up Climate Ambition communication both achieve emissions reductions in the range of 60% compared to 2015.[7] However, the scope and assumptions do not fully coincide. This is shown, for example, by the fact that the Renovation Wave document states that to achieve a 55% GHG target by 2030, the EU should reduce buildings' GHG emissions by 60%, and reduce the energy consumption for heating and cooling by 18% compared to 2015. The Responsible Policy Scenario, however, concludes that a reduction of the energy demand of 24.8% in 2030 compared to 2015 is required to achieve the 60% objective.

[7] The Renovation Wave communication specifically mentions a 60% reduction of emissions in 2030 compared to 2015 in the building sector; the Impact Assessment of the Stepping Up Climate Ambition communication presents different scenarios associated with a 55% climate target that achieve in 2030 buildings emissions cuts in the range of 61% to 65% in the residential sector only, and 54-61% in services for 55% GHG scenarios.

POLICY IMPLICATIONS OF ACHIEVING 60% GHG EMISSION REDUCTIONS BY 2030

Achieving 60% GHG emissions reductions in the building sector by 2030 requires a transformative approach compared to current construction and renovation practices. An increased effort to phase out fossil fuels and integrate renewable energy supply in buildings is essential to decarbonise the building sector. The Renovation Wave is opening the way to measures that will transform the building sector but the implementation of policies and support instruments must become faster and more ambitious. The pathway presented by the Responsible Policy Scenario and its associated assumptions gives guidance for possible measures that could achieve a greater impact.

In the EU, renovation rates currently average 1% per year, but deep renovation is only at 0.2%[4]. The Renovation Wave's general goal to double the annual energy renovation rate is insufficient to achieve the desired CO_2 reduction. The Responsible Policy Scenario shows that the current annual deep renovation rate of 0.2% needs to grow by at least a factor of 10 to 2% and should approach 3% as quickly as possible. This is nothing short of a complete overhaul of current renovation practices and requires the scaling up of existing practices to industrial levels. A focus on deep renovation will reduce energy demand in buildings through effective efficiency measures that improve a building's envelope and through replacing existing heating systems with more efficient and renewables-based systems.

The average rate of renovation should be increased as a minimum to 3% per year to ensure the renovation of the full building stock by mid-century. The more this change is delayed, the higher the effort in increasing renovation rate and depth should be in the next decade. Deep renovation, resulting in energy savings of at least 60%, will have to make up 70% of the total, while the remaining renovation activities should result in medium-depth renovation, cutting energy demand by at least 40%. There is no room for shallow renovations that do not deliver the necessary energy savings.

Essentially, all renovations should follow the nearly zero-energy building (NZEB) principle, i.e. achieving the highest efficiency level of a given building type while supplying the remaining energy demand from renewable sources. This requires a strategic effort to decarbonise heating and cooling energy supply, and to invest in low temperature heat supply infrastructure.

THE AVERAGE RATE OF DEEP RENOVATION should increase to minimum **3%** **PER YEAR** until 2030 to deliver the desired GHG reduction.

To achieve faster and deep renovations, mandatory minimum energy performance requirements can be an effective policy, as indicated in the Renovation Wave. These should be tailored to specific segments of the building stock and ownership tenures, and coupled with financing and targeted advice.

The use of fossil fuels for heating and hot water in buildings should drastically decrease in the next decade. Considering that the average lifetime of heating equipment is in the range of 15-20 years,[8] any new installation of fossil fuels-based heating systems locks in CO_2 emissions for the next two decades. Effective policies need to phase out fossil fuel-based systems as soon as possible.

The ambitious implementation of current EU legislation could help avoid installing stranded heating systems assets, as a minimum for new constructions. As of 1 January 2021, all new buildings in the EU must be NZEBs, combining very high energy performance with significant renewable energy supply.[9] National definitions of NZEB vary considerably as Member States are responsible for setting their technical criteria considering national and local circumstances. However, to ensure these definitions help achieve the EU climate neutrality objectives, no new fossil fuel heating system should be installed in new construction from 2021 onwards. As new buildings must have very low energy consumption, it is technically possible to integrate renewables-based solutions to cover the very low remaining energy needs.

For existing buildings, the switch to renewable energy must be made in conjunction with comprehensive deep renovation. Where the infrastructure is suitable, renovations could take advantage of connecting to low-temperature heat networks using waste heat or renewables-based heat.

The ongoing revision of the ecodesign and energy labelling rules for space and water heaters should be used as an opportunity to phase out inefficient and fossil fuel-based heating systems from the EU market. Incentives and support schemes should be designed to encourage citizens to carry out an earlier replacement of still functioning fossil fuel-based heating systems. Such policies would contribute not only to reducing GHG emissions, but also to improving air quality in cities with clear health benefits for citizens.

The financial framework and incentives should be better aligned with the decarbonisation objective, and the price signal should reward a fuel switch towards cleaner and renewables-based technologies.

To achieve the desired emissions reduction by 2030, the synergies between energy efficiency and renewable energy measures in the building sector need to be exploited much more. Renewables-based technologies such as solar thermal, geothermal and heat pumps and renewables-based district heating work better with low-energy buildings, allowing a higher deployment rate and investments in these technologies. Integrated planning favouring the combination of energy efficiency and renewable energy is needed, in particular at regional and municipal level.

[8] Different individual heating technologies have different lifetimes; the EU Heating and Cooling Strategy highlights that "almost half of the EU's buildings have individual boilers installed before 1992".

[9] Article 2.2 of the Energy Performance of Buildings Directive (Directive 2010/31) states that a 'nearly zero-energy building' means a building that has a very high energy performance, as determined in accordance with Annex I. The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby.

The current EU legislation and requirements do not fully encourage this alignment between efficiency and renewable energy measures in the building sector. Even if the national energy and climate plans are helping to streamline policies at the country level, there is still a certain misalignment in EU legislation. For example, while the long-term renovation strategies should foster policies for a highly energy efficient and decarbonised building stock, the specific measures that Member States should consider in these strategies according to the official guidance do not directly encourage the decarbonisation of energy used in buildings. Similarly, the national heating and cooling plans required by the Energy Efficiency Directive to support the growth of highly efficient heating technologies are disconnected from the analysis of demand-side measures in buildings.

Better integrated planning and policy design at all levels for supply- and demand-side measures is crucial to develop synergies to decarbonise the building stock and to maximise societal benefits.

CONCLUSIONS

This paper shows that additional action in the building sector is crucial to achieve a higher 2030 climate target, including stringent measures to reduce energy consumption and to support renewable energy penetration.

This is only possible with a transformative approach that changes current renovation practices and supports a much more comprehensive effort to decarbonise buildings, combining efficiency measures with phasing out fossil fuels and support for renewables growth. The transformation will not be easy, but it will be possible with effective policies and support instruments to stimulate the innovation potential for both renovation services and technologies, and encourage owners, investors and industry.

The Stepping Up Climate Ambition communication and the Renovation Wave communication have paved the way for achieving climate neutrality by mid-century with increased efforts in this decade. A vision for reducing GHG emissions and energy use in the building sector has taken shape. In 2021, the European Commission should translate this vision into workable proposals when revising the EU climate and energy legislation.

The expected revisions of the Energy Efficiency Directive, the Renewable Energy Directive and the Energy Performance of Buildings Directive are crucial opportunities to enshrine the needed changes into legislation.

In parallel, EU Member States must increase their efforts to implement policies which lead to a significant increase in renovation rate and depth. It will not be possible to jump from the current low base to the targeted renovation rate overnight, so it is vital that no time is lost. The increasing financial support provided by the Recovery and Resilience Facility and the EU's multi-annual budget 2021 to 2027 should be directed to push innovative technical systems and solutions and service models into the mass renovation market.

The transformation of our buildings to a healthy, sustainable and zero-carbon environment requires strong and effective policies which are implemented in a consistent way in all Member States. Decision-makers in the building and construction sector have a clearly defined task to support the transition with innovative renovation solutions and the construction of new zero-carbon buildings.

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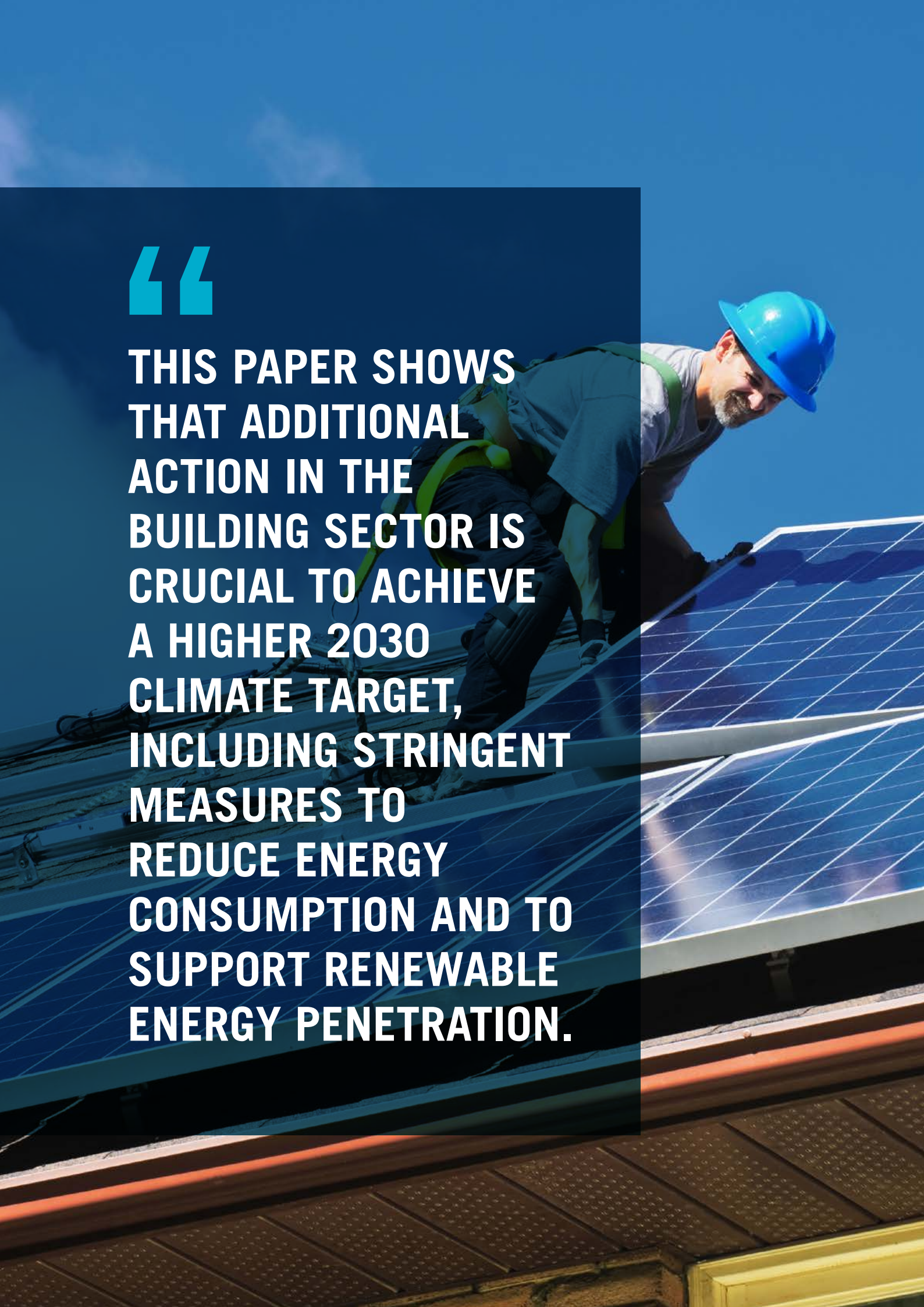

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THIS PAPER SHOWS THAT ADDITIONAL ACTION IN THE BUILDING SECTOR IS CRUCIAL TO ACHIEVE A HIGHER 2030 CLIMATE TARGET, INCLUDING STRINGENT MEASURES TO REDUCE ENERGY CONSUMPTION AND TO SUPPORT RENEWABLE ENERGY PENETRATION.

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