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# Transitioning to a climate-neutral EU buildings sector: Benchmarks for the success of the European Green Deal

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Dear reader,

Considerable research has been conducted in recent years on how to make the EU's building stock compatible with the goal of climate neutrality. After much deliberation and debate, there is a growing consensus among researchers, industry experts and policymakers concerning the necessary components of a climate-neutral EU buildings sector. While the required actions are many, they can be categorized into four topic areas: building envelopes; heating & cooling; building materials; and smart electrification. In other words, the transformation of the EU building stock to climate-neutrality will entail not one transition, but four.

This paper takes stock of each of these four transitions in the context of the European Green Deal to identify where we stand in delivering on them and which legislative proposals in discussion could help the EU achieve its medium and long-term goals for decarbonizing the building sector.

In short, it sets Agora benchmarks for success for the transformation of the buildings sector in the European Green Deal.

I hope you find this report both informative and stimulating.

Matthias Buck  
*Director of European Energy Policy*

## Key findings

1

**Climate-neutrality in the building sector requires not only one transition, but four:**

1) a building envelope transition, 2) a heating and cooling transition, 3) a building materials transition and 4) a smart electrification transition.

2

**Investments in the transition to a climate-neutral building sector at the scale needed will not happen on their own.**

Strong regulatory standards must drive investment in line with the EU's 2030 and 2050 climate targets, in particular ambitious standards for new construction and for renovating existing buildings. Neither carbon pricing nor public finance measures alone will suffice. The July Fit for 55 Package put in place some policies to drive investment in public buildings; the December Package must add ambitious requirements for privately owned buildings and for heating appliances, including ambitious minimum energy performance standards.

3

**Muddling through is not an option.**

A transition at this scale and speed means governments and building owners must plan for success and develop action plans aligned with the long-term goal of a zero-emissions building stock. The July Fit for 55 Package introduced important requirements for comprehensive heating and cooling assessments at national and local level; the December package should add requirements for Member States to develop National Building Renovation Action Plans and for households to use Building Renovation Passports to guide their way to a zero-emissions building stock by 2050.

4

**Don't forget the enabling framework!** Some basic elements of the policy framework needed to make regulatory standards work effectively are not yet in place, including robust energy performance certificates (EPC), environmental product declarations for building materials (EPD) or ambitious Green Public Procurement guidelines. Governments must not lose sight of these often complex and 'technical', but essential complementary files.

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## Introduction

Climate neutrality in the buildings sector remains a far-off goal. Indeed, nearly all European buildings still require energy-efficient refurbishment up to 2050, and fossil fuels remain the dominant source of energy for heating and cooling, both in district heating networks and on-site systems. Most of the building materials used in construction are carbon-intensive, and represent a growing share of embedded carbon emissions. Moreover, most buildings lack the technical systems required to enable flexible management of heat pumps and electric vehicle charging.

In other words, to make progress towards a climate-neutral buildings sector, the European Green Deal will need to catalyse not just one transition in the buildings sector, but rather four:

- 1) A **building envelope transition** to radically improve the energy performance of the building stock;
- 2) A **heating & cooling transition** to phase-out the use of fossil fuels in buildings;
- 3) A **building materials transition** to make recycled and zero-carbon materials the new standard in construction; and
- 4) A **smart electrification transition** to ensure the societally beneficial and cost-efficient electrification of buildings.

Regrettably, the current policy framework and pace of change are far from sufficient for meeting the EU's 2030 climate target, let alone its climate-neutrality objectives. Scenarios developed by the European Commission estimate that current policies for the building sector will only deliver a 26% emissions reduction in the sector between 2020 and 2030.

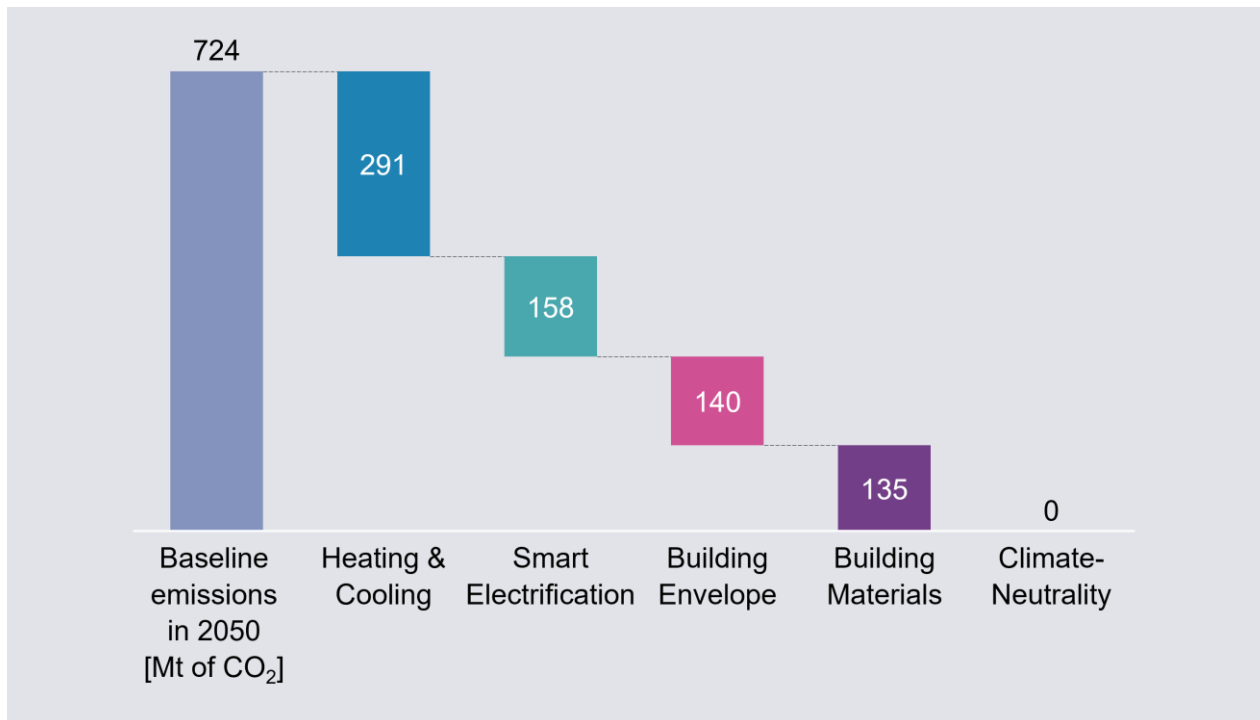
By contrast, according to the EU's policy scenarios, a 47% reduction is needed by 2030<sup>1</sup>. The burden now falls on the European Green Deal to close this gap if the EU is to remain on a pathway to climate-neutrality by 2050.

This paper takes a closer look at the challenges associated with each of these four transitions, highlighting where we stand at present and where we need to be by 2030 and 2050. We specifically identify whether and to what extent each transition is addressed in the July Fit-for-55 package, and present our recommendations for legislative adjustments and new legislative proposals expected in December 2021 and the coming years.

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1 Based on the EU's MIX Scenario relative to 2020 emissions in the building sector. See EC (2021): Policy scenarios for delivering the European Green Deal.

Figure 1: Technical mitigation potentials for the buildings sector across the four transition categories relative to a 2050 baseline [in Mt of CO<sub>2</sub>]



Source: Based on ECF (2020): Zero Carbon Buildings 2050 – Summary Report.

Note: The scenario used compares a 2050 scenario with baseline emissions (current policies) with a net-zero scenario. It counts heat pumps under heating and cooling and does not include EVs.

## Background

### Where do we stand on buildings in the European Green Deal?

In December 2020, EU heads of state and government set “a binding EU target of a net domestic reduction of at least 55% in greenhouse gas emissions by 2030 compared to 1990”; increasing ambition from the previous 40% target for 2030. While a 55% decline in emissions up to 2030 would put the European Union on a realistic path to achieving climate neutrality by 2050, it will also require a comprehensive revision of the EU’s climate and energy laws.

In July 2021, the European Commission released the first of two legislative packages designed to enshrine the 55% target into Europe’s climate and energy laws. The “July package” contains 12 legislative proposals, seven of which are relevant for the building sector:

- revisions to the EU Emissions Trading System (ETS);
- a legislative proposal for a Social Climate Fund (SCF);
- revisions to the Climate Action Regulation (CAR, or Effort Sharing Regulation);
- revisions to the Energy Tax Directive (ETD);
- amendments to the Renewable Energy Directive to implement the increased ambition of the new 2030 climate target (RED);
- amendments to the Energy Efficiency Directive to implement the increased ambition of the new 2030 climate target (EED); and
- revisions to the Regulation on the inclusion of greenhouse gas emissions and carbon removals from land use, land use change and forestry (LULUCF).

On 14 December 2021, the Commission will table five additional proposals of relevance to the buildings sector:

- revisions to the Energy Performance of Buildings Directive (EPBD);

- revisions to the Third Energy Package for Gas (Gas Directive and Gas Regulation); and
- a legislative proposal for reducing methane emissions in the energy sector.

Together, these two legislative packages are referred to as the “Fit for 55” package – the European Commission’s main contributions to aligning EU legislation with the new EU Climate Law. Negotiations on the “Fit for 55” package will likely be concluded by the end of 2023 and the updated laws will take effect in 2024 or 2025, as we are halfway through the 2020–2030 decade.

Until then, accelerated climate action – including the rapid refurbishment of the building stock and the deployment of clean energy infrastructure – will have to rely primarily on the effective implementation of the existing Clean Energy for All Europeans Package and on the full use of climate-related funding in the €1.85 trillion European budget.

Successful implementation will also require close alignment between a number of separate but closely related upcoming policy initiatives:

- new “Guidelines on state aid for climate, environmental protection and energy 2022” (CEEAG) are expected to be adopted by the end of 2021;
- a package composed of a sustainable products initiative, the revision of the ecodesign directive, a review of the construction product regulation and a proposal on substantiating green claims, is expected to be presented on March 30 2022;
- revisions to the F-gas regulation are expected to be proposed in Q2 2022;
- revisions to the Green Public Procurement guidelines for office building design, construction and management anticipated at the end of 2022;
- revisions to the Ecodesign and Energy Labelling rules for space and water heating appliances are likely to be finalized in the coming years (vote planned in 2023, entry into force earliest 2024).

## Where do buildings fit into the EU's broader climate-policy architecture?

Delivering on the more ambitious 2030 climate target and 2050 climate neutrality target will also require changes to the EU's broader climate policy architecture. In particular, adjustments are needed to augment policy ambition and ensure target compliance. The existing climate policy architecture is organized around three pillars:

- **The EU Emissions Trading System (EU ETS)** caps emissions of more than 11,000 installations in power generation, industry, and inner-European aviation. It sets a carbon price for the covered emissions.
- **The Effort Sharing Regulation (ESR)** sets out different national reduction targets for the sectors not currently covered under the EU ETS – mainly in buildings, transport, agriculture, and waste.
- **The LULUCF Regulation** governs emissions and removals from land use and forestry. It currently aims to keep emissions and removals in balance (the “no debit” rule) and establishes EU-wide accounting protocols for tracking progress.

Under the EU's current carbon accounting and compliance mechanisms for the EU climate target, emissions from buildings are governed by all three pieces of legislation.

- Energy-related emissions from the combustion of fossil fuels in smaller fossil-fuel boilers in residential and commercial buildings are covered by the Effort Sharing Regulation and are generally what is meant when speaking of emissions in the buildings sector.

- Emissions from electricity and heat generation in large-combustion installations, including heating and cooling plants connected to district heating serving residential and commercial buildings, are largely covered by the EU ETS.
- Most bioenergy-related emissions in both small and large-scale installations are currently counted as “carbon-neutral” or zero in the ETS and ESR, because it is assumed that emissions from burning biomass – if compliant with EU guidelines on Sustainable Forest Management – will eventually be offset by newly planted trees in the land-use sector. They are thus still reported and accounted for in the country of harvesting in the land-use sector (LULUCF), instead of in the ESR or ETS<sup>2</sup>.

Finally, emissions from the production and manufacturing of building materials and household appliances are covered by a variety of different reporting categories related to industrial emissions and fall under both the EU ETS and the ESR. By contrast, carbon stored in durable Harvested Wood Products used in construction are also covered by the LULUCF Regulation.

In 2019, buildings represented 35.4% of the EU's total energy-related GHG emissions when all direct and indirect energy-related GHG emissions are counted – including electricity and distributed heat. The existing EU ETS covers more than half of these emissions (54%).

Embodied greenhouse gas emissions from material extraction, manufacturing of construction products, and construction activities are more difficult to estimate, but are likely to represent 5-12% of total national GHG emissions and largely fall under the existing EU ETS<sup>3</sup>. For example, in the EU buildings represent approximately 50% of cement consumption, 35% of steel consumption, 23% of aluminium consumption and 20% of plastics consumption<sup>4</sup>.

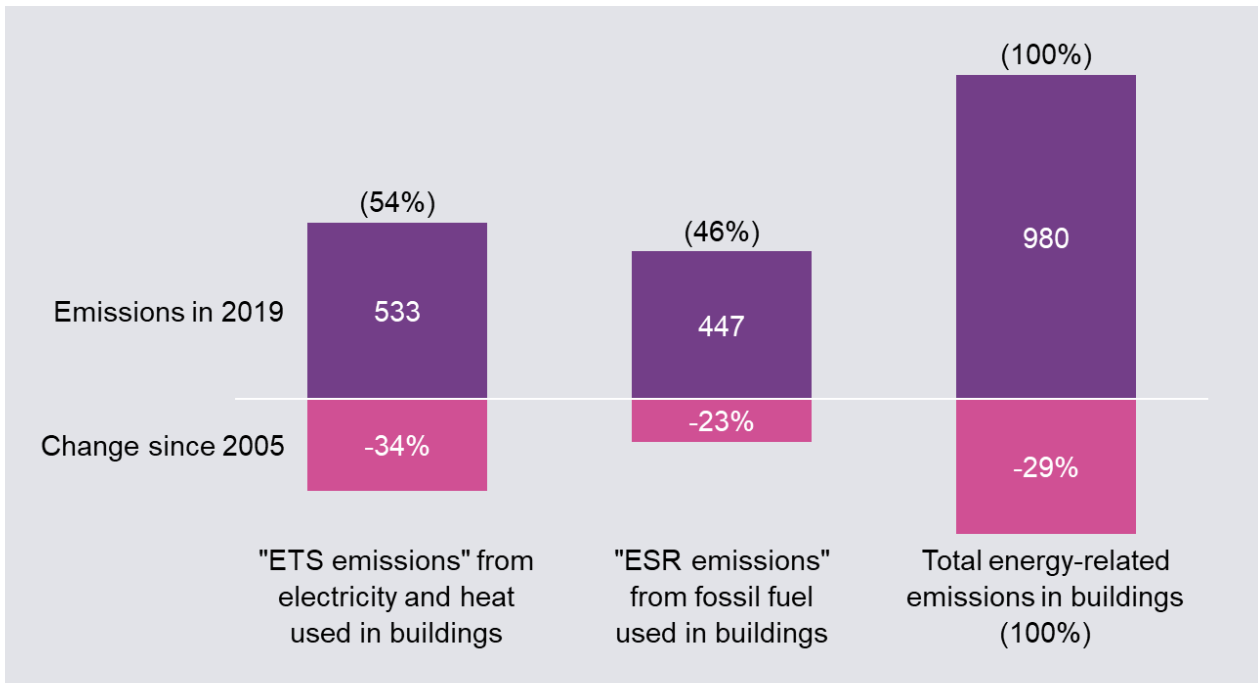
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2 Calls to change this carbon accounting have been increasing.

3 See DG Grow (2021): Buildings and Construction.

4 Agora Energiewende & CISL (2021): “Tomorrow's Markets Today: Creating markets for climate neutral basic materials and products”.

Figure 2: Greenhouse gas emissions from energy use in buildings in Europe (in Mt CO<sub>2</sub>e)



Source: EEA (2021): Greenhouse gas emissions from energy use in buildings in Europe.

Note: Excludes GHG emissions from the combustion of bioenergy and the manufacturing of building materials and household appliances.



## The Building Envelope Transition

### What is the challenge?

Meeting the EU's climate targets will require a 13% reduction in final energy demand in the building sector by 2030 and a 23% reduction by 2050 (relative to 2020 levels), while minimizing growing electricity demand due to electrification of heating and transport<sup>5</sup>. Achieving these reductions will first and foremost require significant improvements in the thermal envelope of buildings, in order to reduce heating and cooling losses. Associated refurbishment measures include improving roof, ceiling and wall insulation, installing efficient windows and doors, and upgrading ventilation systems to create an air-tight enclosure of the building shell while maintaining comfort. It is estimated that one third (35%) of the EU's building stock was built before energy performance requirements were introduced into building codes (from 1970s onwards) and that the vast majority of buildings are currently energy inefficient.<sup>6</sup> Thus, the building envelope transition will require improving the energy performance of the building stock as a whole by renovating the vast majority of EU buildings and by constructing all new buildings to high energy performance standards. Currently, less than 3% of the building stock conforms with the energy performance certificate (EPC) rating A ("very efficient")<sup>7</sup>.

### Where we stand today

Modern construction methods allow for significant energy savings relative to the energy performance of older buildings, such that passive (<15 kWh/m<sup>2</sup>a), and even zero-heating (<0 kWh/m<sup>2</sup>a) standards are now readily attainable<sup>8</sup>.

As of 2021 all newly constructed buildings in the EU must meet so-called "Nearly Zero Energy Building" (NZEB) performance standards,<sup>9</sup> but in practice, the stringency with which this performance standard is applied varies significantly within the EU, e.g. ranging from 27 kWh/m<sup>2</sup>a (Denmark) to 157 kWh/m<sup>2</sup>a (Romania) for single family homes. In light of today's relatively low new build rate (<1%), such measures will also be insufficient for reaching the EU's climate targets.

With regards to the existing building stock, between 2012 and 2016, 12.3% of residential buildings and 9.5% of non-residential buildings received some level of energy-related renovation each year. However, only 0.2% and 0.3%, respectively could be classified as "deep renovations" that delivered significant energy savings; the vast majority of renovation projects only led to small or marginal gains in energy performance. The weighted renovation rate has thus been estimated at closer to 1% in each sector, far below the level required to achieve a climate-neutral building sector by 2050<sup>10</sup>.

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5 Based on the European Commission MIX Policy Scenario.

6 JRC (2019): Achieving the cost-effective energy transformation of Europe's buildings.

7 BPIE (2017): 97% of buildings in the EU need to be upgraded.

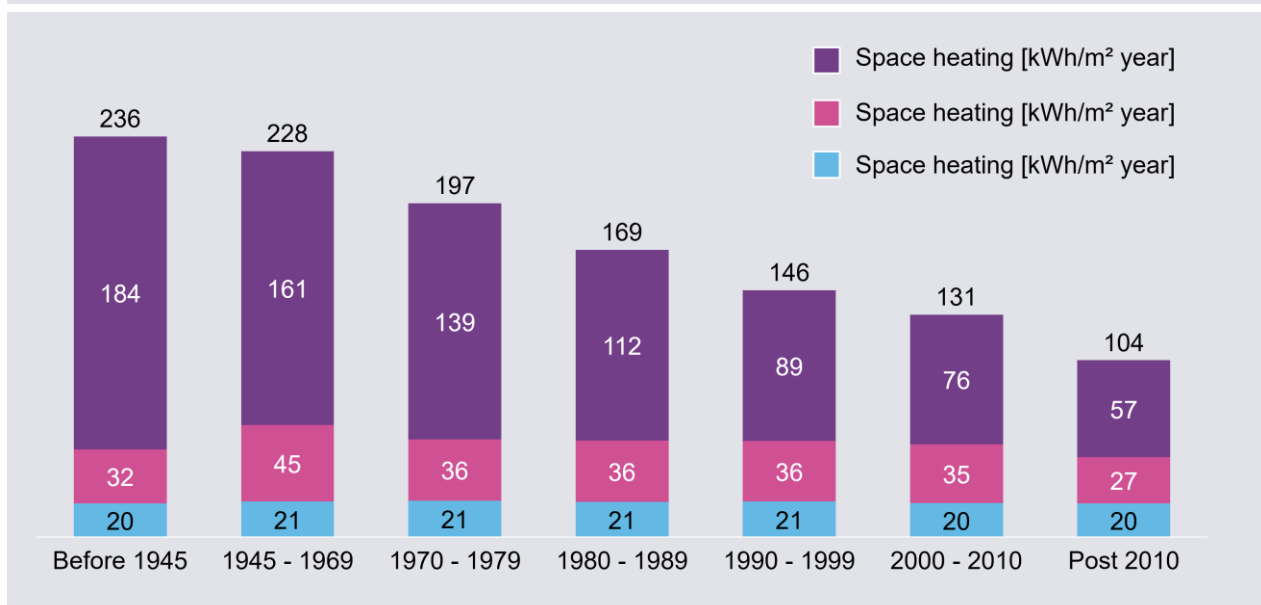
8 Passepedia (2019): Zero-energy and zero heating energy houses.

9 The European Commission's benchmark nZEB energy performance standard ranges from 50-90 kWh/m<sup>2</sup>/a for single family homes; 80-100 kWh/m<sup>2</sup>/a for office buildings.

10 JRC (2019): Comprehensive study of building energy renovation activities and the uptake of nearly zero-energy buildings in the EU

Where we need to be in 2030?	Where we need to be in 2050?
<ul style="list-style-type: none"> <li>Between 2-3% of the building stock is renovated with regards to building envelopes each year.</li> </ul>	<ul style="list-style-type: none"> <li>The building stock as a whole is decarbonized.</li> </ul>
<ul style="list-style-type: none"> <li>All renovations take place as one-off or staged deep-renovations designed to achieve 60-75% savings in useful energy consumption.</li> </ul>	
<ul style="list-style-type: none"> <li>All existing buildings are renewables-ready.</li> </ul>	
<ul style="list-style-type: none"> <li>All new builds adhere to ambitious new energy performance standards for construction.</li> </ul>	

Figure 3: Average useful energy demand - EU28 residential building stock by year of construction  
Space heating+Space cooling + Domestic hot water [kWh/m<sup>2</sup> year]



Source: Hot Maps Building Stock Analysis

## Key proposals in the July Package

### Energy Efficiency Directive

*Article 5* : introduces an obligation for the public sector to reduce its energy consumption for public services and installations of public bodies by -1.7% per year.

*Article 6* : requires Member States to ensure the renovation of 3% of their building stock larger than 250m<sup>2</sup> per year are renovated to the Near Zero Energy Buildings (NZEB) standard. It also broadens the scope of the existing renovation obligation for public bodies to include all public bodies at all administration levels and in all sectors of public bodies' activities (including healthcare, education and public housing), where the buildings are owned by public bodies.

*Article 7* : requires Member States to ensure that contracting authorities and contracting entities concluding contracts above certain thresholds purchase only products, services and buildings with high energy-efficiency performance. It also strengthens public procurement provisions by extending an obligation to take into account energy efficiency requirements at all levels of public administration, and by removing conditionalities related to cost-effectiveness and technical and economic feasibility. However, for public buildings occupied but not owned by public authorities, buildings must only comply with cost-effective energy savings potential, thus a substantially lower level of ambition compared to the NZEB standard applied to buildings owned by public bodies in Article 6.

*Articles 8 & 9* : increases energy savings obligations from 0.8% to 1.5% per annum beginning in 2024, while requiring a share of savings to benefit people affected by energy poverty, vulnerable customers and social housing.

*Article 21* : strengthens the obligations of Member States towards consumers with regards to the availability and provision of information and awareness, such as through the creation of one-stop shops. It also includes obligations to identify and lift barriers

relevant to the split incentives between tenants and owners or among owners.

*Article 22* : introduces an obligation for Member States to implement energy efficiency improvement measures as a priority among vulnerable customers, people affected by energy poverty and, where applicable, people living in social housing, to alleviate energy poverty.

*Article 26* : reinforces provisions related to the availability of qualification, accreditation and certification schemes for different energy services providers, energy auditors, energy managers and installers.

*Article 27* : introduces requirements to remove regulatory and non-regulatory barriers that impede the uptake of energy performance contracting and other energy efficiency service models for the identification and/or implementation of energy saving measures.

*Article 28* : introduces a requirement for Member States to report on energy efficiency investments as part of Governance Regulation, including on energy performance contracts concluded. It also requires Member States to set up project development assistance mechanisms at national, regional and local levels to promote energy efficiency investments.

## Recommendations

### Energy Efficiency Directive

- In order to avoid legal loopholes and possible market distortions, ensure consistency between renovation requirements for public buildings owned by public authorities (*Article 6*) and those occupied through public procurement (*Article 7*) by applying the NZEB standard to both categories. At the very least, the NZEB standard should apply to all occupied buildings subject to new rental agreements.

## What is still needed?

### Energy Performance of Buildings Directive

- Set a clear political target for the building stock as a whole in each Member State to achieve climate-neutrality by 2050, defined as zero operational emissions.
- Transform the Long-term Renovation Strategies to National Building Renovation Action Plans that require Member States to develop a detailed roadmap for transforming their building sector to zero-emissions by 2050, including national target for 2030, 2040 and 2050 relevant for each of the four transitions in the building sector, planned policies and measures, as well as a detailed outline of investment needs and financing measures.
- Introduce a 'zero-emissions buildings' (ZEB) definition to serve as the new standard for new construction and the new goal for all energy-related renovations. Allow Member States to set the ZEB standard in terms of a GHG emission requirements or any energy performance indicator (primary energy, delivered energy or an energy need indicator) suitable in the respective countries to guide the building requirements towards climate neutrality. The ZEB standard should clearly reflect the energy efficiency first principle, which means that energy needs should be very low. The Commission should thus provide benchmarks for the energy performance of the building envelope in new construction that meets at least the passive house standard across Europe. The ZEB standard should also require buildings to use an energy supply that can be fully decarbonised by 2050 (such as electricity or district heating and cooling) and integrate locally available renewable resources, without discriminating against low-temperature district heating.
- Change the existing definition of cost-optimality to serve the purpose of finding building configurations that meet the overarching target of being compatible with climate neutrality in a cost-optimal way, while allowing Member States to also include other non-energy benefits in their cost-optimality calculations.
- Establish a definition for deep renovations that sets an ambitious standard for renovations to achieve their full potential for energy savings, while allowing this standard to be met in more than one step. As a benchmark, component energy standards (for walls, windows, roof etc.) for deep renovations should be close to the standards that are typically required to meet the ZEB requirements for new buildings, while individual exceptions should be possible e. g. in the case of cultural heritage building.
- Set an indicative sub-target for deep-renovations and require Member States to design renovation support schemes in the building sector that provide clear incentives to do one-off deep renovations instead of staged ones and prioritize renovation support for low-income households.
- Set new rules to better harmonize the implementation of Energy Performance Certificates (EPC) across the EU, in order to improve comparability and reliability. Importantly, the basis for EPC scaling should shift from primary energy consumption to final or useful energy consumption and be verified using real consumption data wherever possible. Key indicators provided in the Energy Performance Certificates should at minimum include final or useful energy consumption and space heating & cooling demand, operational GHG emissions, as well as information on renewables-readiness and smart-readiness. For new buildings whole life-cycle GHG emissions should also be included.
- Set a sequentially increasing minimum performance standard for existing buildings with clear dates between 2027 and 2050 applying to all buildings. These requirements should be set in such a way that by 2050 the energy and climate performance of all buildings in the building stock approaches at least a harmonized EPC level "B" and is compatible with the overall climate-neutrality objective.

- Establish a new renewable heating and cooling readiness (RES-readiness) standard for existing buildings that defines the 'building envelope' / 'fabric efficiency' measures necessary to enable the efficient operation of efficient renewable heating systems such as heat pumps and low-temperature district heating (e.g. achieving a heating flow temperature below 55°C). These generally will include targeted improvement of insulation, as well as the replacement and proper installation of radiators optimized for low flow-temperatures in water-based systems. It should also include an assessment of the technical and economic feasibility of connection to an existing or planned low-temperature district heating or cooling network.
- Establish minimum performance standards for all existing buildings that require them to meet the RES-readiness standard by 2030 to ensure they are ready for a fuel switch to a heat pump or low-temperature district heating.
- Require building renovation passports to be introduced for all buildings and aligned to both the minimum RES-readiness standard and the minimum energy or climate performance standard for existing buildings.
- Require financial regulators to mandate a Mortgage Portfolio Standard aligned with the goal of a zero-emission building stock by 2050 as an approach to manage transition risk in real estate lending and EU mortgage portfolios.

#### **Climate, Energy and Environment State Aid Guidelines (CEEAG) and General Block Exemption Regulation (GBER)**

- Ensure that all building owners required to do renovation works to meet the minimum energy or climate performance standard are eligible for state aid, while linking the level of eligible costs to the depth of renovation and early action.

## The Heating and Cooling Transition

### What is the challenge?

To achieve the EU's climate targets, emissions from heating and cooling in the buildings sector must fall by half between 2020 and 2030 and approach zero by 2050. With 72% of space and water heating in the EU still supplied by fossil fuels, this will require a fuel switch from carbon intensive energy carriers to renewable energy and waste heat. Triggering this transformation will require "push" measures to accelerate the phase-out of fossil fuel heating & cooling technologies, as well as "pull" measures to massively scale the supply of renewable heating and cooling and build-out the necessary infrastructure to deliver them (e.g. district heating and cooling networks). Ambient heat delivered by heat pumps, solar thermal and geothermal will be the main sources of clean energy to replace fossil fuels in heating and cooling, while considerable investment in district heating and cooling networks will be needed to affordably and reliably meet heating and cooling needs where heat demand is highly concentrated.

### Where we stand today

In 2017, an estimated 83% of installed space heating capacity in the EU relied on fossil fuels (66% gas; 15% oil; 2% coal) and in 2019 more than half of district heat sales in Europe still originated from fossil fuels<sup>11</sup>. Furthermore, of the 129 million boilers installed in Europe, more than half are relatively

inefficient (ranked in C or lower in efficiency) and old (installed before 1992)<sup>12</sup>.

By contrast, in 2019 renewables represented only 22.1% of EU final energy demand for heating and cooling, with national shares ranging significantly from 6.3% in Ireland to 66.1% in Sweden<sup>13</sup>. In 2018, the lion's share (85%) was provided by bioenergy in form of solid biomass (81%) and biogas (4%). The remaining 15% of renewable heating and cooling was delivered by ambient heat from heat pumps (12%), solar thermal (2.4%) and geothermal (0.8%)<sup>14</sup>. While annual sales of heat pumps have roughly doubled since 2015, solar thermal and geothermal sales have been more volatile and lower than targeted in member state renewable energy action plans. Without further guardrails the EU's new climate targets could push demand for bioenergy in heating & cooling and power generation beyond sustainability limits<sup>15</sup>.

District heating and cooling provides roughly 10% of heating and cooling in buildings, serving some 70 million EU citizens, including more than half of the population in Latvia, Denmark, Estonia, Lithuania, Poland, Sweden and Finland. However, most of the existing heat district heating networks were developed to transport high temperature fossil-based heat and will need significant upgrading if they are to function as modern low-temperature heat networks that maximize efficiency and are able to integrate larger shares of renewables. Moreover, local heating and cooling planning is basically non-existent in large parts of Europe, making it close to impossible for municipalities to make an informed decision on the suitability of heating and cooling networks for decarbonizing their building stock.

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11 IEA (2020): District heat sales in Europe by fuel source, 2000-2019.

12 ECOS (2020) Five Years Left: How ecodesign and energy labelling can decarbonize heating.

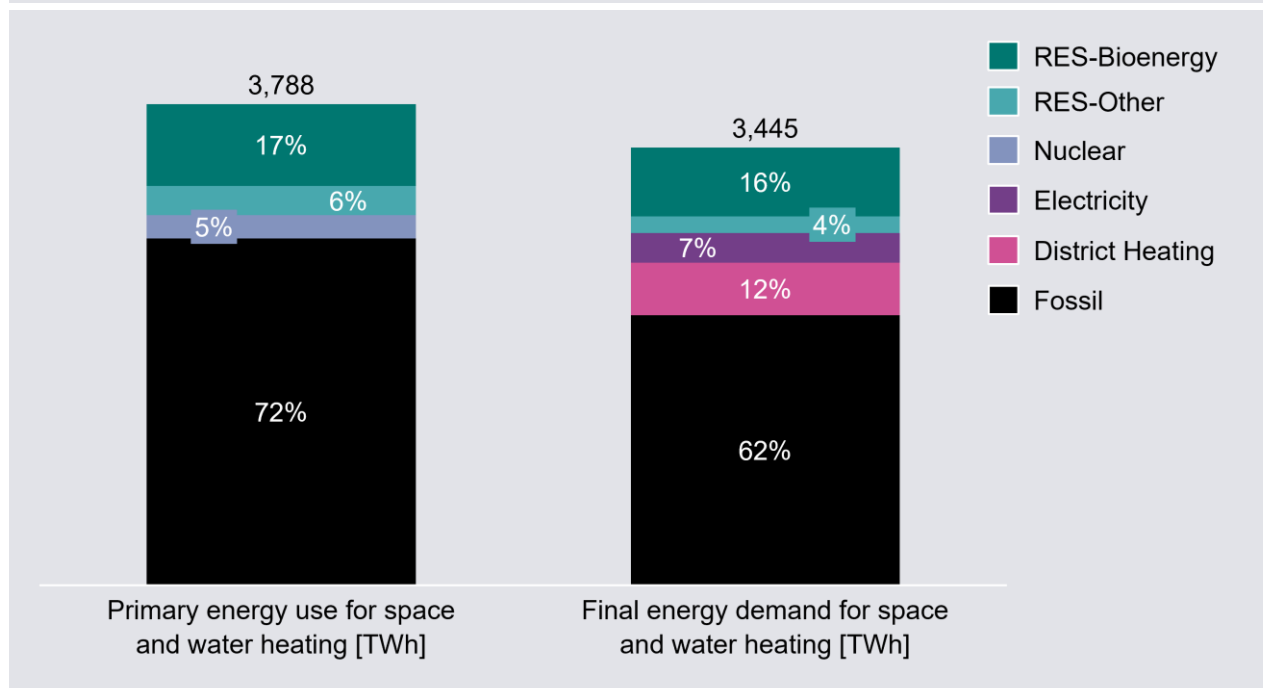
13 EC (2020): Just over 20% of energy used for heating and cooling is renewable.

14 EEA (2020): ETC/CME Report 7/2020: Renewable energy in Europe 2020 - Recent growth and knock-on effects.

15 JRC (2021): The use of woody biomass for energy production in the EU.

Where we need to be in 2030?	Where we need to be in 2050?
<ul style="list-style-type: none"> <li>• 50 million installed heat pumps.</li> </ul>	<ul style="list-style-type: none"> <li>• 100% RES and waste heat in heating and cooling.</li> </ul>
<ul style="list-style-type: none"> <li>• A market share for district heating and cooling of 20% with at least 50% RES and waste heat.</li> </ul>	
<ul style="list-style-type: none"> <li>• Hydrogen and bioenergy are limited to sustainable potentials and no-regret applications.</li> </ul>	

Figure 4: Overview of primary and final energy consumption, space and water heating, EU-27, 2017



Source: Fraunhofer et al (2021): Description of the heat supply sectors of individual EU Member States Space heating market summary 2017-European Union (EU-27) (Forthcoming)

## Key proposals in the July Package

### Energy Efficiency Directive

*Article 5* : introduces an obligation for the public sector to reduce its energy consumption for public services and installations of public bodies by 1.7% per year. This target can be reached through efficiency measures in any part the public sector, including publicly owned district heating & cooling networks.

*Article 8* : ensures the additionality of energy savings achieved through energy savings obligations by excluding the counting of energy saving from direct fossil fuel combustion technologies and measures under the ETS Directive under Annex V. In practice, this means that if, for example, Member States set up a support scheme to replace heating systems with more efficient gas boilers, the resulting energy savings cannot count towards the 1.5% energy savings obligation, disincentivizing public support for fossil heating. By contrast, efficiency measures in district heating and cooling networks can count towards the energy savings.

*Article 11* : As part of mandatory energy audits for companies with high energy consumption, Member States may require that an assessment of the technical and economic feasibility of connection to an existing or planned district heating or cooling network be done.

*Article 23* : requires Member States to undertake comprehensive heating and cooling assessments and encourage municipalities with more than 50,000 people to prepare local heating and cooling plans.

*Article 24* : requires new and renovated district heating and cooling networks to meet progressively stronger efficient district heating and cooling targets, including an increasing share of RES and waste heat. It also requires Member States to ensure a site-

specific cost-benefit analysis when certain installations are newly planned or substantially refurbished (including data centres), with a particular view to assessing use of waste heat on and off-site.

### Renewable Energy Directive

*Article 3* : requires Member States to take into account the waste hierarchy and the cascading principle<sup>16</sup> in the use of biomass for energy, including by limiting support for certain types of biomass and waste incineration (such as the production of electricity from forest biomass in electricity-only-installations) from 31 December 2026. It also requires the Commissions to adopt a delegated act on how to apply the cascading principle within one year after entry into force of the revised directive and present a report on the impact of Member State support schemes for biomass by 2026.

*Article 15* : sets an indicative target of at least a 49% share of energy from renewable sources in the buildings sector by 2030; requires Member States to introduce minimum RES shares in building regulations and codes; and sets requirements to ensure sufficient trained and certified installers to meet the target.

*Article 18* : strengthens requirements for Member State to ensure a sufficient number of trained and qualified installers to meet the RES sub-target for heating & cooling.

*Article 20* : makes technical adjustments to ensure consistency with other district heating and cooling provisions ensuring that only efficient district heating and cooling are promoted.

*Article 23* : sets a binding target to increase RES in heating and cooling by 1.1%-1.5% per year, as well as a requirement for Member States to perform an

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16 The cascading principle aims to achieve resource efficiency of biomass use through prioritising biomass material use to energy use wherever possible, increasing thus the amount of biomass available within the system. In line with the cascading principle, woody biomass should be used according to its highest economic and

environmental added value in the following order of priorities: 1) wood-based products, 2) extending their service life, 3) re-use, 4) recycling, 5) bio-energy and 6) disposal.



assessment of their RES and waste heat and cold potential.

*Article 24* : sets an indicative target to increase RES and waste heat in district heating by 2.1% per year.

*Article 29* : strengthens sustainability and GHG emissions savings criteria by prohibiting countries from supporting certain types of biomass (primary forests, highly biodiverse forests, wetland and peatland), or counting their use as contributing towards the EU's RES targets. It also specifies certain harvesting criteria for forest biomass and extends sustainability criteria for heat and power installations to plants above 5 MW (from 20 MW), including existing installations<sup>17</sup>.

*Article 30* : introduces an obligation for Member States to establish simplified national verification schemes to verify fulfillment of sustainability and GHG criteria set out in Article 29 for installations producing electricity heating and cooling with a total rated thermal input between 5 and 10 MW.

### **EU ETS Directive**

*Article 10* : earmarks an additional 2.5% of EU ETS allowances for the Modernisation Fund from the date of entry into force of the revised ETS until 2030, on top of the current 2% of total allowances to be auctioned. These funds will be distributed to countries below 65% and 60% of the EU average GDP per capita in the period 2016–2018 (respectively) and should be used to support improvements in energy efficiency and the modernization of energy systems. The Modernization Fund will no longer be able to support projects related to fossil fuels, including fossil gas.

*Article 14* : applies the sustainability criteria for bioenergy under the RED Directive to large installations, meaning biomass burned in large installations will not be treated as zero-emission in principle.

*Chapter IVa*: A new ETS 2 for buildings and transport is to be phased in between 2024 and 2025 as an upstream system obligating fuel suppliers to purchase and surrender allowances from 2026 onward. The new system would set a cap on emissions in the regulated sectors – declining to –43% in 2030 below 2005 levels. The proposal aims to moderate price fluctuations through volume-based instruments, including frontloading of allowances and introducing a separate Market Stability Reserve.

**The Social Climate Fund** will provide €72 billion disbursed over 2025–2032 to be matched by Member States and to be specifically used to support lower-income households and micro-enterprises. It also introduces a new planning instrument obliging Member States to set out the measures and investments to be financed by the social climate fund payments, their expected costs as well as milestones and targets to achieve them.

### **Energy Taxation Directive**

*Article 2* : Biomass will no longer be exempted as a general rule. Rather, differentiated reference values will be applied, provided that they meet sustainability criteria for bioenergy under the Renewable Energy Directive.

*Article 16* : allows Member States to apply exemptions or reductions in the level of taxation to electricity from renewables, highly efficient cogeneration and renewable fuels of non-biological origin (RFNBOs).

*Article 17(c)* : allows Member States to permit differentiated energy taxation for households and businesses by gradually phasing in new rates for households over a transitional period starting from a rate of zero in year one to the final minimum rates in year ten, increasing by one tenth per year. It also allows Member States to exempt vulnerable and

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17 According to Commission analysis, these criteria extend the sustainability criteria to 1,065 additional plans with a size between 5MW up to 20MW.

energy poor households from taxation on energy products and electricity for a maximum period of 10 years.

### LULUCF Regulation

*Article 4* : The European Commission has proposed creating a new land-use sector from 2030 and has set the goal of achieving a climate-neutral land-use sector by 2035, thus putting pressure on unsustainable bioenergy use that negatively impacts the forest sink. Towards this aim, the European Commission has for the first time proposed quantitative LULUCF targets for the year 2030 and will propose by 2025 contributions to be made by Member States towards the 2035 climate-neutral land-use target. The contribution proposals will be based on the integrated National Energy and Climate Plans, which Member States must finalize and submit to the European Commission by 30 June 2024.

### Recommendations

#### Energy Efficiency Directive

- Make local heat planning binding and applicable to all municipalities of more than 20,000 people.
- Sustainability requirements for district heating and cooling are not sufficiently ambitious in the period up until 2035 and should be tightened over the short-term, including with regards to the standard for what is counted as highly-efficient cogeneration (270h/kWh is too high).

#### Renewable Energy Directive

- Introduce CO<sub>2</sub> standards for heating & cooling in buildings, as well as an overall cap on the use of bioenergy in the EU buildings sector (*Article 15*).
- With regards to the banning of support for the production of electricity from forest biomass in electricity-only-installations (*Article 3*), remove the exemption for installations in regions identified in a territorial just transition plan.

#### EU ETS Directive

- Include a political target for the cap to reach zero by 2045 to signal to the market that there will be a complete phaseout of unabated fossil gas use in buildings. Under the current LRF for the ETS 2 (that automatically applies also after 2030), the cap reaches zero by 2044.

#### Social Climate Fund

- Explicitly exclude support for any fossil fuel investment using Social Climate Fund revenues.
- Require Member States to systematically assess the impact of the ETS 2 on low-income households when developing their Social Climate Plans.

#### Energy Taxation Directive

- Strengthen national minimum energy pricing for heating fuels (natural gas and heating oil).
- Introduce a political target and planning obligation for reducing the gap between electricity and gas prices to below a certain threshold, e.g. a ratio of 2 to 1.
- Introduce common rules by which Member States can adjust their excise duties on heating and road transport fuels to respond to variable carbon pricing under the new ETS 2 for a temporary period of time.

### What is still needed?

#### Energy Performance of Buildings Directive

- Ensure that National Building Renovation Action Plans require a political target to phase-out fossil fuels from the building sector by 2045 and establish a requirement for Member States to plan the transition for phasing out fossil fuels in buildings in line with this target and a shrinking fossil gas market. These plans should draw on national and local heating and cooling and RES assessments (RED/EED) and National Social Climate Plans (Social Climate Fund), while also helping to inform the National Energy and Climate Plans (Governance Regulation) and the Integrated Network

Planning for energy infrastructure  
(Gas Directive).

- Strengthen the definition of Nearly Zero Energy Buildings applicable to new construction to explicitly prohibit the direct combustion of fossil fuels in all new buildings from entry into force.
- Forbid Member States to provide any public support to the installation of fossil fuel boilers.

### **Ecodesign and Energy Labelling for Space and Water Heating Appliances**

- Maintain the rescaled Energy Labelling for space heating as foreseen in the draft regulation, which would adapt the class boundaries to downgrade the majority of fossil-fuel powered appliances, including condensing gas boilers, to the lowest grades: F (Eff. 90 - 100%) and G (Eff < 90%).
- Revise the draft ecodesign regulation for space and water heaters to phase out the least-performing space heaters by setting a minimum seasonal space heating efficiency of above 105% falling under grade E (Eff. 100 - 120%).

### **Gas Directive and Regulation**

- Introduce requirement for DSOs/TSOs to develop detailed strategies and action plans for decommissioning fossil gas infrastructure that will no longer be needed and start building reserves for their removal.
- Introduce a specific mandate for NRAs and ACER to pursue further market monitoring with regards to decreasing transaction volumes on the internal fossil gas market and its consequences, including potential future increases in network fees for individual consumers and potential concerns over market power.

### **F-Gas Regulation**

- Introduce bans for high global warming potential heat pumps in the upcoming revision of the F-Gas Regulation in all applications where hydrofluorocarbon-free alternatives already exist, including domestic ground-source heat pumps,

water-source heat pumps, exhaust air heat pumps and monobloc air-source heat pumps.

### **Climate, Energy and Environment State Aid Guidelines (CEEAG) and General Block Exemption Regulation (GBER)**

- Introduce specific provisions with regards to support for decarbonization in district heating and cooling where competitive price determination is not possible in order to accelerate state aid approval and avoid case-by-case notification procedures.
- Strengthen the conditionality of support for inefficient district heating networks and networks operating on the basis of fossil fuels.
- Permit Member states to tender renewable energies on a technology-specific basis without the need for justification, given the need to ensure a diversified and balanced RES portfolio.
- When Member States grant state aid to scarce energy options (e.g. bioenergy and hydrogen), oblige them to demonstrate this is the most energy efficient decarbonization solution for the usage context, in order to promote reliance on such energy carriers only in high value applications, particularly in industry.

## The Building Materials Transition

### What is the challenge?

Beyond cutting the operational emissions of the EU's building stock, achieving the EU's climate targets will require reducing the embedded emissions of building materials used in construction and renovation to zero by 2050. This will require reducing emissions from the manufacturing of basic materials used in construction (e.g. steel and cement) by supporting the scaling of breakthrough clean technologies in industry, as well as significantly enhancing material substitution, efficiency and recycling to reduce the need for carbon-intensive virgin materials and achieve positive CO<sub>2</sub> capture in wood and bioplastics. Equally, the building sector must contribute to the creation of scalable markets for climate-friendly and circular materials, thus helping to create a business case for the relevant technologies and value chains.

### Where we stand today

While embodied carbon is responsible for a relatively small share of the CO<sub>2</sub>-footprint of buildings today (roughly 10–20%), its relative importance is set to rise as improvements in energy efficiency and clean energy reduce operational emissions from space and water heating and other household appliances. Indeed, embodied carbon emissions are estimated to represent as much as half of the whole-life cycle emissions for new buildings constructed in line with advanced energy performance standards.<sup>18</sup>

While overall whole lifecycle emissions in new construction and renovation are largely unregulated at the EU-level, some Member State regulations already address this issue. Notably, France and

Denmark have adopted regulations that set limits on whole lifecycle emissions of new buildings constructed from 2021 and 2023, respectively<sup>19</sup>.

Manufacturers of construction materials are increasingly using environmental product declarations (EPDs) to publish lifecycle assessment (LCA) data for their products. However, a commonly used reporting framework for the whole lifecycle assessment (WLCA) of basic materials is still lacking. While the EU has introduced a reporting framework – called “Level(s)” – for the benchmarking of lifecycle carbon performance, various countries, such as Sweden, Finland and the Netherlands, still use their own (simplified) LCA methodologies for the sake of practical implementation, thus limiting EU-wide comparability and monitoring. Another challenge is that companies are not required to pass on EPD information along the value chain and often choose not to, either for reasons of cost or lack of performance.

The production of key building materials (e.g. steel and cement production) is also covered by carbon pricing under the Emissions Trading System, but a combination of free allocation of allowances to industry and relatively low allowance prices generally fails to incentivize some of the key options to reduce emissions. In many construction projects, concern about minimizing time to completion and labour costs often also outweighs considerations related to the cost of materials. Regulatory incentives may therefore be more effective in many cases to incentivize the necessary abatement solutions.

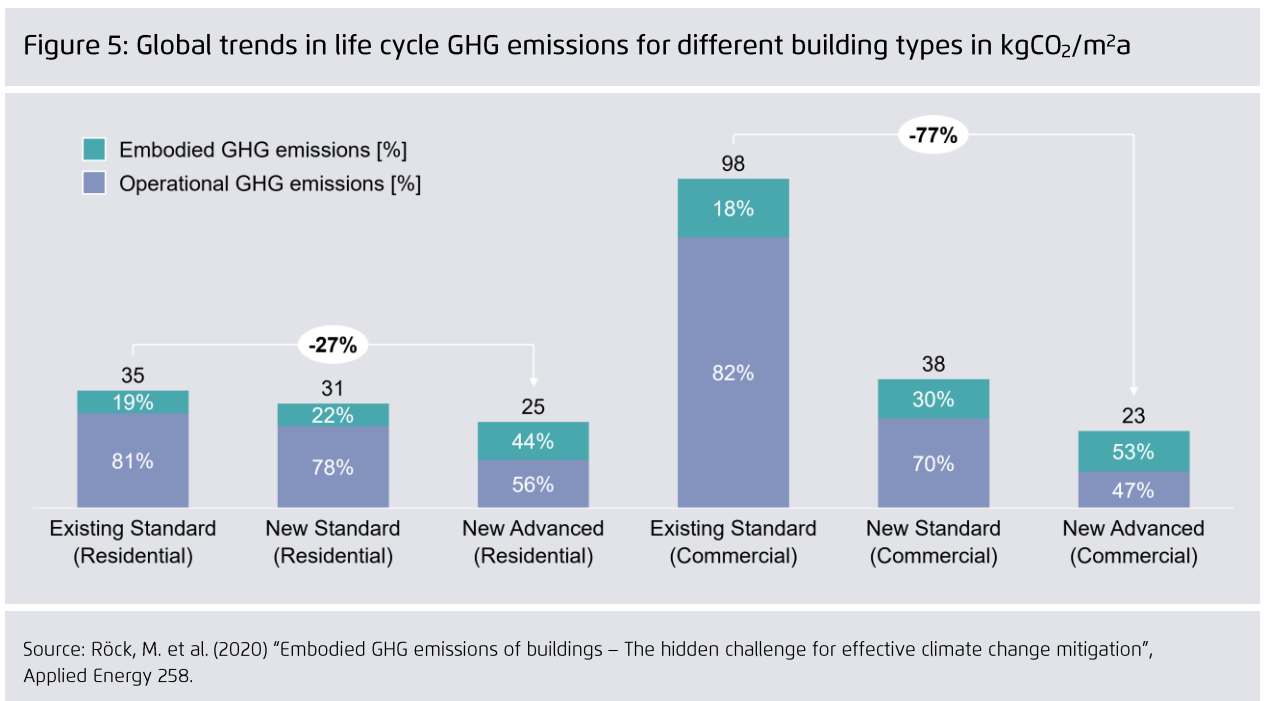
Significant barriers also remain in the domains of material substitution, efficiency and recycling. For instance, value chains for recycling concrete and unhydrated cement particles from building demolition don't yet exist, and structural engineers and architects generally do not take material efficiency into account when designing a building.

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18 BPIE (2021): Whole-life carbon: challenges and solutions for highly efficient and climate-neutral buildings.

19 BPIE (2021): Whole-life carbon: challenges and solutions for highly efficient and climate-neutral buildings.

Where we need to be in 2030?	Where we need to be in 2050?
<ul style="list-style-type: none"> <li>All new private and public buildings meet ambitious and declining limits on embedded carbon.</li> </ul>	<ul style="list-style-type: none"> <li>Whole-life cycle emissions in building construction and renovation decline to zero by 2050.</li> </ul>
<ul style="list-style-type: none"> <li>All large new buildings contain a minimum of 50% recycled steel, and 25% low-carbon or recycled cement content.</li> </ul>	
<ul style="list-style-type: none"> <li>The renovation wave has not increased WLC emissions.</li> </ul>	



## Key proposals in the July Package

### Energy Efficiency Directive

*Article 5:* Member States must encourage all public bodies, including local and regional authorities, to consider life cycle carbon emissions in their public bodies' investment and policy activities.

*Article 6:* Member States may take into account new buildings replacing public buildings demolished in the last two years as part of their renovation rate, under the condition that they are more sustainable in terms of energy and lifecycle CO<sub>2</sub> emissions achieved compared to renovations.

*Article 7:* Member States must adhere to EU green public procurement criteria, and may take circular economy aspects into account. Member States are also required to support public bodies through various measures and may require disclosure of the Global Warming Potential of new buildings in tenders in order to increase awareness for whole life-cycle emissions in public procurement practices.

### LULUCF

*Article 9:* Adds new categories of carbon storage products, including durable harvested wood products, that have a carbon sequestration effect, based on IPCC Guidelines and ensuring environmental integrity.

### Recommendations

- Require that Member States take into account circular economy aspects during public procurement for building contracts above a certain threshold (*Article 7*).

## What is still needed?

### Energy Performance of Buildings Directive (EPBD)

- Require Member States to ensure that the whole life cycle emissions of new buildings are disclosed with regards to the life-cycle Global

Warming Potential in terms of kgCO<sub>2</sub>e/m<sup>2</sup>/year and rated according to a performance label on the Energy Performance Certificate.

- Require member states to define mandatory regulatory limits on embedded (life cycle) carbon in public and private buildings that are newly built from 2030 onwards and introduce a requirement to include a minimum share of recycled cement in all large new buildings.
- Ensure that the National Building Renovation Action Plans include a roadmap with targets and progress indicators to deliver a climate neutral building stock, in which the whole life cycle emissions are reduced to zero by 2050.
- Require construction projects to report on the embedded emissions in all new buildings and store the data in a digital repository.

### Construction Products Regulation

- Clarify that innovative low-carbon or recycled products receiving European technical assessment approval at the EU level will automatically be considered to be compliant with national (i.e. non-harmonised) standards in member states.

### Sustainable Products Legislation

- Require the Commission to develop by 2024 a standardized CO<sub>2</sub> performance rating label for basic materials (beginning with steel, aluminium and concrete), akin to the A–F performance ratings for energy consumption. The system could establish performance categories that range from F to A (i.e. climate neutrality) with D potentially representing the current ETS benchmarks and taxonomy criteria.
- Require the Commission to mandate a common methodological standard be used to report on embedded carbon in construction products – perhaps using the EU's own Product Environmental Footprint (PEF) methodology.
- Require companies producing and processing CO<sub>2</sub> intensive products over a given threshold in key value chains (including construction), to provide relevant information related to the

embedded CO<sub>2</sub> emissions in the product to downstream consumers at point of sale using the EU's Product Environmental Footprint methodology.

#### **Green Public Procurement Directive**

- Introduce a timeline for increasingly ambitious public procurement criteria that would gradually limit the CO<sub>2</sub> intensity of basic materials – beginning with steel, concrete and aluminium. Initially, the directive could require procured materials to adhere to EU ETS best-performance benchmarks; subsequently, fulfilment of a CO<sub>2</sub> rating category could become mandatory, with a shift to the next most stringent category every five years (e.g. from D to C, then C to a B, with D potentially representing current ETS benchmarks/taxonomy criteria).

#### **F-Gas Regulation**

- Ban building materials with high Global Warming Potential (GWP) (e.g. certain foams).

## The Smart Electrification Transition

### What is the challenge?

Meeting the EU's climate targets will require a significant change in the structure of energy demand for heating and transport among households and businesses. In particular, target fulfilment will require widespread electrification, and an associated strong increase in RES and related infrastructure in buildings. On the supply side, there is a need to maximize on-site RES generation by rooftop solar and building-integrated PV. On the demand side, power consumption by appliances (e.g. heat pumps), electric vehicles and other systems (washers, dryers, lighting) needs to become more efficient and more flexible, in order to accommodate the electrification of heating and transport in the electricity grid and make the most effective use of valuable renewable resources by shifting electricity demand to times of abundant renewable generation and lower grid congestion.

### Where we stand today

In 2020, the EU had 90 GW of installed rooftop PV. However, more than 90% of the European rooftops suitable for PV deployment remain unused<sup>20</sup>.

The energy performance of most major household appliances is already regulated via energy labels and ecodesign standards. Accordingly, efficiency

measures in this area have already generated savings equivalent to 9% of total EU energy consumption. However, further progress is being stalled by industry lobbying and a chronic underfunding of the Commission's work.<sup>21</sup>

The electrification of heating, cooling and transport is accelerating. In 2020, a total of 13.3 million heat pumps were installed across 19 EU Member States.<sup>22</sup> Annual heat pump sales have doubled since 2015, and by 2030, an estimated 38 to 50 million heat pumps will be installed.<sup>23</sup> Similarly, the electric vehicle stock in Europe has increased 54% during 2021 thus far, reaching 3.8 million.<sup>24</sup> By 2030, there will be an estimated 30 to 70 million EVs on European roads.<sup>25</sup>

With smart management, heat pumps and EVs can contribute to the balancing of supply and demand in power grids, thus allowing larger shares of variable renewables. However, buildings and vehicles are often not equipped with the technical systems required to fully exploit such potential, in part because existing market arrangements do not adequately incentivize heat pump and electric vehicle owners to provide "flexibility services".

The 2018 revision of the Energy Performance of Buildings Directive (EPBD) introduced a Smart Readiness Indicator to rate the readiness of buildings to optimize their energy efficiency and performance in line with the needs of the occupant and the grid. However, deployment of this informational tool remains entirely voluntary.

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20 SolarPower Europe (2020): EU Market Outlook for Solar Power 2020-2024

21 EEB (2021): Ecodesign and energy labelling are essential in the 'green' transition – but the EU must fund them.

22 EHPA (2021) Market Data.

23 European Commission modelling for the Fit for 55 package expects 38 million heat pumps in its 2030 policy scenarios. Meanwhile, a study commissioned by

Eurelectric (2020) indicates the number could be closer to 50 million.

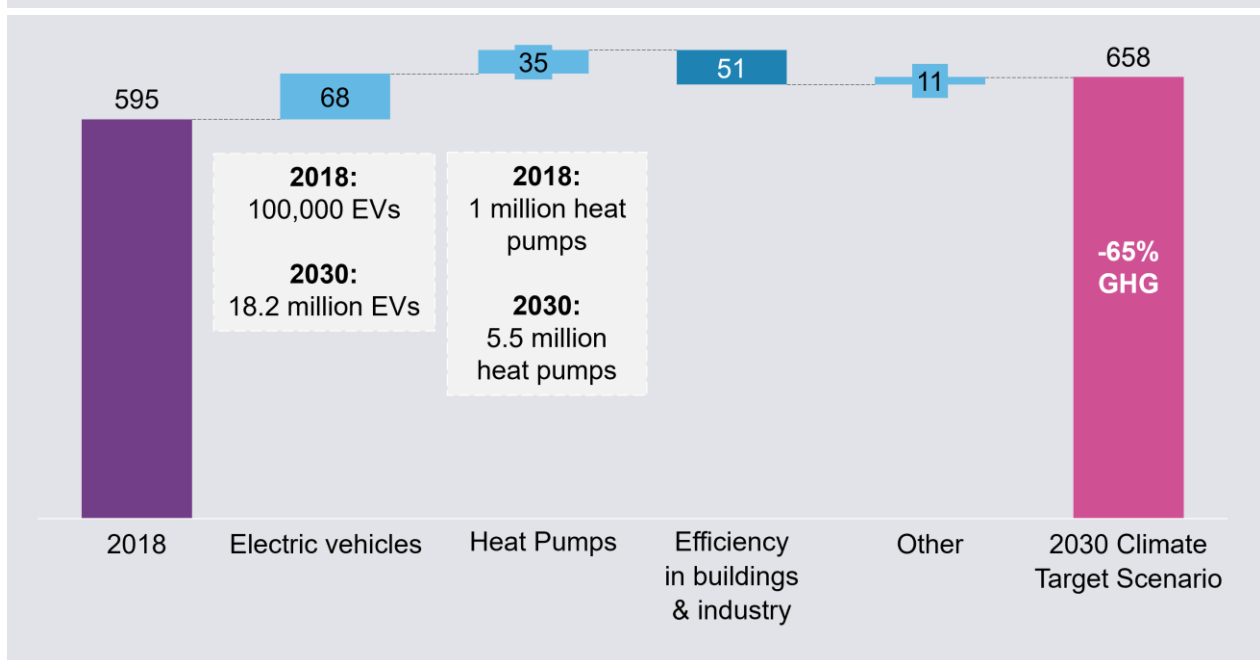
24 See the figures for electric vehicles (incl. plug-in hybrids) on the European Alternative Fuels Observatory website.

25 EU Commission modelling for the Fit for 55 package expects 32 million EVs in its 2030 MIX scenario. Meanwhile, a study commissioned by Eurelectric (2020) indicates the number could be closer to 50-70 million.



Where we need to be in 2030?	Where we need to be in 2050?
<ul style="list-style-type: none"> <li>At least 30 million solar roofs, including all new builds (+60GWp).</li> </ul>	<ul style="list-style-type: none"> <li>100% of solar rooftop potential is used (between 485 and 545 GWp of PV)<sup>26</sup>.</li> </ul>
<ul style="list-style-type: none"> <li>Electricity covers at least 41% of final energy consumption in buildings.</li> </ul>	<ul style="list-style-type: none"> <li>Electricity covers roughly half of final energy consumption in buildings<sup>27</sup>.</li> </ul>
<ul style="list-style-type: none"> <li>All heat pumps and EV chargers, and the buildings in which they are installed are smart ready.</li> </ul>	<ul style="list-style-type: none"> <li>All buildings are smart ready.</li> </ul>

Figure 6: Change in gross electricity consumption in Germany from 2018-2030 by sector (in TWh)



Source: Prognos, Fraunhofer ISI, Öko Institut (2021)

26 Calculations for solar rooftop potential based on Jäger-Waldau, Arnulf (2020): The Untapped Area Potential for Photovoltaic Power in the European Union.

27 Electrification estimates based on the European Commission's modelling for the Fit for 55 Package.

## Key proposals in the July Package

### Renewable Energy Directive

*Article 15:* sets an indicative 49 % target for renewables in the buildings sector while also requiring Member States to introduce minimum RES shares in building regulations and codes.

*Article 18:* requires Member States to ensure that enough trained and qualified installers of renewable heating and cooling systems are available to deliver the EU's 2030 sub-target for renewables in heating and cooling and that sufficient training programmes are made available to achieve this goal.

*Article 20a(1):* requires TSOs and DSOs to make data available on the RES share and GHG content of the grid electricity in each bidding zone so it can be used by aggregators, consumers and end-users.

*Article 20a(2):* requires manufacturers of domestic and industrial batteries to enable real-time access to basic battery management system information (e.g. charge and state of health) to battery owners and users as well as to building energy management companies and electricity market participants, under non-discriminatory terms and at no cost.

*Article 20a(3):* It also requires non-publicly accessible normal power charging points to have smart charging functionality and, where appropriate, bidirectional charging functionalities.

*Article 20a(4):* requires Member States to ensure non-discriminatory access to electricity markets for EVs and domestic battery storage systems, both directly and through aggregation.

### Energy Taxation Directive

*Article 5:* allows for differentiated taxation on electricity used to charge electric vehicles (battery electric vehicles and plug-in electric vehicles).

*Article 16:* Member States may apply exemptions or reductions in the level of taxation to electricity from renewables, highly efficient cogeneration and renewable fuels of non-biological origin (RFNBOs).

## Recommendations

### Renewable Energy Directive

- Introduce a sub-target for electrification in buildings counted in primary energy terms and require Member States to introduce a solar rooftop obligation in building regulations and codes – for example, by requiring the owner either (1) to install rooftop solar PV or solar thermal, or (2) enter the rooftop in a lease register that allows others to exploit the potential (*Article 15*).
- Extend the scope of *Article 18* so that it also covers installers of EV charging points and batteries and trains sufficient installers capable of optimizing the installed energy systems to maximise self-consumption from rooftop solar.
- With regards to access to data, require TSOs and DSOs to also make data available on electricity prices (*Article 20a(1)*) and extend the scope of provisions to not only cover data from batteries and EVs but also data from heating appliances and home energy management systems (*Article 20a(2)*).

## What is still needed?

### Energy Performance of Buildings Directive

- Introduce a new Article to establish a new harmonized EU framework for building renovation passports that includes measures to promote the smart flexibility of the building, including, where appropriate, smart EV charging, smart heat pumps, battery storage and heat storage.
- Revise *Article 4* to require that Member States introduce building codes for both new buildings and major renovations that consider demand-side flexibility and storage, for example by

ensuring technological readiness to interact with the grid. To this end, Building Energy Management Systems (BEMS) that enable automated flexibility should be mandatory in all new and renovated non-residential buildings from 2025 onwards.

- Enshrine a “right to plug” in EU law to ensure that citizens living in multi-dwelling buildings with more than three parking spots (a) have pre-cabling for every parking spot, (b) have an enforceable right to a smart charging station in their shared garage and (c) that employees have an enforceable right to a dedicated or shared charging station at their workplace. The wait time from making the request to install a charging station should not exceed 3 months.
- Revise *Article 8* to expand EV charging provisions to cover existing buildings and ensure that all parking spaces in buildings with more than three parking spots are cabled for EV charging by 2035. Towards this aim Member States should be obligated to meet intermediate targets of 10% in 2025 and 30% in 2030. Furthermore, Member State should require all buildings with more than three parking spaces to develop a collective charging plan and set minimum requirements for smart charging points (at least 5% in 2025, 10% in 2027 and 15% in 2030) and bi-directional charging.
- Revise *Article 10* to require smart charging readiness for all new and renovated charging infrastructure in residential and non-residential buildings based on the functionality levels for EV charging in the Smart Readiness Indicator, including requirements to integrate these chargers into Building Energy Management Systems.
- Revise *Article 11* to require that Smart Readiness Indicators are integrated into Energy Performance Certificates for all buildings from 2025 onwards in line with Articles 14 and 15 of the current EPBD. Furthermore, the current EPC framework should be expanded to include both the CO<sub>2</sub> footprint of a building and measured

energy performance metrics, rather than just theoretical energy performance.

- Expand the scope of the EPBD beyond new buildings and major renovations to include private depots and logistic hubs and require all new or renovated depots and logistic hubs to make depots and garages at freight terminals ready for future battery electric truck charging. This requirement should govern technical prerequisites (notably, conduit routing) as well as the correctly sized and future proof grid connection.

#### **Ecodesign & Energy Labelling for Space & Water Heating Appliances**

- Introduce minimum performance requirements with regards to the smartness of heat pumps to ensure they have the technical ability to deliver demand-side flexibility. To avoid consumer lock-in into a limited number of demand response providers, the European Commission should establish a standardised and open-source communication protocol, facilitating the communication between consumers' products and grid operators. At a later stage, and once this protocol is available, all heat pumps should be required to be compatible with it.



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