Buildings Efficiency

Special Report

International Energy Agency



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Abstract

This special report developed at the request of Türkiye in the framework of the strategic partnership between the President of COP 31 and the IEA, explores a pathway to improve global buildings energy intensity by at least 25% by 2035. It examines the policies, technologies and investment needed to accelerate progress, assessing policy coverage across building envelopes, electrification of end uses, equipment efficiency and access to clean cooking. The report outlines policy options to support implementation in efforts to reduce emissions, lower energy bills, increase clean cooking access, and manage growing electricity demand.

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Executive summary

Improving efficiency in buildings is central for emissions reduction and affordability

Energy used in buildings accounts for around 30% of total final consumption, half of global electricity consumption, and 2.8 Gt of direct CO_2 emissions. Higher incomes, urbanisation, and increased cooling needs are driving up energy demand, while rising energy bills, growing pressure on power systems, and limited access to clean cooking remain key challenges. Improving buildings efficiency is therefore essential to keeping energy services affordable and reducing emissions.

This report was developed at the request of Türkiye in the framework of the strategic partnership between the President of COP31 and the IEA. It explores a pathway to reducing energy consumption intensity in the building sector by at least 25% by 2035, in line with the target proposed by the COP31 Presidency.

Meeting the proposed target would require annual improvements in buildings energy intensity to more than double, compared to the rate of 1% achieved so far this decade. This acceleration is significant but achievable with technologies and policy measures already available. The analysed pathway to meet the proposed target is aligned with the goal of doubling the global average annual rate of energy efficiency improvements agreed by nearly 200 governments at COP28, and with the COP31 Presidency's goal of increasing the share of electricity in total final energy consumption to 35% by 2035. Faster progress in buildings is essential for achieving both.

Four key levers deliver the required efficiency gains, but higher policy ambition is needed

By 2035, global buildings energy intensity declines by only 7% compared to 2025 levels, and 11% compared to 2020, **in a scenario based on today's policy settings**, falling well short of the proposed target. This highlights the need for further efficiency improvements across the sector.

The report explores a pathway that reaches an energy intensity improvement of 26% from 2025 levels, and 28% from 2020 levels, by 2035, combining four main levers: strengthening equipment efficiency, improving building envelopes, electrifying end uses, and expanding access to clean cooking.

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Achieving this global target will require different approaches across countries, reflecting their respective starting points and the relative importance of each lever based on national contexts.

Equipment efficiency plays a key role, accounting for 40% of the intensity reductions. Today, about 140 countries have regulations targeting the efficiency of different home appliances and equipment, but their stringency varies significantly. For instance, 118 countries have minimum energy performance standards (MEPS) for air conditioners, covering over 90% of today's global energy demand for cooling, but some markets allow equipment that is less than half as efficient as models accepted in other markets. The pathway relies on all equipment efficiency improving at a faster rate, and sales of space cooling equipment and appliances progressing towards today's best-in-class standards. Stronger MEPS, regularly updated energy labels, and incentives to accelerate the adoption of more efficient models are central to achieve this.

Improving envelopes in new and existing buildings contributes to 20% of intensity reductions, yet policy coverage and compliance remain key challenges: 102 countries, where the majority of new construction takes place, have mandatory building energy codes. However, the lack of widespread enforcement, combined with this coverage gap, results in only around 60% of all new buildings being built in compliance with a code today. Key measures for achieving the target include expanding compliance to all new buildings, increasing stringency of building energy codes, and accelerating retrofits to Zero Carbon Ready Buildings.

Electrification provides another 15%, particularly through the use of heat pumps for space and water heating. Heat pumps are typically three to five times more efficient than fossil fuel boilers, but the costs of equipment, installation, and electricity, alongside non-economic barriers, hinder adoption. IEA analysis indicates that heat pumps are already competitive in countries accounting for more than half of global space heating demand. In this pathway, heat pumps' installed capacity triples by 2035, contributing to a nearly 35% reduction in space heating intensity.

Expanding access to clean cooking delivers 25% of the intensity reduction, replacing the inefficient use of traditional biomass with modern cooking solutions. Nearly 2 billion people still lack access to clean cooking, and progress remains insufficient. Policy momentum has accelerated, with more than 120 new policies and programmes implemented or announced across sub-Saharan Africa between 2024 and 2026. However, implementation lags behind ambition: although 32 countries have launched or announced national clean cooking strategies since 2024, only around 20 regulatory measures have been fully implemented. Universal access to clean cooking is achievable with today's technologies, and at

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modest cost. In this pathway, clean cooking access expands to more than 1 750 million people by 2035, delivering additional health and climate benefits.

Investment must more than triple to put buildings on track to achieving the target

Reaching the proposed target would require annual investment to rise to nearly USD 1.2 trillion by 2035. Global investment in buildings efficiency, electrification, and other end-use improvements exceeded USD 370 billion in 2025, meaning it will need to more than triple. The challenge is not simply to mobilise more capital, but also to direct it towards effective renovations and high-efficiency technologies that deliver lasting energy savings.

Public funding will remain important in overcoming upfront costs to support vulnerable households and reduce investment risks, but it cannot meet the financing requirement alone. Green lending, energy performance contracting, energy service companies, and blended finance can help mobilise private investment. Clean cooking also requires more financial support, as reaching universal access globally would require just above USD 4 billion per year. This represents only a small fraction of the overall efficiency investment needed.

Strengthening existing regulations and covering policy gaps are essential to accelerate progress

Accelerating buildings efficiency is both achievable and essential, but no single policy instrument alone can deliver the required improvements. Integrated policy packages can support progress by combining regulation, information, and incentives across the four key levers. The IEA provides policy makers with concrete tools to accelerate progress through its Energy Efficiency Policy Toolkit. All countries have opportunities to strengthen policy action from different starting points. Those already applying leading global standards can build on these efforts, updating them continuously and complementing them with other measures. Those with less ambitious policies have scope to strengthen requirements and expand their scope. Where policies are not yet in place, establishing the necessary frameworks and closing existing gaps will be critical to advancing progress, and these countries can build on others' experiences and adapt them to their local contexts.

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Chapter 1. Introduction

The importance of buildings' energy efficiency

This special report was developed at the request of Türkiye in the framework of the strategic partnership between the President of COP 31 and the IEA. It explores a pathway to achieve the proposed target of improving the energy intensity of buildings, measured as "buildings' final energy consumption over total built area globally", by at least 25% by 2035. If adopted, this target would help focus government action on improving the efficiency of buildings worldwide, while supporting efforts to improve energy security, reduce energy bills, manage growing electricity demand, and lower emissions.

Key message

Achieving at least a 25% improvement in buildings' energy intensity globally by 2035 would require annual efficiency progress to more than double from current rates, but it can be achieved using technologies and policies that are already available today.

Energy used in buildings accounts for around 30% of total final consumption, half of global electricity consumption, and 2.8 Gt of direct CO_2 emissions. At the same time, rapid urbanisation and rising incomes are increasing demand for energy services. Meeting these needs without a significant increase in energy consumption will require substantially faster efficiency improvements.

Buildings are where households and businesses are directly exposed to energy costs. In advanced economies, for instance, more than 120 million households spend over 10% of their income on residential heating, cooling, and appliance use. The low uptake and lack of affordable cooling solutions is contributing to rising heat-related mortality in many countries, while the rapid increase in air conditioner ownership is driving record electricity demand in others. More efficient buildings and high-efficiency equipment can lower bills, improve comfort and health, and improve energy security.

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Traditional use of biomass remains the primary source of cooking energy for the nearly 2 billion people worldwide who still lack access to clean cooking - half of whom live in sub-Saharan Africa. Wood, charcoal, and agricultural waste burned on open fires and basic stoves account for around 14% of buildings' energy consumption globally, much of which is lost through highly inefficient combustion. The resulting household air pollution contributes to around 2.5 million premature deaths each year, and these traditional cooking methods emit around 1.2 Gt CO_2-eq annually from direct emissions and forest degradation – comparable to the combined emissions of international aviation and shipping. Expanding access to clean cooking is therefore an integral part of the transformation of the buildings sector and emissions mitigation efforts.

Achieving the proposed target would require a marked acceleration in efficiency improvements. The buildings sector has delivered important efficiency gains over the past decade, improving close to 2% per year between 2010 and 2019, but only around 1% annually so far this decade. In order to reach at least a 25% improvement in buildings' energy intensity globally by 2035, annual progress must more than double. The technologies required to meet the proposed target are already available, and governments have a range of successful policy measures to choose from to accelerate technology deployment.

This report examines the scale of the acceleration required, and the policy, technology, and investment priorities needed to overcome this challenge. While the proposed 25% improvement rate is a global target, the report recognises that countries have diverse individual starting points, income levels and climate conditions, which will determine their own policy ambitions and key milestones.

Links with broader COP energy goals

The proposed target builds on commitments governments have already made through the COP process and provides a sector-specific goal for turning them into action.

COP28 doubling target

At COP28 held in Dubai in 2023, nearly 200 governments agreed to work together to collectively double the global average annual rate of energy efficiency improvements and triple renewable energy capacity globally by 2030. The world is not yet on track to achieve either of these targets. Progress on energy efficiency lags particularly far behind, with an average annual improvement of 1.3% so far this decade, well below the 4% target.

Progress in buildings is particularly important to achieving the doubling goal. Efficiency improvements in the buildings sector, such as improved insulation

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through renovations, electrification of heating and cooking, and higher equipment efficiency, are major levers to doubling global energy efficiency progress.

Achieving the proposed target of at least a 25% improvement in buildings' energy intensity globally by 2035 would place the buildings sector on a trajectory consistent with doubling the global rate of energy efficiency improvement by 2030, with further progress through 2035.

COP31 electrification target

Buildings also have an important role to play in the proposed COP31 target of increasing electricity's share of total final energy consumption to 35% by 2035 ("35 by 35").

Among major end-use sectors, buildings are already the most electrified, with electricity accounting for 39% of the sector's final energy consumption, well above the economy-wide average of 23%. This electricity share reflects the contribution of fully electrified end uses like cooling and appliances, both of which account for an increasingly large share of energy demand in buildings. Much larger opportunities for electrification remain in heating and cooking. Space heating, water heating, and cooking together account for more than 70% of residential energy use globally. Today, electricity meets only around 20% of water heating and cooking demand, and less than 15% of space heating demand. Most of the rest of the demand is still met by fossil fuels.

Electrification of these end uses can be a major driver of final energy intensity improvements in buildings. Heat pumps are three to five times more efficient than fossil fuel boilers used for space and water heating, and the most efficient induction cookstoves can be twice as efficient as conventional natural gas or liquefied petroleum gas (LPG) alternatives. Today, these services can be provided using commercially available electric appliances. This report identifies electrification as one of the key pillars for achieving the proposed target of at least a 25% improvement in buildings' energy intensity globally and elaborates on the measures needed to accelerate the deployment of electrified technologies.

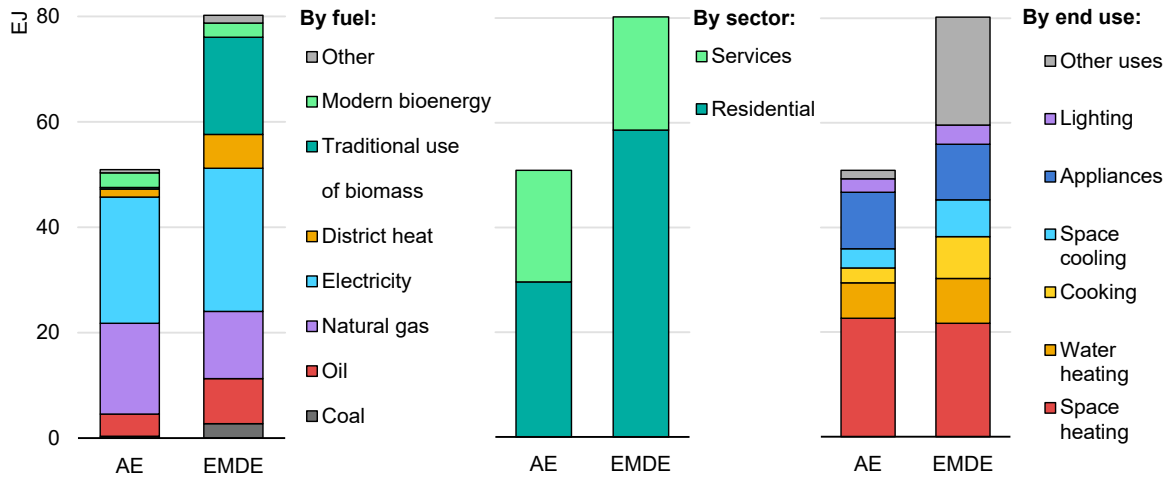
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Chapter 2. Current trends and policy landscape

The buildings sector today

Buildings consume 131 EJ per year, equivalent to around 30% of total final consumption. Energy consumption in the buildings sector is shaped by factors such as weather conditions, cultural preferences, levels of income, the weight of the services sector in the economy, and the availability of different fuels. Fossil fuels account for around 35% of buildings energy consumption (mostly in the form of natural gas), and electricity accounts for 39%, making buildings the most electrified of all end-use sectors. District heat and renewables such as geothermal and solar thermal make up a smaller contribution globally but are essential energy sources in some countries and cities.

Buildings' energy consumption by fuel, subsector, end use, and regional grouping at the global level, 2025



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Note: AE = advanced economies; EMDE = emerging markets and developing economies; *other* = other renewables, non-renewable waste and hydrogen; *other uses* = traditional use of biomass, data centres and water desalination.

Around 80% of global buildings' floor area, or floorspace, is dedicated to the residential sector. However, the residential sector only contributes to two-thirds of buildings' energy consumption. The services sector has a higher energy intensity, with more energy-consuming activities, within a smaller space. The share of services in buildings' floorspace and in consumption is higher in advanced economies on average, reflecting the larger role of the sector in the economy.

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The largest end use in buildings globally is space heating, but its share in individual regions reflects climate conditions. It accounts for almost 50% of buildings' energy consumption in advanced economies, where countries with cold winters predominate. Yet, it accounts for less than 15% in emerging markets and developing economies (EMDE) except for the People's Republic of China (hereafter 'China') and the Russian Federation, which account for most of the energy used for heating in this grouping. Economies with low heating needs tend to be exposed to high temperatures and humidity levels, leading to significant cooling needs. Consumption is curbed, however, by limited air conditioner ownership, with less than 20% of households equipped with an air conditioner globally. Ownership levels in advanced economies are higher, with half of households equipped with an air conditioner. Even so, electricity consumption remains limited because the units are operated less often than heating systems, reflecting a milder and shorter cooling season on average. Consumption in other end uses is shaped by population, cooking access, income levels, and ownership of appliances. Across end uses, envelope and equipment efficiency curb consumption in regions where higher efficiency levels are reached.

The buildings policy landscape

The buildings sector offers some of the largest opportunities for improving energy efficiency, but capturing those opportunities depends on effective policy frameworks. Governments use a range of tools to influence how buildings are designed, renovated, and equipped, including regulations, information, and incentives. This section reviews the existing policies across four areas: building envelopes, electrification of end uses, equipment efficiency, and access to clean cooking.

Building envelopes

The building envelope comprises roofs, walls, floors, windows, and doors, and protects the inside of a building from water, cold, heat, and noise. Its thermal performance also depends on design features such as building orientation, roof reflectivity, and shading, especially in hot climates. Building energy codes, retrofit programmes, and energy performance certificates form the backbone of policy efforts to improve the effectiveness of building envelopes. They are among the main tools for reducing energy demand for heating and cooling. While their adoption has expanded significantly over the past two decades, major gaps remain in both policy coverage and implementation across regions and technologies.

For new buildings, energy codes and standards largely determine future energy performance. By setting minimum requirements, they ensure that buildings achieve a baseline level of efficiency and thermal comfort. The most common approaches are prescriptive codes, which set minimum efficiency standards for individual elements such as walls, windows, and doors, or performance-based

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codes, which set an overall energy consumption target for the building as a whole. Many modern building energy codes include both approaches as alternative routes for compliance.

Globally, 102 countries have mandatory regulations for residential or non-residential buildings as of 2026. Coverage is widespread across Asia, Europe, and most jurisdictions in North America, while regulation is much less common across Africa, and Central and South America. Requirements vary in stringency across countries and are vital factors in accelerating progress in energy efficiency. An average house built in a country with less stringent requirements can use over four times more energy than one built in a country with stringent regulations in a similar climate.

The IEA building energy code content assessment tool evaluates such regulations and scores their performance across ten elements of a comprehensive building code, which include coverage, compliance, and requirements on energy efficiency, zero-carbon readiness, on-site renewables, energy management systems, and smart solutions. The effectiveness of a building code depends on these elements.

Strong building energy codes deliver their full potential only when they are effectively enforced. Robust compliance regimes depend on institutional capacity and effective governance, both nationally and even more so at the local level, where they are usually implemented. Of the 71 countries with mandatory codes that were assessed in a 2025 World Bank analysis, 52 countries enforce those codes consistently. This results in a large share of potential energy savings not being realised in countries with less regulation compliance.

Compliance frameworks can be improved by strengthening local authority capacity, incorporating pre- and post-construction verification checks, or using digital solutions to improve existing processes. Recent examples from Rwanda and Ghana stand out: Rwanda implemented an electronic building permit system that grants inspectors access to documents linked to a given site, and Ghana completed a nationwide capacity-building programme for building inspectors and planning officers.

Improving efficiency in new buildings alone is not enough. Much of the sector's efficiency challenge lies in existing building stock, and regulatory coverage here is narrower still. Sixty-two out of 102 countries with mandatory codes, of which most are EU countries, include efficiency requirements for undertaking major renovations. Therefore, a large share of the existing building stock falls outside any regulatory efficiency standard when renovated.

Retrofit grants are used to incentivise upgrades for existing buildings by lowering the upfront cost of the investment, making the use of efficient technologies more accessible and affordable. The scope of such programmes varies widely, from covering basic insulation, glazing, and heating upgrades to supporting deeper, whole-building interventions that include updating the building envelope, upgrading the heating system, and integrating renewable energy generation.

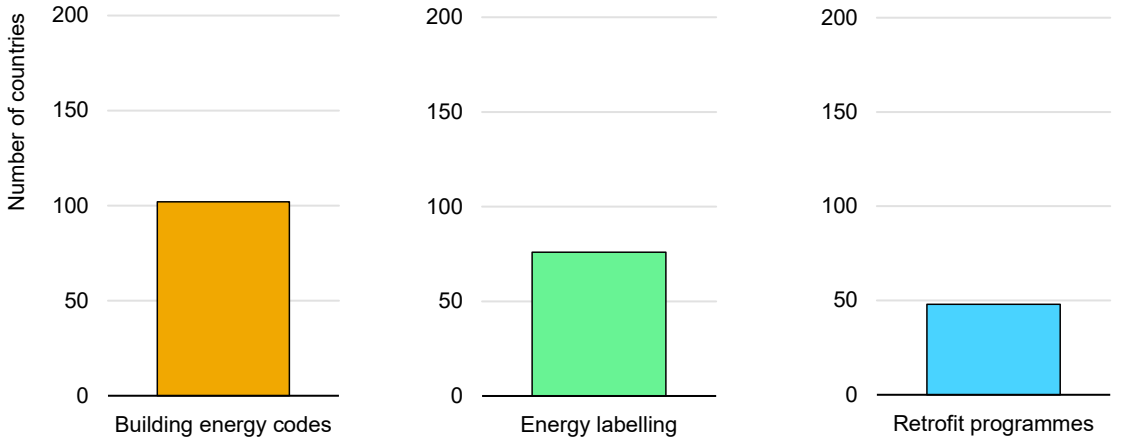
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National, government-funded retrofit incentives were identified within 49 countries, heavily concentrated in advanced economies. Retrofit programmes are often delivered through a mixture of direct grants for updates and subsidised loans, such as in Czechia, France, and Ireland. Other delivery mechanisms include income tax deductions, such as in Italy, direct installations at no upfront cost for low-income households, such as in Canada, and several complementary incentive schemes in China. Simplified permitting procedures for energy renovations in existing buildings, such as those in Türkiye, can increase uptake.

Energy labels and performance certificates, which provide information on the energy use of a building, help bridge the gap between new and existing buildings by making energy performance more transparent. By providing information on expected or measured energy use, labels help consumers make better-informed choices when renting or buying a property and can raise the sales value of efficient buildings. They can also help deliver insights to governments on a country's building stock, which in turn can inform new policy. The most common model, an asset rating or energy performance certificate, such as the Energy Performance Certificate used in Türkiye, evaluates a building's theoretical modelled energy use and targets prospective buyers and renters. Operational labels like NABERS in Australia, rate buildings based on measured in-use energy consumption. Operational labels are much less common and often mandatory only for buildings over a certain size. In addition to government-run labels, voluntary green building certifications (which are growing in number) can help provide market transparency by rating the overall sustainability performance of buildings.

Global coverage remains uneven: 76 countries have some form of building-level energy label, but the schemes are concentrated mainly in Asia and Europe. Only 45 countries have requirements for standardised ratings across both new and existing buildings, and across residential and non-residential uses. Others operate voluntary or partial regimes limited to certain provinces, territories, or building categories.

State of buildings policy coverage at the global level, 2026



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Notes: Energy labelling includes asset labels and operational labels. Retrofit programmes include a wide range of incentives for building energy upgrades. Building energy codes include only mandatory ones.

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Electrification of end uses

The electrification of heating and cooking offers significant potential for improving energy efficiency; the greatest impact of that electrification depends on country context. In advanced economies, and in China, where cold winters predominate, the greatest opportunity lies in space and water heating, while the electrification of cooking via efficient technologies such as induction stoves has significant potential across most countries.

Space and water heating represent a significant share of energy consumption in buildings, reaching 60% in advanced economies and 40% in EMDE. Most of this demand is concentrated in approximately 70 countries that experience cold winters, where electrification can significantly improve energy efficiency. These countries are the main focus of the extended analysis in this section. Heat pumps are a key technology to electrify heating and reduce energy demand in the sector due to their substantially higher efficiency compared to conventional fossil fuel technologies. Many governments have deployed a range of measures to accelerate their adoption. Other electric technologies, such as direct electric heaters, can support heating electrification in regions with milder winters and lower energy demand for heating, but they offer fewer efficiency gains.

The relative cost of electricity against fossil fuels strongly influences operating costs and consumer choices related to electrification. Although heat pumps are more efficient than conventional boilers, their competitiveness varies considerably across markets; savings might be limited when electricity prices are several times higher than fossil fuel prices. In markets with widespread natural gas networks, a lower electricity-to-gas price ratio can help favour heat pump adoption. In the newly published Electrification Action Plan, the European Commission encourages member states to bring down national electricity-to-gas price ratios for households to a maximum of 2.5 by 2030. Of the 70 countries analysed in this section, among those where gas represents a major share of energy used for heating, 19 have electricity-to-gas price ratios below 2.5, 18 have ratios between 2.5 and 3.5, and 16 countries have ratios above 3.5. In the remaining countries, district heating, electricity, or biomass predominate over natural gas.

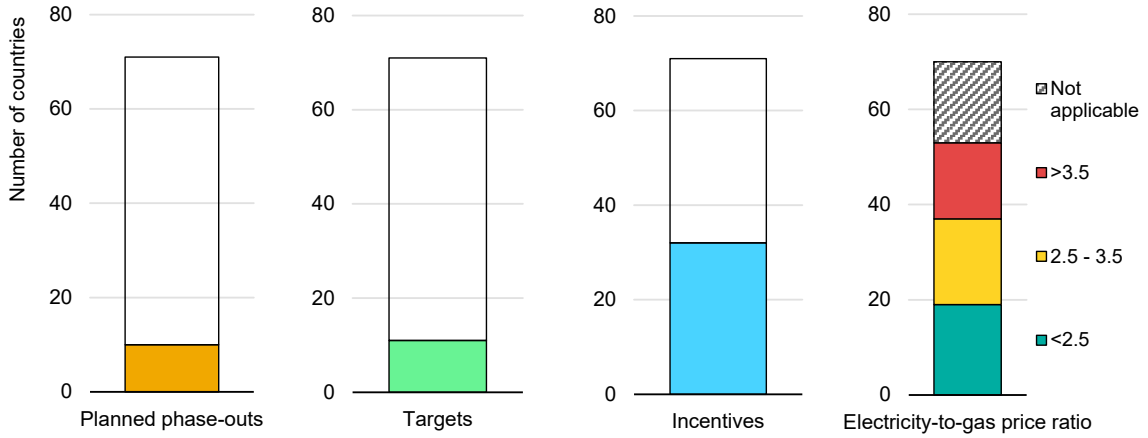
Financial incentives are widely used by governments to accelerate the adoption of heat pumps. High upfront investment costs, including equipment and installation costs and, in some cases, the need for building envelope upgrades, remain a barrier to heat pump adoption. These upfront costs can vary significantly by market. Financial support like grants and rebates can help consumers overcome the challenges related to upfront investment. Among the 70 countries considered in the assessment, 32 offer financial incentives to support installation of heat pumps or renewable heating technologies, making them the most common

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policy measure used to accelerate deployment. The UK Boiler Upgrade Scheme offers up to USD 10 000 towards a heat pump installation to replace gas boilers in existing homes. Poland's Clean Air Programme (Czyste Powietrze) covers between 40-100% of heat pump installations costs, depending on household income. In France, qualifying reversible heat pumps are subject to reduced value added tax (VAT) rates.

Regulatory measures such as phase-outs on fossil fuel heating technologies or restrictions on the expansion of gas infrastructure are used by few countries. Of the 70 countries assessed in this section, 10 have existing policies in place that promote the phase-out of fossil fuel heating. The Danish Energy Agreement for 2012-2020 placed a ban on the installation of fossil fuel-based boilers in new buildings from 1 January 2013 onwards. Since 2018, the Netherlands has promoted the phase-out of fossil fuel heating by restricting the connection of new buildings to the natural gas grid. Some governments are using targets focused on annual sales volumes or deployment levels by a given date to provide a clear signal to industry and consumers. Of the 70 countries considered in the extended assessment, 11 have established targets for heat pump deployment. In April 2026, the Korean government announced a policy target to deploy 3.5 million heat pumps by 2035 as part of its Heat Energy Innovation Strategy.

State of buildings sector policies supporting heat pump implementation for 70 selected countries with high demand for space and water heating, 2026



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Notes: Countries where heating demand is predominantly covered by electric heaters, district heating or non-fossil fuels have been considered "not applicable" in the electricity-to-gas price ratio analysis, as this ratio is not a key barrier for electrification.

The electrification of cooking offers significant energy efficiency, energy security, and health benefits. Many countries, particularly EMDE, rely heavily on imported liquefied petroleum gas (LPG) for cooking purposes, leaving

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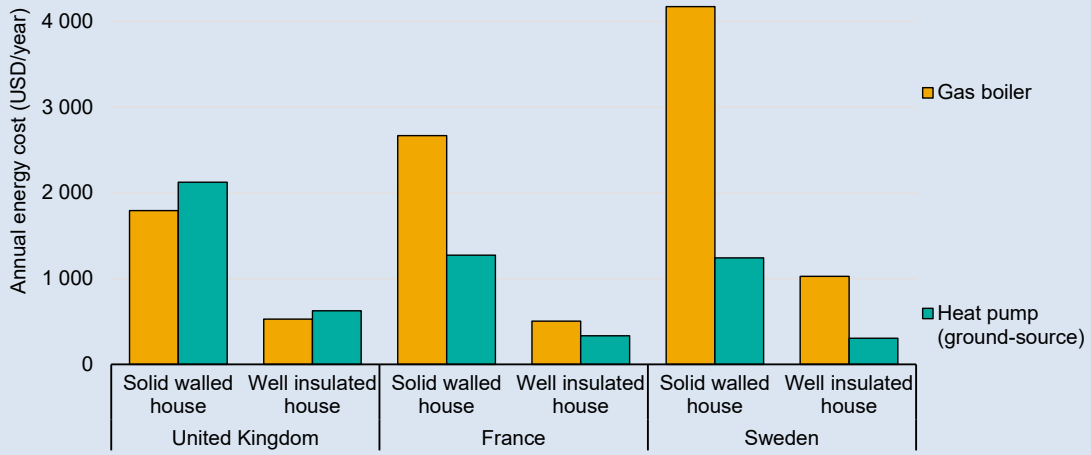
households and businesses vulnerable to fuel supply disruptions and price volatility, as seen during the 2026 energy crisis. As a result, some countries are looking to accelerate the adoption of electric cookstoves through different incentive measures. India launched the National Efficient Cooking Programme in 2023 to promote affordable, energy-efficient induction cookers via bulk procurement, scaling up the programme in 2026 to target 500 000 additional units. Indonesia launched its provision of electric cooking equipment programme in 2023 to support the distribution of electric rice cookers to eligible households, and a new electric stove programme is under preparation. The global electrification rate of cooking is around 15% today, and while electrified cooking is more common in advanced economies, the electrification rate remains at 30%.

Combining more-efficient building envelopes with electrification can significantly reduce energy bills

Homes that are better insulated or heated more efficiently use less energy to provide the same level of thermal comfort, reducing annual energy bills. In colder climates, where most energy is used for space and water heating, the energy costs in well-insulated homes are half those of households living in poorly-insulated homes.

Additionally, in countries where electricity is priced competitively compared to natural gas, combining well-insulated envelopes with high-efficiency heat pumps can lower energy bills by up to 90%.

Heating costs with different insulation levels and heating systems, selected countries, 2026



Note: Solid walled houses do not have a cavity between the layers and are not insulated.

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Equipment efficiency

Policies supporting equipment efficiency are among the most widely adopted energy efficiency measures globally. Governments use a combination of minimum energy performance standards (MEPS), energy labels, and financial incentives to improve the efficiency of appliances, cooling equipment, and lighting. While policy coverage has expanded considerably over the past two decades, important differences remain in policy ambition and stringency across countries.

Household appliances (including space cooling) and lighting represent 75% of electricity demand in buildings today. Improving the efficiency of these technologies therefore plays a critical role in limiting electricity demand growth while maintaining access to energy services. Policy can influence equipment efficiency through an integrated approach combining regulation, information, and incentives. Regulations like MEPS can ensure that products sold in the market are efficient, and more than 150 countries have them already in place for at least some key appliances.

Information instruments, such as energy labels, help consumers compare products, and 140 countries already have them in place. The most commonly used labels divide products into different classes, helping consumers identify the most efficient models. In India, additional equipment categories are regularly added to the labelling scheme. Labels are voluntarily phased in for new categories before being mandated based on market penetration and energy-saving potential, giving manufacturers time to adapt while building consumer awareness. Endorsement labels, such as Brazil's PROCEL Seal and Mexico's FIDE seal, are often used to promote the most efficient products in the market.

For many appliances, high-efficiency models do not necessarily cost more than average models, since price often depends on marketing strategies, brand positioning, or additional functionalities. This is the case for air conditioners and refrigerators across many surveyed markets. Thus, updated MEPS and labels, together with information campaigns, can ensure users have easy access and can choose to purchase efficient products without paying more.

However, some countries use incentives such as rebates and loans to accelerate the uptake of best-in-class models. For instance, Singapore's Climate Voucher programme offers rebates across multiple appliance and lighting categories. Bulk procurement in combination with offerings through energy service companies is another common approach. For example, Energy Efficiency Services Limited in India offers low prices for energy services like lighting, cooling, or cooking by sourcing specific appliances that can be procured in large quantities. Similarly, the state-owned Public Investment Fund in Saudi Arabia founded Tarshid, an energy service company which finances public building retrofits in a similar way.

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Cooling efficiency

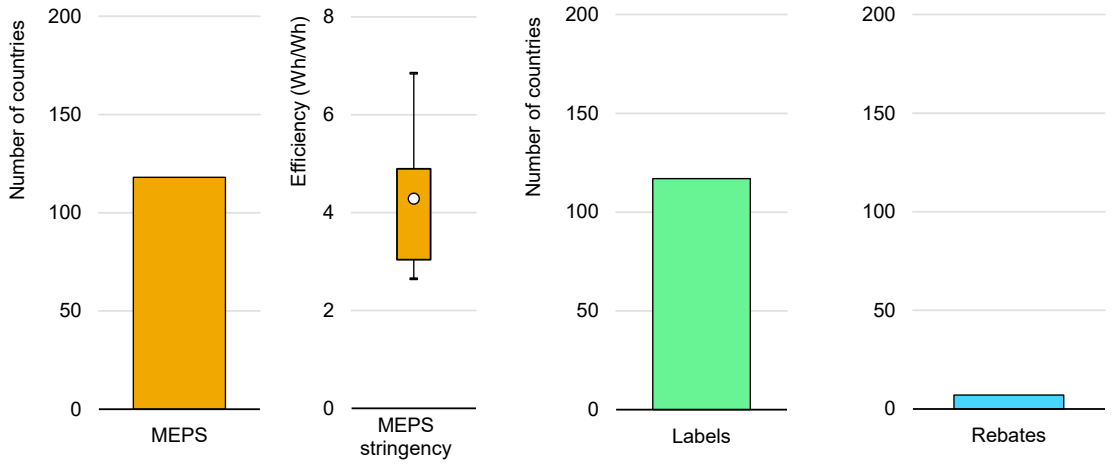
Space cooling is one of the largest drivers of global electricity demand, having grown by 50% since 2015, and global electricity demand for space cooling is now greater than the total electricity consumption of the European Union. This growth is being driven by increased uptake of air conditioners, particularly in EMDE, as well as by higher summer temperatures and more frequent heatwaves across the world.

In the context of rapid electricity demand growth, limiting the impact of cooling on electricity generation and grid capacity is increasingly important. More stringent MEPS and improved affordability have increased the average efficiency of new air conditioners by around 20% over the past decade, while demand response capabilities are increasingly being incorporated to reduce pressure on electricity systems during peak demand hours. MEPS for air conditioners have been implemented in 118 countries as of 2026, covering over 90% of space cooling demand. However, the stringency of these standards varies significantly, with some countries allowing units that are half as efficient as those permitted in other markets.

A similar number of countries have implemented appliance labelling programmes, with air conditioners and refrigerators among the most covered products. Comparative labels allow consumers to assess the efficiency of different models and encourage the purchase of more-efficient equipment.

Given that more-efficient appliances can usually be cost-competitive compared with average models with different functionalities, financial incentives remain less common than regulatory and information measures. Only a limited number of countries provide rebates or discounts for purchasing best-in-class cooling equipment at the national level.

Status of air conditioner policies at the global level, 2026



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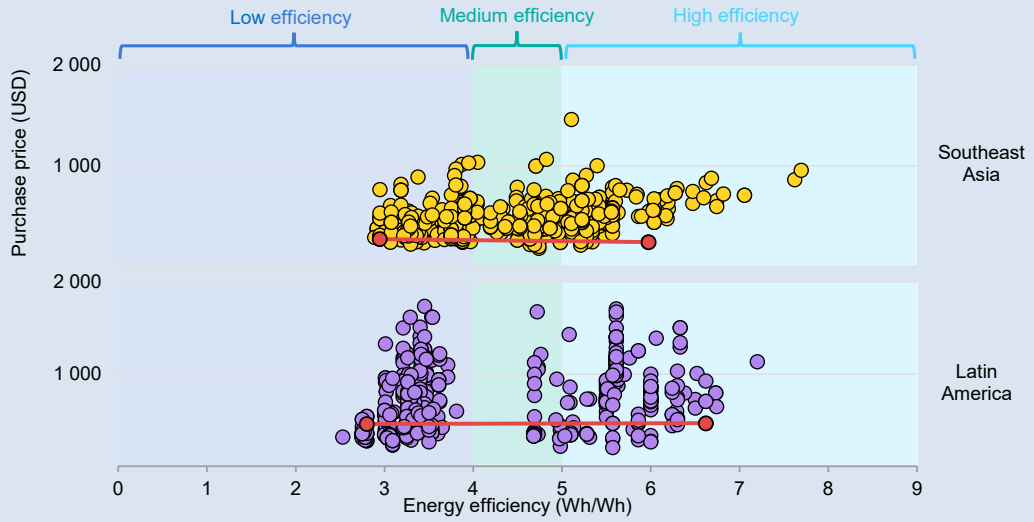
Notes: Incentives include rebates for air conditioners or air-to-air heat pumps based on cooling efficiency, refrigerant global warming potential or demand response capabilities. The MEPS stringency panel shows the range of requirements across countries. The dot shows the median global stringency, the box shows the 10th to 90th percentile, and the error bars represent the minimum and maximum values in the sample.

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High-efficiency air conditioners can cost the same as average models, while providing more affordable cooling

In many markets, affordable highly-efficient models are available for various appliances, such as refrigerators, air conditioners, and fans. For example, in countries in Southeast Asia and Latin America, a consumer can choose from dozens of AC models within the average price range of USD 300 to USD 400, with efficiencies ranging from just below 3 Wh/Wh to over 6 Wh/Wh. Opting for the more-efficient alternative can more than halve the energy expenditure through the lifetime of the product.

Purchase price and efficiency of air conditioners in selected regions, 2024



Notes: AC models shown are wall-mounted single split type. Purchase prices are normalised to equipment with 3.5 kW cooling capacity.

Lighting efficiency

Around 8% of global electricity demand today is attributed to lighting in buildings and outdoor applications. Efficiency progress in lighting has been very strong over the past two decades due to the rapid uptake of LEDs. The most common light sources 25 years ago, incandescent and halogen lamps, delivered only up to 20 lumens of light per watt (lm/W). Later, compact fluorescent lamps (CFLs) increased that to 60 lm/W, providing important efficiency gains. Today, an average LED provides 100 lm/W, with best-in-class LEDs delivering even two times that. Within two decades, the most frequently sold light bulbs have increased efficiency fivefold.

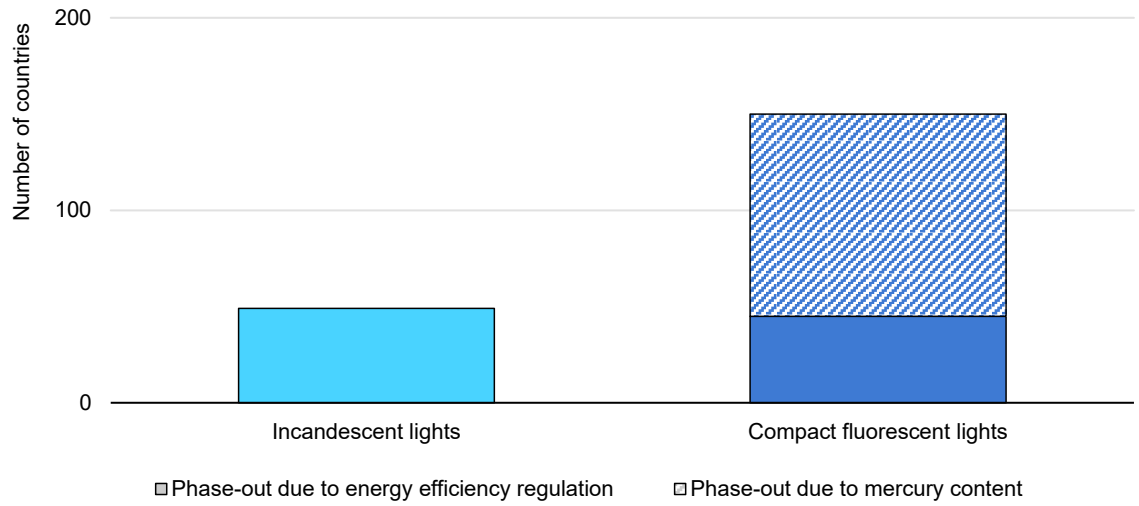
This transformation has been supported by strong policy intervention. More than 110 countries now have MEPS for lighting products, and labelling programmes have helped consumers identify efficient alternatives. Incandescent lights have been phased out in around 50 countries, and the phase-out of CFLs is

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accelerating. In parallel, more than 150 parties have ratified the Minamata Convention on Mercury, reinforcing efforts to eliminate mercury-containing lighting products, including CFLs.

Information campaigns, particularly in EMDE, are helping close remaining gaps in LED uptake. In other markets where LEDs now dominate, additional efficiency gains remain available. As first-generation LEDs reach end of life, they are increasingly being replaced with newer products offering higher efficiency, longer lifetimes, and smarter control capabilities.

Phase-out policies for incandescent and compact fluorescent lights, global level, 2026



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Note: Phase-out due to mercury content includes countries where current MEPS levels are below the average compact fluorescent lamps efficiency levels and that are Parties to the Minamata Convention on Mercury.

Other appliances

Refrigerators, clothes washers and dryers, dishwashers, televisions, and cooking appliances are also large energy consumers in the buildings sector. Refrigerators and freezers are among the most common appliances in households, usually having the highest ownership rates of all major appliances, together with televisions. Policies targeting these appliances can have significant impact, given their widespread ownership, substantial energy consumption, and regular replacement. IEA analysis shows that an extended bundle of high-efficiency appliances, including a refrigerator, a television, a fan, and lighting equipment, can reduce energy consumption by more than half and total ownership costs by a third, compared to a low-efficiency bundle. Even when having to pay a small premium for best-in-class products, the lifetime savings in energy bills can far exceed the additional investment.

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Nearly 120 countries have MEPS for refrigerators, covering more than 90% of their energy consumption worldwide. Similarly, televisions are regulated in 70 countries, covering more than 80% of television energy consumption. More than ten countries have implemented MEPS for clothes washers since 2020 alone, bringing the number up to 54. Similarly, cooking appliances are regulated in only 53 countries, leaving large potential savings untapped.

Small appliances and electronic devices can also represent a growing source of electricity demand as ownership levels increase. These products are usually not regulated because the energy consumption of each device is generally low. However, standby consumption of multiple units that remained plugged can add to the overall demand. Policies such as setting maximum standby power consumption, power management requirements, and energy labels can help reduce this demand, without affecting the devices' functionality.

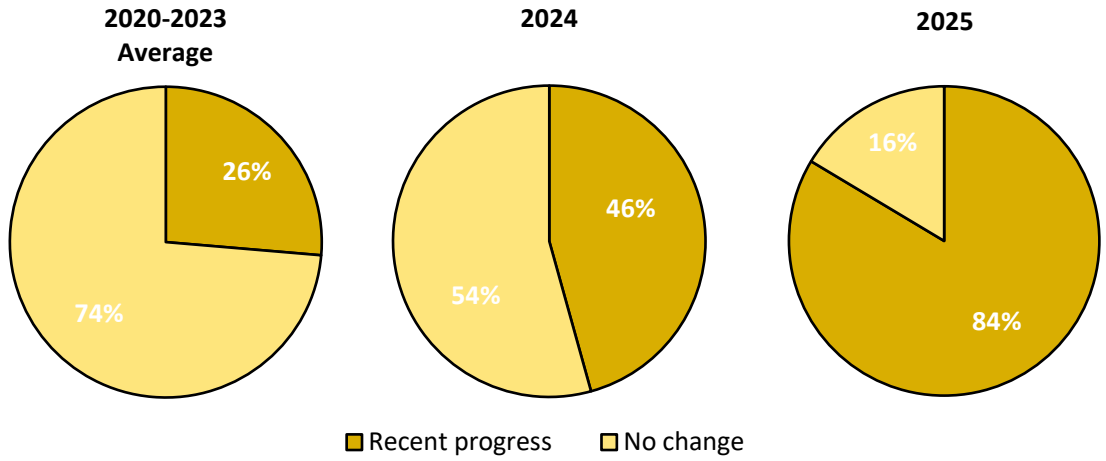
Access to clean cooking

Access to clean cooking remains an urgent but solvable challenge. Nearly 2 billion people still cook using wood, charcoal, and other polluting fuels, half of them in sub-Saharan Africa. Households without access to clean cooking spend four hours a day on average, collecting fuel and cooking – time taken from education and paid work, with women and children bearing the greatest burden. Rapid progress is nonetheless possible: since 2010, around 1.7 billion people have gained access to clean cooking fuels globally, led by large government programmes in China, India, and Indonesia that relied mainly on LPG. Progress in sub-Saharan Africa is now accelerating, with around 12 million people gaining access in 2024 – triple the pace of 2010 – and preliminary estimates pointing to a record of around 15 million in 2025. However, population growth continues to outpace these gains, and the number of people without access in the region rose by around 14 million in 2024.

Policy coverage for clean cooking has expanded sharply since 2024. More than 120 new policies and programmes supporting clean cooking were implemented or announced across sub-Saharan Africa between 2024 and the first quarter of 2026. Between 2020 and 2023, around one-quarter of the population without access to clean cooking lived in countries recording new policy developments each year; this share rose to 46% in 2024 and 84% in 2025. Much of this momentum centred on strategic frameworks: 32 countries have launched or announced a national clean cooking strategy since 2024, and more than 30 have set new or updated access targets that cover more than 85% of the population without access in the region. Implementation, however, lags behind. Only around 20 accompanying regulatory measures, such as tariff reforms, cookstove standards, and carbon credit legislation, have been fully implemented since 2024.

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Share of population without access to clean cooking living in countries with clean cooking policy progress in sub-Saharan Africa, 2020-2025



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Notes: *Policy progress* = new clean cooking policy introduced or announced during the year. Values for 2020-2023 are an annual average.
Source: IEA (2026), Clean Cooking in Africa 2026.

Measures directly linked to buildings are emerging as priorities but remain at an early stage. A recent survey of African governments conducted by the IEA and the African Energy Commission identified the measures most frequently taken by governments, which include the integration of clean cooking into building codes, the use of carbon credit revenues to improve affordability of clean cooking solutions, and stronger data collection. Additional measures include fast-tracked permitting, dedicated clean cooking delivery institutions, and public procurement of clean cooking for schools and other public buildings. Few countries reported these measures as already being in place, pointing to a gap between policy ambition and delivery, but 18 countries have signalled their intention to implement additional clean cooking policies in the period ahead.

In May 2024, the IEA hosted the first-ever international Summit on Clean Cooking in Africa, held in Paris, France. The summit mobilised USD 2.2 billion in public and private commitments and saw 12 African governments commit to concrete policy action. As of mid-2026, nearly USD 740 million had been disbursed to projects across almost 30 African countries. In July 2026, the co-chairs and co-organisers of the second Summit on Clean Cooking in Africa announced nearly USD 900 million in new financial commitments, the integration of the Clean Cooking Alliance into the IEA, and the new IEA Clean Cooking Security Programme to strengthen the resilience of supply chains. The second summit, to be held in Nairobi, Kenya, on 27-28 January 2027, will build on this momentum to mobilise new financial and policy commitments.

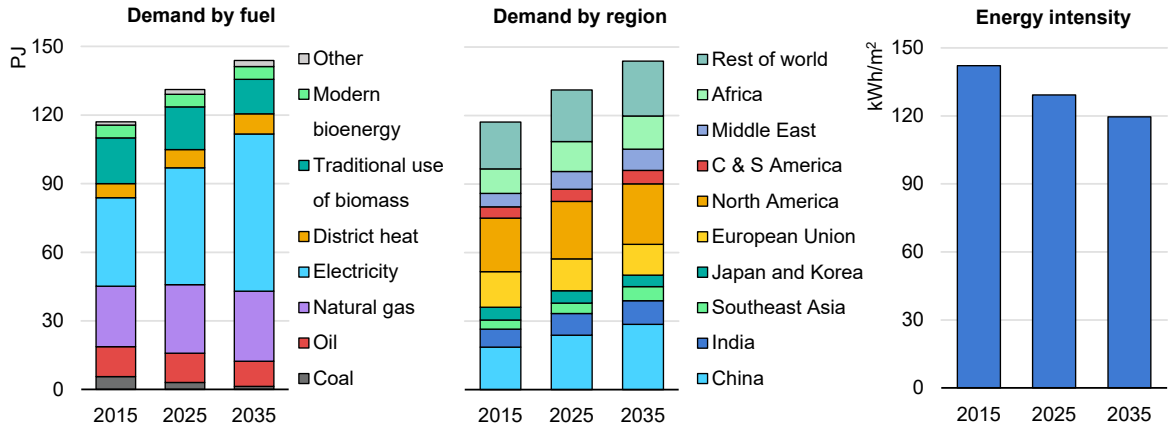
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Trends under today's policy settings

The preceding sections showed that policy coverage has expanded significantly across building envelopes, heating electrification, equipment efficiency and clean cooking. This section explores how growth in population, energy needs and income levels interacts with efficiency and electrification policies over the next decade. The Stated Policies Scenario (STEPS) builds on energy-related policies that are in place but also considers those that have been put forward but not yet adopted, without assuming that aspirational goals are achieved. The STEPS is an exploratory scenario that does not target a predetermined outcome; instead, it sets the starting conditions and sees where they lead. Examining how energy demand, electrification and energy intensity evolve under these conditions helps illustrate both the progress that can be expected and the gap that remains in achieving the proposed target for buildings' energy intensity.

Energy demand in the buildings sector has grown at an average annual rate of 1.1% since 2015, reaching 131 EJ in 2025. Growth slows slightly to 0.9% per year to 2035 in the STEPS. Coal and oil use in buildings continues decreasing, falling on average by 7% and 2% per year, respectively, through 2035. Most of the decline in coal use is concentrated in China. LPG use in buildings rises through 2035 in regions like India, Africa, and Southeast Asia, where access to clean cooking expands. Natural gas consumption plateaus: it has increased 1.3% annually since 2015 and slows down to just 0.2% per year to 2035, as electrification and efficiency improvements curb heating demand in advanced economies. More than 600 million people are set to gain access to clean cooking by 2035, which fuels consumption growth for modern sources of energy and a decline in the traditional use of biomass. The use of modern bioenergy and solar thermal grows by 1% annually to 2035, driven by the expansion of low-emission heating.

Energy demand by fuel and by region, and energy intensity in the Stated Policies Scenario, 2015-2035



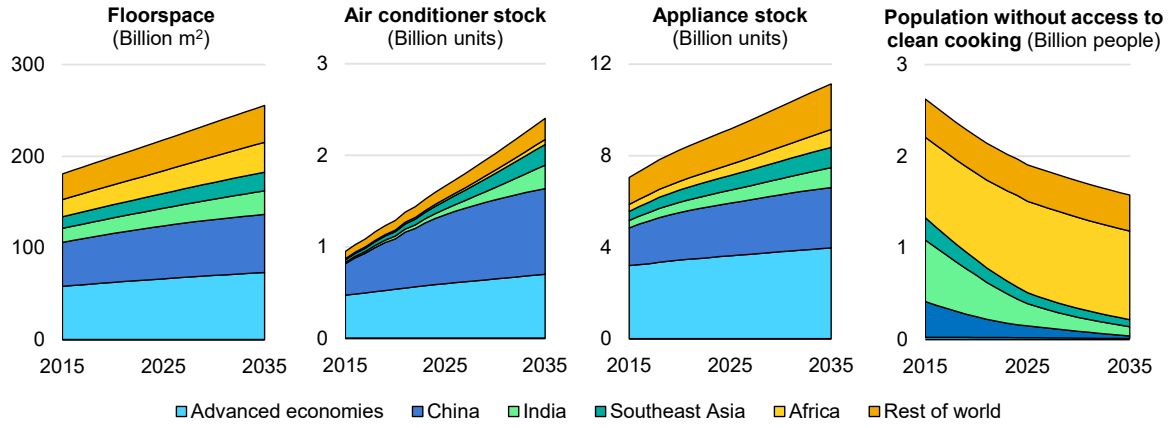
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Note: Other = non-renewable waste and hydrogen; Other renewables = solar thermal and geothermal.

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More than 90% of energy demand growth takes place in EMDE, which account for most additions to global floorspace and stock of appliances. Floorspace is set to expand by 40 billion m^2 in the next ten years. The stock of air conditioners grows by 45%, and the appliance stock expands by 2 billion units, increasing the global electrification rate in buildings from today's 39% to 48% by 2035. China drove most of the air conditioner stock increase in the last decade. The stock continues to grow, but the outlook identifies new regional centres of growth: the share of the stock in India and Southeast Asia rises from less than 10% in 2025 to 20% by 2035.

Floorspace, air conditioner, and appliance stock, and population without access to clean cooking, by region, 2015-2035



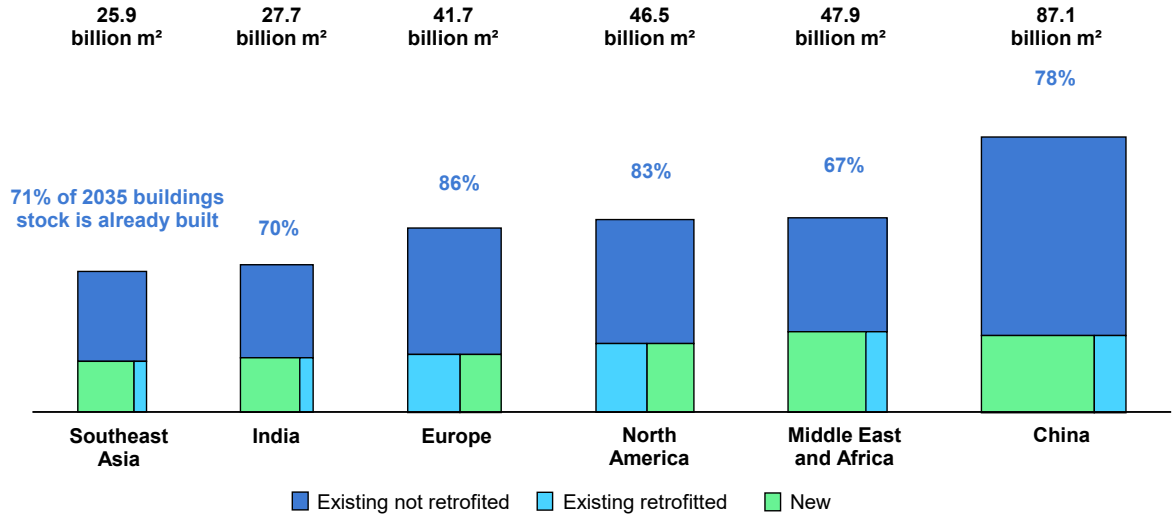
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Buildings' electricity demand increases by almost 5 000 TWh to 2035, growing more than three times as fast as overall buildings' energy demand. Beyond appliances and space cooling, which account for more than 60% of electricity demand today, electricity also meets most of the net demand growth for space heating, water heating, and cooking. The share of electric technologies in sales across heating and cooking has risen since 2015 and is set to continue increasing through to 2035, supported in some regions by electrification policies and the cost-competitiveness of electric technologies.

By 2035, energy intensity decreases by 7% compared to 2025 levels and 11% compared to 2020, in a scenario based on today's policy settings, falling well short of the proposed target of at least 25%. Progress is slightly stronger in advanced economies, with intensities 8% lower in 2035 than today. In EMDE, intensities decrease by 6% despite GDP per capita growing 30% over ten years: progress in efficiency and clean cooking access more than offsets higher demand for energy services as incomes rise.

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Buildings' floorspace by construction period in selected regions in the Stated Policies Scenario, 2035



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Change takes time in the buildings sector, especially for building envelopes and for heating equipment. Early action is therefore essential in improving energy intensity. Heating equipment is typically replaced every 10 to 20 years, while buildings stand for 60 to 100 years. On average, most floorspace standing in 2035 already exists today, although this share is lower in some EMDE such as India and Southeast Asia, which are poised for growth in the outlook. Around 30% of the floorspace standing in 2035 is still to be built, underscoring the need to strengthen building energy codes quickly so that new construction is efficient from the outset. In North America and Europe, where over 80% of the floorspace standing in 2035 is already built, energy savings and lower intensities are achieved through large renovation programmes.

Under today's policy settings, access to clean cooking continues to expand, but the world remains far from universal access. In the STEPS, more than 600 million people gain access to clean cooking by 2035, mainly through LPG and electricity. This gain adds to modern energy demand in buildings and drives much of the growth in LPG use in EMDE. Access to modern sources of energy reduces reliance on traditional use of biomass, which decreases by 20% in 2035 compared to 2025. In sub-Saharan Africa, stronger policy frameworks and a robust pipeline of infrastructure investment are expected to sustain access gains above pre-2026 energy crisis trends through 2030. Yet the global trajectory falls well short of universal access: under existing policies, 1.4 billion people still lack access to clean cooking in 2050, more than two-thirds of them in sub-Saharan Africa.

The outlook is also exposed to new risks. The disruption of LPG supply following the closure of the Strait of Hormuz in 2026, and the resulting surge in prices, has

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pushed clean cooking beyond the reach of many households and increased fiscal pressures on governments supporting fuel prices. This may weigh on future progress, as affordability remains a key constraint to transition to clean cooking. The pace of access gains – and the efficiency of the technologies households adopt – will directly shape the evolution of buildings' energy demand and intensity.

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Chapter 3. Improving buildings' energy intensity

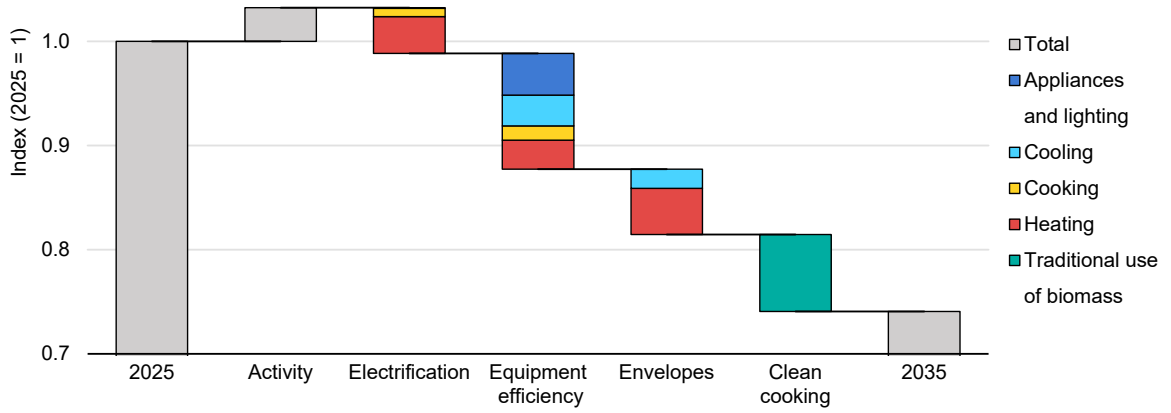
Key pillars to reach the proposed target

This chapter explores a pathway in line with the proposed target of reducing buildings' energy intensity globally by at least 25% by 2035. This level of intensity reduction for buildings is aligned with the IEA's Net Zero Emissions by 2050 Scenario, which limits warming to 1.5°C by 2100. This pathway starts with the same needs for energy services as the Stated Policies Scenario (STEPS), led by population growth, rising incomes, and higher ownership of appliances. It also incorporates today's policy settings on electrification, equipment efficiency, building envelopes, and clean cooking access as a starting point in each region. In this pathway, these policy settings are continued when they are global leading standards today, they are reinforced when their stringency or scope can be improved or expanded, and they are implemented when they are not developed yet. All countries have different starting points with respect to energy needs, climatic conditions, income levels, demographics, equipment ownership, efficiency levels, and access to modern sources of energy. The pathway does not assume that all regions reach the same level of policy ambition. It models a world in which all regions move in the same direction, towards best-in-class policies, while reflecting individual country starting points that shape the structure of each country's needs for energy services.

Globally, this pathway reaches the proposed intensity reduction target thanks to four main levers: building envelope efficiency, electrification, equipment efficiency, and access to clean cooking. Together, these levers lower buildings' energy intensity by 26% compared to 2025, and over 28% compared to 2020. They also offset increasing access to modern sources of energy and higher equipment usage (led by rising incomes), which grow faster than floorspace and would, all other things kept equal, increase buildings intensity.

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Buildings' energy intensity reduction disaggregated by end use and lever at the global level, 2025-2035



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Notes: *Heating* includes space and water heating. *Activity* measures growing needs for energy services.

Equipment efficiency reduces intensity more than any other factor, making up 40% of the reduction. Equipment efficiency refers to energy savings from opting for a more efficient appliance or from replacing a stove or heating equipment running on a given fuel with a more efficient technology running on the same fuel. The efficiency potential spans across end uses: a large potential in appliances remains untapped across economies, as best-in-class products make a modest share of total sales. The most efficient air conditioner available today can be more than twice as efficient as the average unit sold; proper sizing, installation and technology selection can improve heat pumps' coefficient of performance by several units; and many inefficient cookstoves remain in use today.

Improving the insulation levels of existing and new buildings delivers another 20% of the intensity reduction. It captures savings from building more efficient envelopes compared to today as well as renovating existing buildings to deliver lower heating and cooling intensities. Space heating reductions are the largest contributor to intensity reduction, which is explained by space heating's prominent share in buildings' consumption and the relatively higher increase in retrofit rates in advanced economies than in emerging markets and developing economies (EMDE). Lowering space cooling intensities through better building envelopes remains essential and contributes as much to the savings as selling more efficient air conditioners. This is because much of the growth in global floorspace occurs in markets where cooling demand is increasing most rapidly, magnifying the impact of improved building envelopes.

Electrification contributes up to 15% of the intensity reduction. It refers to savings achieved when consumers opt for electric technologies for heating and cooking. These technologies offer substantial efficiency gains compared to their fossil fuel

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equivalent. Heat pumps consume electricity to move ambient energy from the environment to the room and to the storage tank, but they provide more heat than the electricity they consume. Induction stoves and e-pressure cookers offer the ability to cook meals with limited energy losses. Electrification supports a transition away from fossil fuels but also lowers overall energy needs in buildings.

Access to clean cooking plays a distinct role among the four levers. Households gaining access to modern sources of energy reduce their reliance on traditional biomass as they switch to clean cooking solutions. Clean cooking stoves are significantly more efficient than open fires or basic stoves, delivering the same cooking service while consuming 3 to 18 times less energy depending on the model and the fuel. Accordingly, growing modern energy demand is more than offset by lower traditional use of biomass, improving buildings' energy intensity. The pathway delivers clean cooking for almost 1 750 million people by 2035, contributing 25% of the intensity reduction. Beyond its effect on energy intensity, this lever delivers substantial health and climate benefits, as displacing traditional biomass cuts household air pollution, frees time spent collecting fuel, and reduces emissions from forest degradation.

Pillar 1: Improving building envelopes

Efficiency improvements in new buildings

The number of countries with mandatory building energy codes (BECs) for new construction has expanded from 25 countries in 2000 to 102 today. Countries with these regulations account for around 90% of global construction of new floorspace each year. However, in some of the world's largest construction markets, BECs are in their early stages of development and lack the scope, and the accompanying compliance and enforcement measures needed to ensure widespread compliance. As a result, only around 60% of new floorspace constructed each year is built in compliance with a BEC.

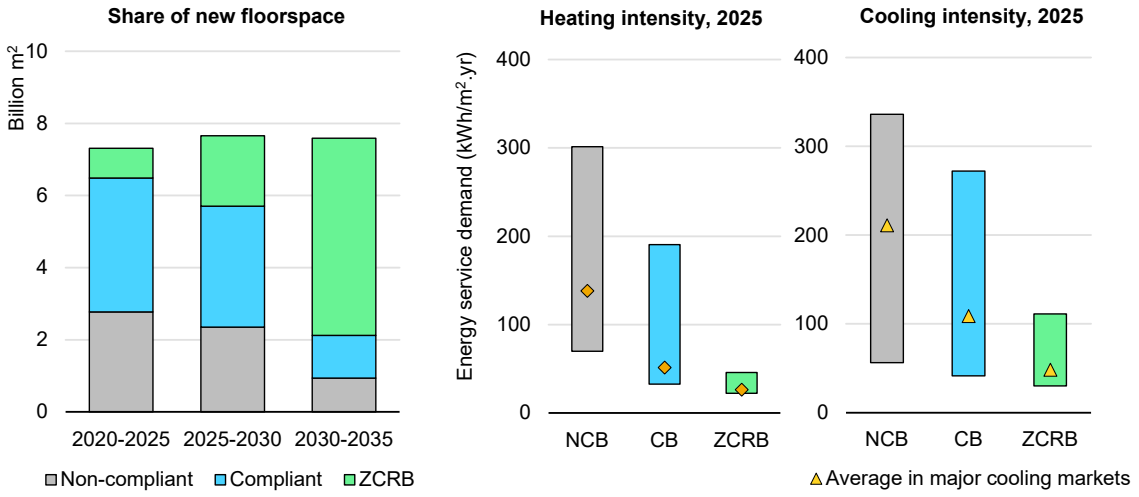
In this pathway, countries expand the scope of BECs and strengthen supporting policies to achieve universal compliance with standards for new construction by 2035. This requires embedding BECs into permitting and inspection processes, with compliance assessed at different stages from design through completion. Effective implementation also depends on adequate resources, training, and technical tools for local authorities. Energy performance certificates can further increase transparency and awareness among developers, construction professionals, and home buyers and renters.

This pathway also relies on progressive improvement in the stringency of BECs. In some major heating markets today, the heating service demand of new construction stands at 25 kWh/m^2 per year, while in other countries with similar

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climates it is twice as high. In the coldest regions, heating energy service demand for new buildings compliant with building energy codes can reach almost 200 kWh/m^2 per year. In these regions, the gap between the best-performing countries and the remainder is widest. BECs mandating zero-carbon-ready buildings in Nordic countries, for instance, ensure that even in climates with harsh winter conditions, heating service demand intensity can be kept below 50 kWh/m^2 per year. A zero-carbon-ready building is a building with a highly energy-efficient thermal envelope, where orientation and glazing are optimised, and all the essential passive elements of the thermal envelope are highly-energy-efficient to manage heat transfer and solar gains and ensure the comfort of occupants in all seasons.

Share of new floorspace, 2020-2035, and energy service demand intensity by compliance with building energy codes at the global level, 2025



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Notes: CB = compliant building; NCB = non-compliant building; ZCRB = zero-carbon-ready building. Intensities are computed against heated or cooled floorspace.

In major cooling markets, zero-carbon-ready buildings are designed to optimise natural ventilation and make use of shading and reflective or green roofs to minimise heat gains. Combined with a highly-energy-efficient thermal envelope, this ensures that the cooling service demand intensity of such buildings is kept below 70 kWh per square metre of cooled floorspace per year in most regions. In zero-carbon-ready buildings, cooling service demand cannot be reduced to the same extent as heating service demand due to internal heat gains from plug loads and human activity, as well as the use of air conditioning to improve indoor air quality in humid regions.

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Today, countries with BECs that mandate zero-carbon-ready building standards account for around 10% of global construction. In this pathway, the coverage of such standards expands rapidly as BECs are strengthened in all countries. By 2030, zero-carbon-ready buildings account for the majority of new construction.

Designing building codes to maximise their effectiveness

The components of a well-designed building energy code should span design, construction, and operation, setting clear efficiency targets. The code should be underpinned by a strong compliance scheme to ensure requirements are met in practice and implemented through effective institutions working consistently across national and subnational levels. The IEA has developed the building energy code content assessment tool, which outlines the critical components of a BEC needed to optimise energy savings and prepare buildings for the future energy system.

Component	Description
Obligation requirements	Obligation requirements mandate compliance from builders and designers, ensuring that all new and renovated buildings adhere to minimum performance standards.
Recent updates	Updates periodically incorporate the latest advancements in energy efficiency and sustainability, ensuring buildings meet the latest standards for reducing energy consumption and emissions.
Sector coverage	Components cover various building sectors, including residential, commercial, and industrial buildings, to ensure comprehensive energy efficiency improvements across all types of structures.
Described measures of compliance	Multiple compliance paths are provided, like prescriptive, trade-off, and performance-based methods, allowing flexibility in how buildings meet energy efficiency standards and achieve compliance.
Requirements for new and existing buildings	New and existing buildings may need distinct requirements, ensuring that new constructions are built to high energy efficiency standards while also providing guidelines for retrofitting existing structures. This dual approach helps improve the energy performance of the building stock over time.
Energy efficiency requirements	Energy efficiency requirements mandate the use of energy-saving practices and technologies, including passive practices such as optimised building orientation, shading and insulation, as well as high-efficiency equipment such as heating, ventilation, air conditioning, and lighting.
Energy management requirements	Energy management requirements in building codes include provisions for monitoring and optimising energy use, such as building automation systems and energy metering.

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Component	Description
Smart solutions	Smart solutions promote the use of advanced technologies, such as smart thermostats, energy management systems, and Internet of Things devices, to enhance energy efficiency and occupant comfort. These solutions enable real-time monitoring, control of building systems, and building-to-grid connectivity.
On-site renewables	Building energy codes increasingly encourage or require the incorporation of on-site renewable energy sources, such as solar panels, to reduce reliance on fossil fuels.
Zero-carbon readiness	Zero-carbon readiness involves designing buildings to be highly-energy-efficient and capable of operating with zero-carbon emissions.

These dimensions can help policy makers evaluate the comprehensiveness of existing building energy codes and understand which additional components can positively impact their implementation.

Efficiency improvement of existing buildings

The growing maturity of the building stock is increasing retrofit activity across most markets. Once a society has largely built its housing and commercial stock, the investment opportunity moves from constructing new buildings to improving existing ones. Homebuilding has historically made up the largest share of the construction market by value, but by the mid-2010s, retrofit activity had taken over in both the United States and the European Union. China is in the early stages of undergoing a similar transition, as its policy makers prepare to shift from large-scale expansion of urban floorspace to improvement in the quality and efficiency of existing urban stock. Today, retrofits are undertaken on roughly 0.5% of global floorspace per year.

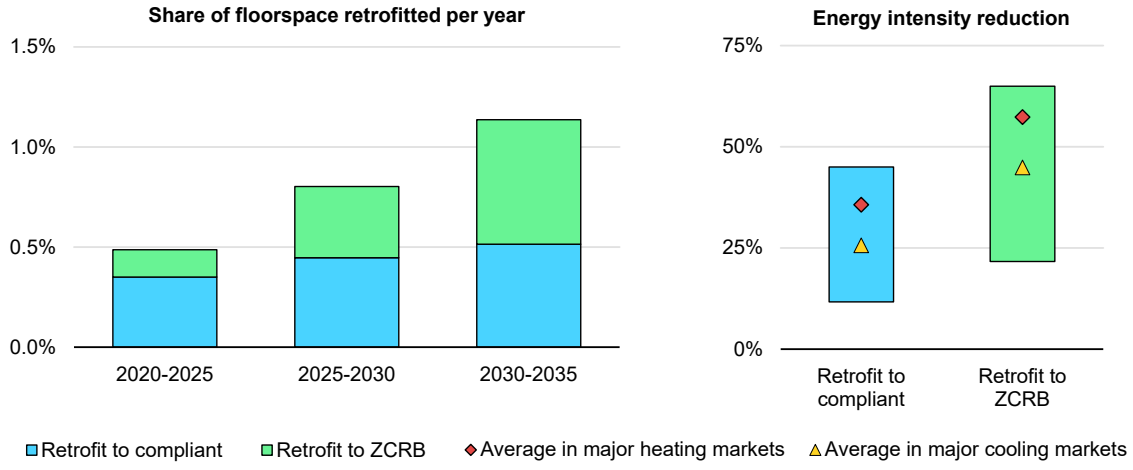
In the wake of the Covid-19 pandemic and the 2022 energy crisis, the retrofit rate rose sharply in advanced economies and has since stabilised at around 1%. In advanced economies, higher retrofit rates are supported by greater household and business investment capacity, better access to finance, and subsidies for insulation, glazing, and other building envelope upgrades. As the overall retrofit market expands, the fiscal cost of broad-based subsidy schemes is becoming increasingly difficult to sustain, particularly as governments face higher borrowing costs and increasing constraints on public spending. Policy makers are increasingly targeting subsidies towards households most in need, while seeking to mobilise a greater share of retrofit investment through private finance.

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Several countries have taken notable steps in this direction in recent years. In France, Germany, and Greece, governments subsidise the interest costs on loans for retrofit investments awarded by commercial banks. This approach ensures that programmes can be publicised effectively and scaled quickly using the established customer relationships and branch networks of existing banks. In Canada, Lithuania, and the Netherlands, retrofit loans are provided through financial institutions established by the government. This model can be administratively less burdensome for borrowers than conventional retrofit loans offered by commercial banks. EU countries are exploring a more fundamental reform of credit markets by introducing "mortgage portfolio standards" to incentivise mortgage lenders to increase the median energy performance of the portfolio of buildings covered by their mortgages.

These lending mechanisms are designed to complement subsidy programmes rather than replace them. By expanding retrofit lending, governments can focus subsidies on the most vulnerable households, ensuring public support unlocks retrofit works that would not otherwise happen, while also freeing up funds for technical and administrative assistance, including advice centres and dedicated project managers for large apartment retrofits. With the right mix of targeted subsidies, reform of credit markets, and expansion of information tools for households, energy renovation activity could scale up considerably. In this pathway, the rate of energy retrofits more than doubles to 1.1% within the next decade.

Share of floorspace retrofitted each year by retrofit type and corresponding energy intensity reduction at the global level, 2020-2035



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Note: ZCRB = zero-carbon-ready building.

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To reduce the energy intensity of buildings by at least 25% globally, retrofits should increase not only in quantity but also in quality. Today, deep retrofits to zero-carbon-ready building level represent only one in five retrofits. Deep retrofits are concentrated in advanced economies, particularly in EU countries, Canada, and the United States. This reflects the greater investment capacity of households and businesses in these economies, alongside a regulatory landscape in which building energy codes often mandate minimum energy efficiency outcomes for major renovation projects. As those requirements are periodically upgraded to reflect changes in what regulators consider cost-optimal based on the prices of products, energy, and carbon, the share of retrofit projects achieving zero-carbon-ready building level rises.

In major heating markets, retrofits of inefficient buildings to zero-carbon-ready building level achieve an average reduction of almost 60% in heating and cooling service demand. Retrofits to zero-carbon-ready building level ensure that all the essential passive elements of the thermal envelope are highly-energy-efficient, that shading and reflective or green roofs are used to minimise heat gains, and that the heating distribution system is prepared for low temperature heat flow. This translates to substantial savings – exceeding 40% on average – in major cooling markets as well.

Pillar 2: Electrifying end uses

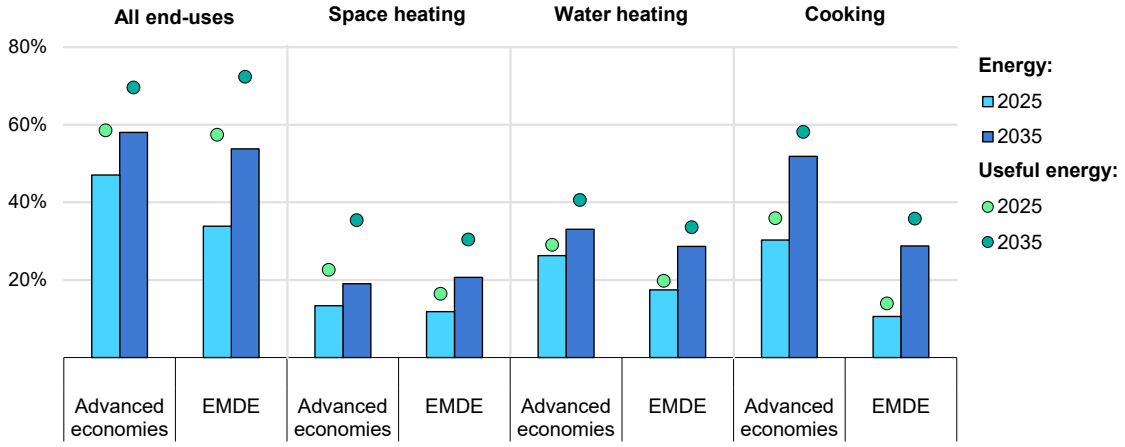
The buildings sector is already highly electrified: 39% of its energy consumption is met by electricity. However, much of this comes from end uses where there is typically no alternative to electricity, such as domestic appliances or space cooling. The electrification rate of end uses that can use either electricity or other fuels, such as heating and cooking, is 15%, substantially lower than the sector-wide share. For these end uses, the equipment aims to transmit heat to air for space heating, to water for water heating, or to food for cooking. Unlike for cars and other vehicles, these heat-based end uses do not make electric technology inherently more efficient than combustion-based technology, as converting either combustion energy or electricity into heat is equivalent. Electric technologies are, however, typically better at transmitting this heat to the desired medium, so less heat is wasted to the environment. More importantly, some electric technologies, such as heat pumps, extract heat from the environment rather than converting energy, which leads to structural efficiency gains.

Another implication of the higher efficiency of electric technologies is that they require less final energy than many fossil fuel-based alternatives that provide the same energy service. Therefore, electricity's share in services delivered in the form of heat, cooling, or cooking is higher than electricity's share in energy consumption. This section distinguishes between shares in "useful energy", or the

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energy service delivered to the consumer, and shares in "energy", which refers to fuels (electricity, gas, district heat, and so on) consumed by the equipment.

Share of electricity in energy demand by end-use and by economic grouping at the global level, 2025-2035



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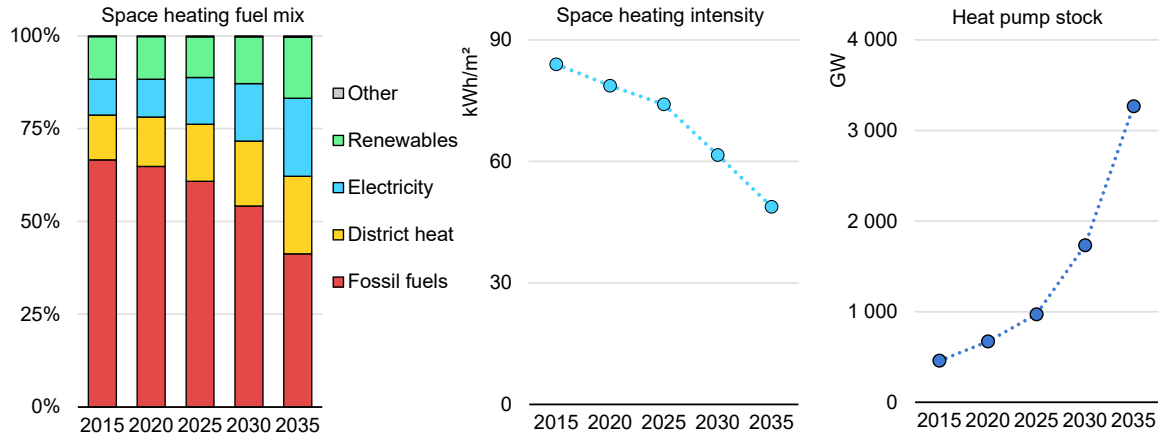
Notes: EMDE = emerging markets and developing economies. Traditional use of biomass is accounted for only at the aggregate level and is not disaggregated by end-use.

By 2035, in the pathway towards the proposed target of at least a 25% improvement in buildings' energy intensity, all end uses are increasingly electrified. As a result, the average electrification rate in buildings reaches 55%. In advanced economies, space heating accounts for most of the electrification potential, and its electrification rate rises from just below 15% to around 20%. As heat pump deployment expands, electricity supplies nearly 40% of useful energy for space heating, approximately twice its share of final energy consumption for that end use. For cooking, the wider adoption of induction cookstoves leads around 60% of useful energy for cooking to be met by electricity by 2035, while electricity accounts for only just above half of energy consumption. Water heating also sees an increase in its electrification rate over the next decade under this pathway, even if the impact is more limited in relation to useful energy due to the prevalence of resistance heaters combined with water tanks across households.

In EMDE, the electrification of cooking shows the largest gains, with the electrification rate almost tripling from around 10% to nearly 30%, and the share of useful energy met by electricity growing to over 35%, more than doubling from just under 15% today. Heating end uses also improve and, as in advanced economies, water heating shows the most limited impact.

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Space heating intensity and heat pump stock at the global level, 2015-2035



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Heat pumps are a core technology to reduce the energy intensity of heating. The installed capacity of heat pumps has almost doubled since 2015, and annual heat pump deployment in the buildings sector now amounts to around 110 GW. The pathway towards the proposed target of at least a 25% reduction in buildings' energy intensity globally would imply more than tripling heat pumps' installed capacity[1] by 2035, a very strong acceleration compared to the last decade, reaching more than 3 000 GW from around 1 000 GW. Since 2015, space heating intensity has gradually declined, while electricity's share in the fuel mix has increased. On the pathway towards the proposed target, accelerated heat pump deployment contributes to a decrease in space heating intensity of more than a third. The adoption of heat pumps for space heating primarily displaces fossil fuels, and their share in space heating decreases from around 60% to around 40%. Heat pumps' substantial efficiency gains lead to an overall reduction in heating demand, not only where they displace fossil fuels but also where they replace direct electric resistance heating.

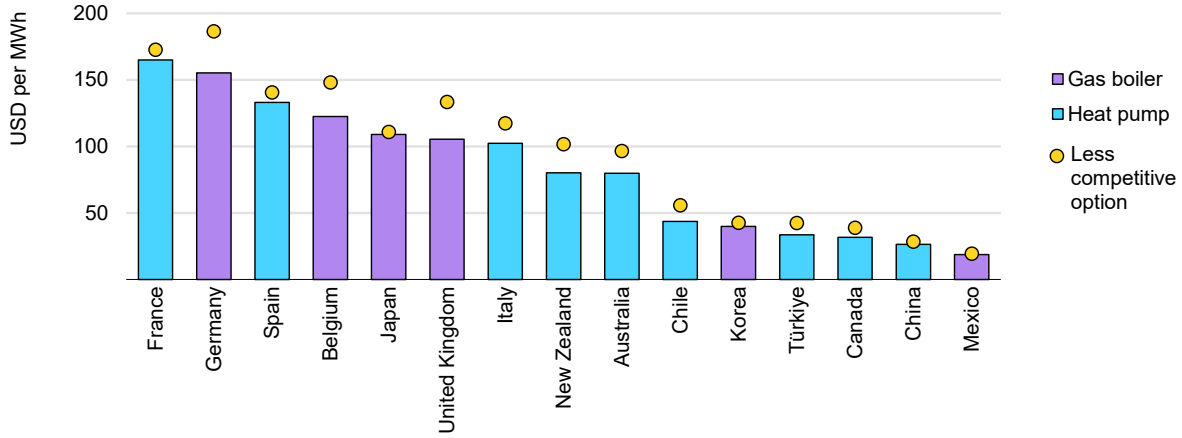
The competitiveness of electric technologies is a key driver of electrification, but it can also be a significant barrier when costs remain higher than those of incumbent alternatives. While the competitiveness of electric technologies plays a central role in shaping the electrification pathway, policy action on energy prices, equipment, or finance cost and overall benefits awareness can significantly impact the economic balance and make electrification more competitive. Conversely, policy revisions as well as changes in international fuel prices can alter the potential in some countries, especially where costs of incumbent and electrified technologies

[1] Heat pumps are measured by their wattage of output capacity. The average capacity of the heat pump stock varies greatly across regions and appliances, generally ranging from 3 kW to 20 kW for residential applications, and beyond 100 kW in large commercial buildings.

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remain close. Consumers make decisions that have consequences over the equipment lifetime, and variability in policies, prices, or competitiveness alters confidence and adds a non-economic barrier that can prevent parts of the cost-competitive potential from materialising.

Levelised cost of using heat pumps versus gas boilers for residential space heating by country, 2025



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Note: The technology (colour) shown per country is the more economically competitive of the two.

Heat pumps are the main technology to electrify space and water heating. Although they have higher upfront costs than gas boilers, they are typically three to five times more efficient, allowing lower operating costs to offset the initial premium over time. Competitiveness depends strongly on the electricity-to-gas price ratio: high ratios, often driven by taxes and levies, reduce lifetime savings and favour conventional technologies. Non-cost barriers also matter, including installer availability, disruption for users, policy uncertainty, and restrictions on external building modifications (see Chapter 2). Nonetheless, IEA analysis indicates that heat pumps are competitive in countries that account for more than half of global space heating demand.

In lower-intensity heating applications, such as in countries with milder winters, electric resistance water and space heaters provide a widely available electrified technology. Resistance heaters have low capital costs but do not have a substantial efficiency benefit compared to gas boilers. This means that their uptake depends on electricity being priced competitively compared to alternatives. Beyond the low investment cost, the main advantage of resistance heaters in low-intensity heat markets is its simple installation and ease of operation. In places without connections to a gas grid, they can also replace more polluting and less convenient fuels, such as coal, wood, and agricultural waste.

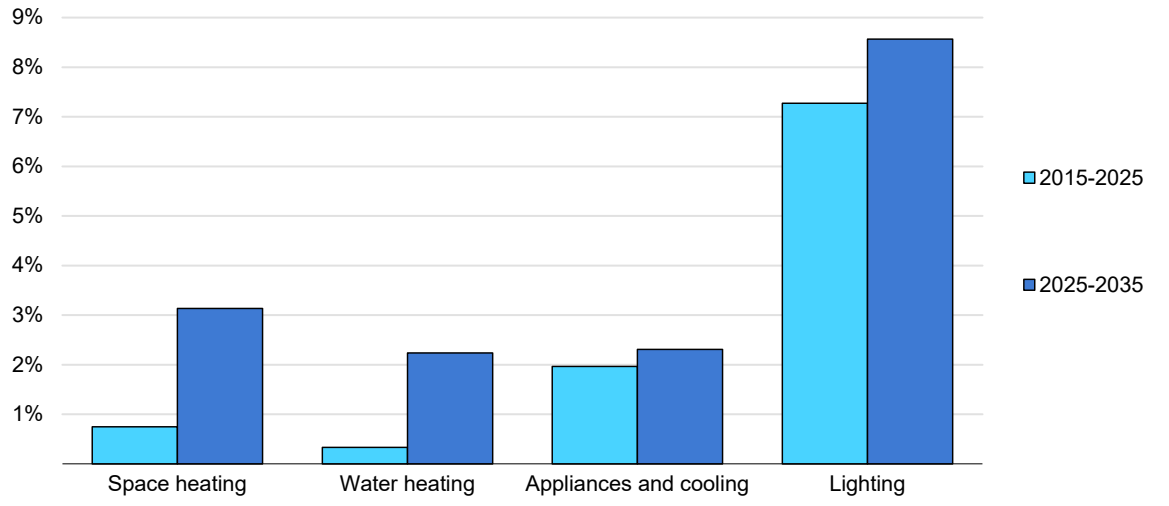
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For cooking, induction or resistance stoves are more efficient than gas stoves, and significantly more efficient than traditional biomass stoves. In an electric cookstove, around 80-85% of the input energy is directed to cooking, versus around 50% for a gas or liquefied petroleum gas (LPG) stove. This means that despite slightly higher upfront costs, the total cost of ownership for an electric cookstove across its lifetime can be up to 10% lower than for an LPG stove. There are other barriers: in many EMDE, unreliable electricity or no access to electricity at all, cultural preferences, lack of awareness, and low access to finance hold back electrified cooking.

Pillar 3: Strengthening equipment efficiency

Over the past decade, the energy efficiency of new equipment in buildings improved by an average of 1.2% per year,2 although progress varied considerably across product categories. Lighting recorded the strongest gains, driven by the rapid uptake of LEDs, with their market share rising from around 10% in 2015 to more than three-quarters today. The efficiency of new household appliances and cooling equipment improved by 2% annually, compared with less than 1% for space and water heating equipment. This variation reflects differences in the cost-competitiveness of higher-efficiency technologies and the reach and stringency of policies promoting their uptake.

Annual efficiency improvement of equipment sales of selected end uses at the global level, 2015-2035



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Note: For appliances, efficiency improvements across product categories are weighted by energy consumption.

[2] Average sales efficiency improvement across equipment categories, weighted by energy consumption.

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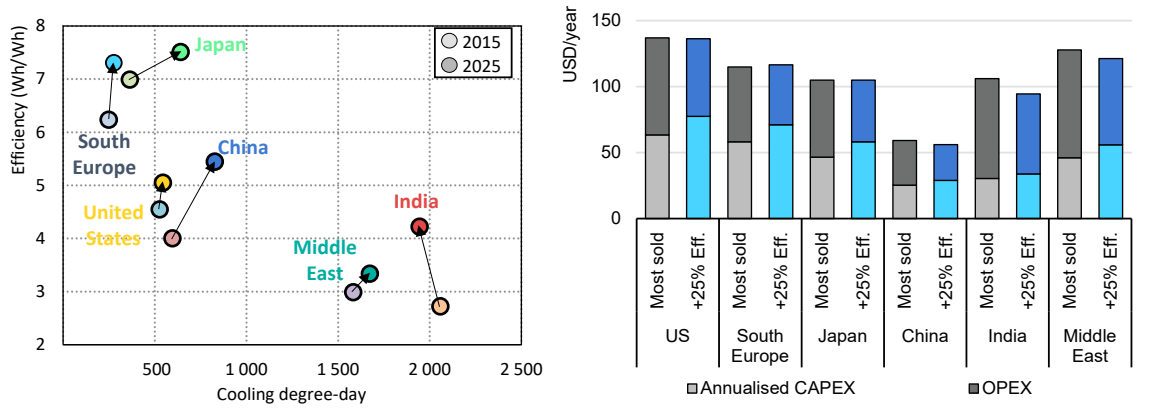
Efficiency improvement in space heating equipment has been concentrated in advanced economies, where MEPS and government subsidies have accelerated the phase-out of the most inefficient boilers using natural gas, oil, and biomass. This pathway relies on a comprehensive expansion of MEPS to phase out the most inefficient heating systems in all EMDE. Growing heat pump markets bring additional efficiency gains through improved system performance, as supply chains mature and installation, sizing, commissioning, and control practices improve. The efficiency of new lighting equipment continues to improve rapidly, driven by growing LED adoption in parts of Africa and Central and South America, where penetration remains relatively low.

In the past decade, the efficiency of new household appliances and cooling equipment has improved at an average annual rate of 2%. The fastest gains were in televisions, where common global product platforms and concentrated manufacturing have narrowed efficiency gaps across regions. Rapid improvement was driven by advances in LED backlighting, more efficient display panels, and optimised power management. Meanwhile, refrigerators and washing machines saw the slowest gains, as regional differences in regulation, consumer preferences, and price sensitivity have sustained more fragmented product markets. In the next decade, efficiency gains in televisions are expected to slow, as the transition to LED backlighting is largely complete. Despite this slowdown, the overall rate of appliance efficiency improvement remains above 2% annually, supported by continued gains in other appliance categories. Since 2015, the adoption and strengthening of MEPS for household appliances have increased pace, especially in EMDE. Much of this policy momentum has centred on air conditioners, amid growing concern over the impact of rapidly-rising cooling demand on electricity systems.

Since 2015, more than 70 countries have introduced or updated MEPS for air conditioners, including some of the world's largest cooling markets such as China, India, and the United States. But the stringency of these standards varies widely, with minimum requirements in many markets still well below the efficiency of air conditioners sold in the best-performing countries. The pathway towards at least a 25% energy intensity reduction for buildings globally relies on further strengthening of MEPS for air conditioners across most major cooling markets to reduce performance gaps with leading markets today. Progress in introducing and strengthening MEPS can be slowed by enforcement challenges, limited product availability, and doubts over market readiness, though affordability remains the principal concern for policy makers in EMDE. On a life cycle basis, efficient air conditioners are broadly competitive, if not cheaper, than the most sold units. Purchase prices of the efficient units can be higher on average but vary across markets, and high-efficiency models with competitive prices can generally be found.

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Average efficiency of sold air conditioner units by region, 2015 and 2025 (left), and yearly cost of efficient air conditioners against most sold models, 2025 (right)



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Notes: CAPEX = capital expenditure; OPEX = operational expenditure; air conditioner efficiencies reflect operation under local climate conditions; US = United States. An early monsoon season lowered cooling needs in India in 2025. South Europe includes Albania, Bosnia and Herzegovina, Croatia, Cyprus[3], Greece, Italy, Malta, Montenegro, Portugal, Spain and Türkiye. *+25% Eff.* refers to models 25% more energy efficient than the most sold unit in each market.

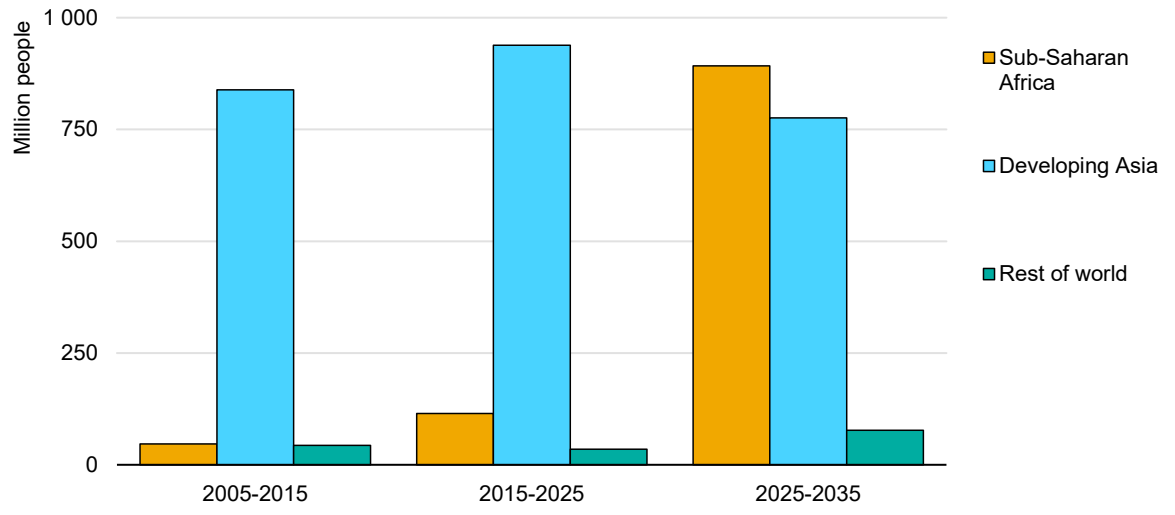
Pillar 4: Improving access to clean cooking

Universal access to clean cooking is achievable with available technologies and at modest cost. Experience in Asia shows how quickly access can expand when sustained policy support is in place: since 2010, countries in the region have provided access to clean cooking to around 1.5 billion people, more than halving the number of people without access in the span of 15 years. IEA modelling showed that if all the countries with access gaps match the best historical rates of progress achieved globally in comparable contexts, universal access to clean cooking solutions could be reached by 2040. Sub-Saharan Africa, where around three in every four households still lack access to clean cooking, requires the steepest acceleration, well beyond the record pace of around 15 million people gaining access per year estimated for 2025.

[3] Note by the Republic of Türkiye The information in this document with reference to "Cyprus" relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Türkiye recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Türkiye shall preserve its position concerning the "Cyprus issue".
Note by all the European Union Member States of the OECD and the European Union The Republic of Cyprus is recognised by all members of the United Nations with the exception of Türkiye. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus

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Number of people gaining access to clean cooking solutions by region, 2005-2035



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Note: *Access to clean cooking solutions* refers to households cooking primarily with liquefied petroleum gas, natural gas, electricity, biogas, bioethanol, or advanced biomass cookstoves.

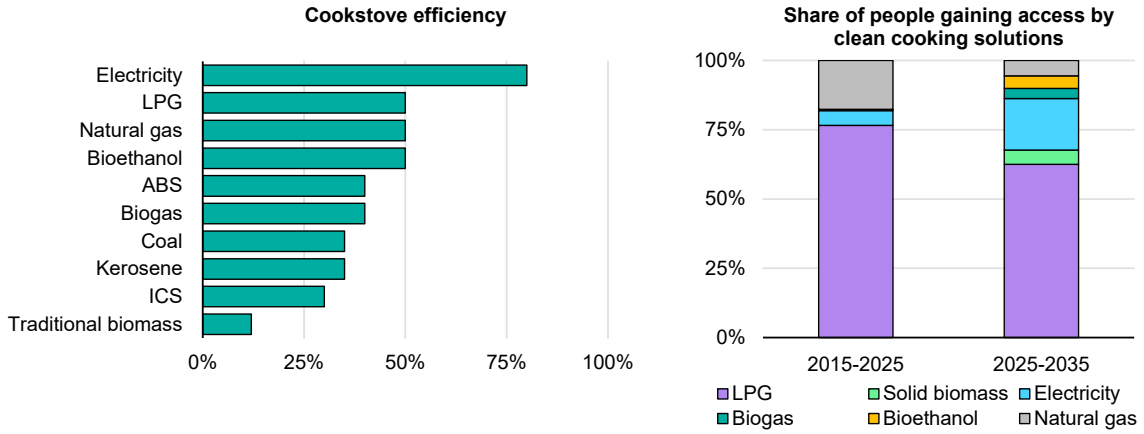
Sources: IEA analysis based on data from WHO (2026), Database: Cooking fuels and technologies (by specific fuel category), accessed in May 2026 and IEA (2026), Clean Cooking in Africa 2026.

Technologies to expand access

The World Health Organisation defines clean cooking as the use of fuels and technologies that meet health-based emission standards and minimise household air pollution, including electricity, solar, biogas, LPG, natural gas, and solid biomass burned in advanced biomass cookstoves. Since 2010, LPG has been the primary driver of expanding clean cooking access and has accounted for roughly 80% of people gaining access. Electricity is the second most widely used clean cooking solution, serving around one-quarter of households with access in EMDE. Induction electric cooking is the most efficient cooking solution (see Pillar 2). Modern bioenergy – including bioethanol, biogas, and pellets used in advanced biomass cookstoves – complements these options, where local resources are available. Improved biomass cookstoves, which have reached at least 4 million additional people annually over the past five years, do not qualify as clean cooking solutions under the WHO definition. Nevertheless, they play an important transitional role towards universal access, delivering immediate benefits while serving as a stepping stone in rural and affordability-constrained markets.

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Cookstove efficiencies and share of population gaining access to clean cooking solutions by technology at the global level, 2015-2035



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Notes: ABS = advanced biomass cookstoves; ICS = improved biomass cookstoves; LPG = liquefied petroleum gas. Clean cooking solutions include clean cooking solutions as defined by the World Health Organization. Solid biomass only includes advanced biomass cookstoves as ICS are not classified as clean.

Public buildings and institutional cooking

Schools, hospitals, and other public buildings offer an important but underexploited opportunity to scale clean cooking. School feeding programmes reach around 87 million students in sub-Saharan Africa and are growing faster than in any other region, yet cooking in schools still relies largely on traditional fuels. In Kenya, only around 10% of schools use clean cooking solutions, and biomass used for school meals accounts for around 4% of national demand for traditional biomass for cooking. The predictable, high-volume demand of institutional kitchens makes them well suited to clean cooking, as shown by large-scale models such as Food4Education in Kenya, which serves around 600 000 meals a day, and by electric cooking in schools in Madagascar and Tanzania and pellet-based solutions in Rwanda. Public procurement of clean cooking for public buildings, identified by several African governments as a priority, can help aggregate demand and develop local supply chains.

Managing import exposure and building resilient clean cooking systems

The closure of the Strait of Hormuz in 2026 underscored the importance of resilience within clean cooking supply chains, especially for the world's most widely used cooking fuel, LPG. Around 3.4 billion people in emerging markets and developing economies rely on LPG as their primary cooking fuel, and around 30% of global seaborne LPG exports passed through the strait in 2025, highlighting the potential impact of supply disruptions on billions of people. In some countries, like India and Indonesia, more than 70% of households rely on LPG, and in many

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countries, known LPG storage covers less than 30 days of consumption. In the Asian market, the closure of the strait led to localised disruptions of supplies, although subsequent measures to find alternative suppliers and increase LPG output from refining capacity helped address these shortages. In sub-Saharan Africa, physical supply largely remained available, as the region sources around 80% of its LPG imports from the United States, but import prices rose by around 70% in West Africa and nearly doubled in East Africa. This pushed more than 10 million LPG users to spend over 5% of household income on cooking fuel, raising the risk that households revert to traditional biomass.

Governments responded swiftly: more than half of the 23 cooking fuel measures tracked by the IEA by May 2026 focused on strengthening supply resilience through strategic reserves, emergency protocols, and supply chain reforms. Around 20% of the measures sought to diversify cooking fuels and technologies, particularly towards electric cooking. In the pathway towards at least a 25% reduction in the energy intensity of buildings globally, resilience is built into the expansion of access through greater fuel and technology diversity, adequate storage, and stronger domestic supply chains – priorities the IEA's new Clean Cooking Security Programme aims to support. Affordability measures remain equally important: IEA analysis finds that removing VAT on clean cookstoves in sub-Saharan Africa could make clean cooking affordable for a further 13 million people at an annual fiscal cost of around USD 20 million.

Implications of reducing buildings' energy intensity

Taken together, electrification, equipment and building envelope efficiency, and access to clean cooking more than offset the growing needs for modern energy services, these measures lower buildings' consumption by more than 10%: space heating contributes the most, and electrification and higher stove efficiency curb most of the cooking demand growth.

Buildings contributed to more than 2.8 Gt of direct CO_2 emissions in 2025. These emissions are reduced by 1 Gt in the next decade through the reduction of energy intensity in the sector. The electrification of heat, combined with growth in low-emission solutions for space and water heating such as solar thermal, geothermal and modern bioenergy, contribute to a phase down of fossil fuel consumption.

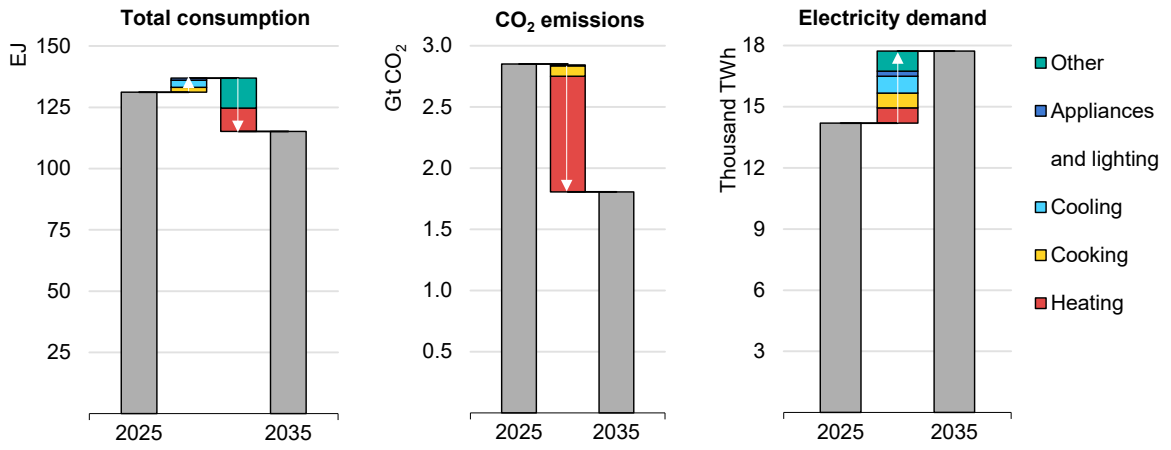
The buildings sector consumed 14 200 TWh of electricity in 2025. In the pathway towards at least a 25% reduction in the energy intensity of buildings globally, growth in appliance and air conditioning ownership, higher incomes leading to higher usage, and increasing temperatures in the next decade lead to growing electricity demand. Increased coverage and stringency of standards, along with other measures, offset part of the growth from higher energy needs and free up space for additional demand from electrification in multi-fuel end uses such as

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cooking and heating. Better insulated buildings, improvements in heat pump efficiencies as well as the replacement of some resistance heaters by heat pumps, curb demand growth further. Considering all measures and forces at stake, in this pathway, buildings' electricity demand grows by 3 500 TWh, but ambitious policy action on energy efficiency allows the electrification rate of buildings to rise even more, from 39% to 55% by 2035.

The benefits of addressing the gap in access to clean cooking are substantial. If all countries with clean cooking gaps replicated the best historical rates of progress, universal access could be reached globally around 2040, at an investment of just over USD 4 billion per year – around 0.1% of today's global energy investment. By 2040, premature deaths from household air pollution would be cut by almost two-thirds, the time saved by households would be roughly equivalent to the total hours worked annually in Indonesia today, and net GHG emissions would fall by 1.25 Gt CO_2-eq per year.

Global buildings energy consumption, direct CO_2 emissions, and electrification demand at the global level, 2025-2035



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Note: *Other* = traditional use of biomass, data centres and water desalination.

Preparing buildings for the future energy system

To achieve the proposed buildings target and sustain efficiency gains in the long-term, the way buildings are designed, constructed, and operated must adapt to the future energy system. Efficient, grid-interactive buildings, capable of balancing supply and demand within an increasingly electrified, interconnected, and climate-resilient energy system, are central to delivering demand reduction and preparing buildings for the future, nature-based design solutions and urban design strategies that enhance thermal comfort, water management and resilience at the neighbourhood scale also have a significant role to play.

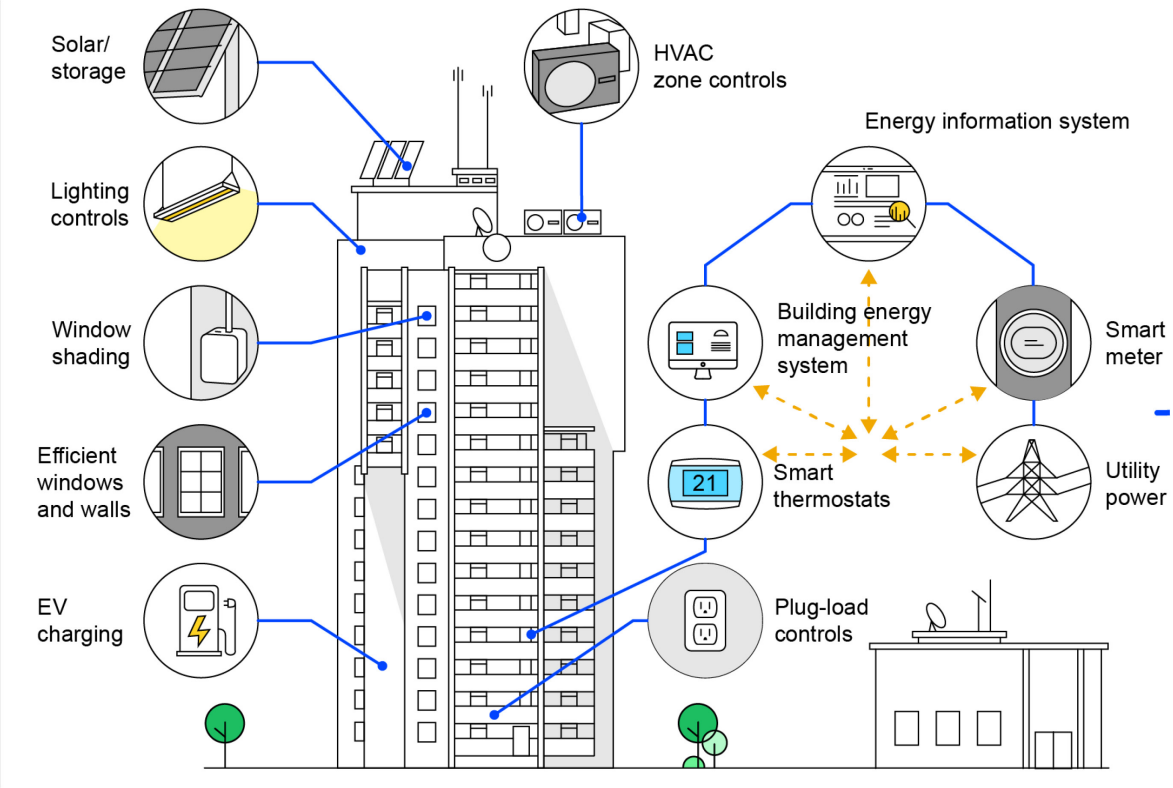
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The role of efficient grid-interactive buildings

As the global energy system moves towards greater connectivity in the Age of Electricity, a buildings sector that is efficient, electrified, smart, and flexible is essential to delivering on the target. Efficient grid-interactive buildings (EGIBs) provide a strategic way to achieve continued improvements in building and equipment energy efficiency and ensure that the electrification of end uses can support rather than strain power systems.

EGIBs are defined by four key attributes: efficiency, connectivity, smartness, and flexibility. **Efficiency** involves the optimisation of energy consumption through high-performance building envelopes, appliances, and systems. **Smartness** refers to the deployment of sensors and controls to monitor and optimise building operations. **Connectivity** enables buildings to exchange signals with the grid and respond to supply and demand changes. **Flexibility** is the ability to adjust energy use in buildings in real time by shifting loads, storing energy, or supplying excess electricity to the grid. Such features can transform buildings from passive consumers into flexible assets that support system stability and renewables integration. They also enhance comfort, reduce bills, and improve resilience to outages and extreme weather, achieving the best results for occupants and the grid.

Efficient grid-interactive buildings: enabling technologies



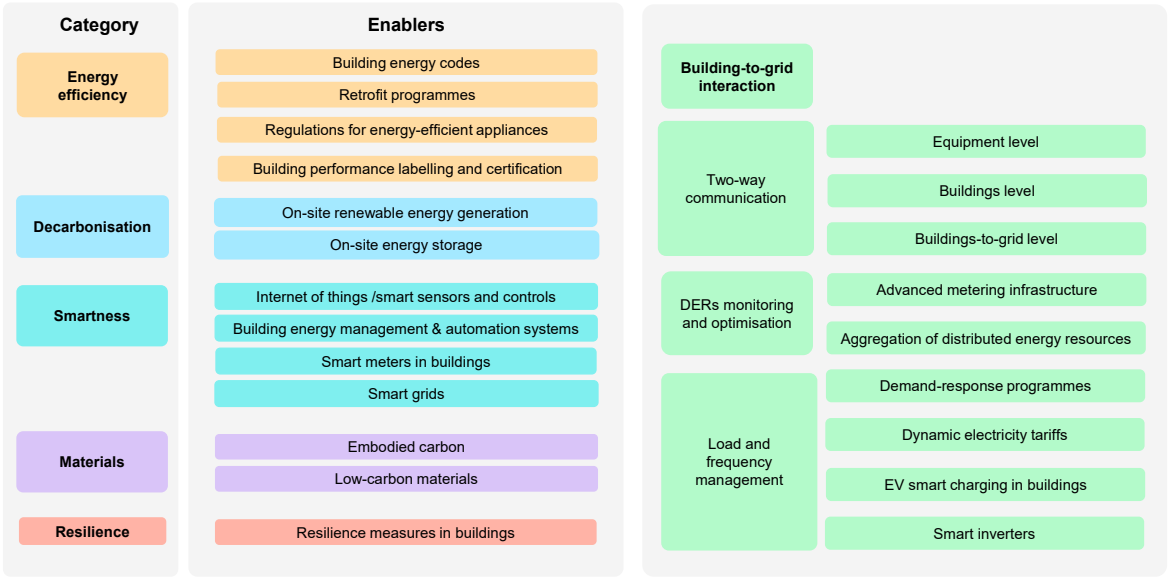
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Note: EV = electric vehicle; HVAC = heating, ventilation and air conditioning.
Source: IEA (2022), Unlocking the Potential of Distributed Energy Resources.

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The transformation of buildings into efficient, grid-interactive assets relies on a policy and regulatory ecosystem that enables technological adoption and market readiness. The IEA has developed a structured framework around a set of defined enablers, evaluated by their presence, strength, and level of implementation. Together, they determine a country's potential and readiness to advance efficient, grid-interactive buildings and offer a benchmark for the current policy landscape. The enablers for EGIBs are organised into six overarching categories: (1) energy efficiency, (2) decarbonisation, (3) smartness, (4) materials, (5) resilience, and (6) building-to-grid interaction.

Policy enablers and conditions for efficient grid-interactive buildings



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Note: DER = distributed energy resource; EV = electric vehicle.

Targeted policies across the EGIB framework are a key lever for driving the efficiency of the buildings sector and, more broadly, for improving the energy efficiency of the wider energy system, including grid performance and reduced peak demand. This is particularly relevant because increased renewables and electrification of end uses will put significant strain on electricity grids globally; enhanced grid flexibility via EGIBs is crucial to overcome this challenge. Furthermore, while building flexibility and grid connectivity do not directly reduce a building's on-site energy consumption, they do lower carbon emissions, since EGIBs can shift electricity use to periods when grid carbon intensity is low.

The EGIB framework also enables progress across all pillars, as it incorporates improved building envelopes, high-performance electrified end uses, and improved equipment efficiency. EGIBs can therefore support the proposed energy reduction target for buildings, while ensuring that buildings and grids are equipped to participate in the future energy system.

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Urban design and nature-based solutions

As heatwaves become more frequent and global temperatures rise, demand for space cooling in buildings is increasing fast and will continue to do so. At the same time, many regions continue to have high demand for heating during winter, making thermal comfort throughout the year a central challenge for future buildings policy. The efficiency of cooling and heating equipment is a key factor in determining how much energy is needed to meet that demand. Much of the thermal comfort felt indoors is determined outside of the building envelope.

During heatwaves, the urban heat island effect can push temperatures in cities more than 10°C above rural areas. This effect, which is driven by heat stored and released in concrete and asphalt, can be drastically reduced by integrating nature-based solutions into urban design. Green infrastructure such as trees, parks, green roofs and walls, and blue infrastructure such as ponds and canals, can each reduce ambient temperatures by as much as 5°C. Municipal heat action plans can help cities identify heat risks, co-ordinate comprehensive long-term cooling measures, and set heat-planning goals.

Mandating passive design strategies in building energy codes, such as shading and reflective coatings, optimised orientation, ventilation, and insulation as part of a strategic urban planning, reduces the need for active cooling and heating.

Community-based energy solutions like district heating and cooling can efficiently meet heating and cooling demand in densely populated areas by distributing centrally produced heat or cold through insulated networks. District heating already serves more than 600 million people worldwide and meets 10% of global building heat demand today, mainly in China, the Russian Federation, Europe, and parts of Central Asia.

District heating remains largely fossil fuel based, but in a small and slowly increasing number of regions, renewable heat and otherwise wasted heat streams, such as industrial waste heat or wastewater, are beginning to contribute to the decarbonisation of these facilities. Growing electricity consumers, such as data centres and hydrogen electrolysers, can further contribute waste heat to future district heating systems. Heat networks can also contribute to accelerating the electrification of heat through large-scale heat pumps and thermal storage, using low-priced renewable electricity from wind and solar at times of high generation.

District cooling is less widespread but growing fast, particularly in the Middle East, with some networks also emerging in other regions, such as Latin America. District cooling uses centralised chilled-water networks connected to cooling sources including rivers, lakes, or even wastewater. Especially when combined with

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thermal energy storage, it helps reduce and shift peak electricity demand while also mitigating the urban heat island effect by rerouting the removed heat away from densely populated areas.

Together, these measures can reduce urban heat risks, improve resilience to temperature extremes, reduce energy demand inside buildings, and reinforce wider building efficiency efforts.

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Chapter 4. Financing the gap

Scaling investment to meet the target

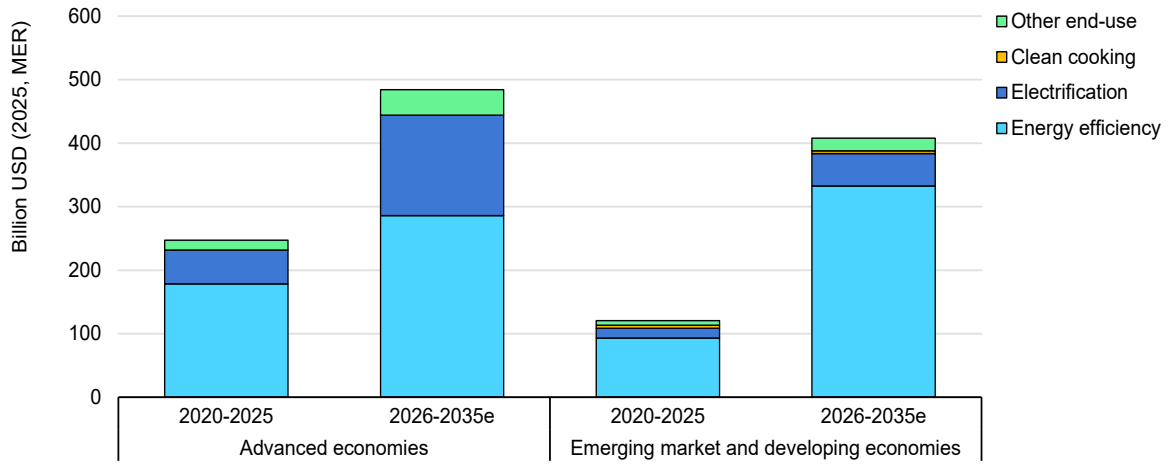
Investment in buildings efficiency, electrification, and other end-use improvements exceeded USD 370 billion in 2025, more than double the level seen a decade earlier. This growth reflects rising policy support for energy efficiency, stronger deployment of electrified technologies such as heat pumps, and increasing awareness of the economic and energy security benefits of reducing energy demand in buildings. Despite this progress, current investment trends remain insufficient to achieve global energy and climate objectives. By 2035, annual investment needs to rise to nearly USD 1.2 trillion.

Many of the measures needed to reach the target can be achieved with cost-competitive technologies already available. However, so far, growth in investment has taken place alongside continued expansion of the global building stock and increasing demand for energy services, rather than in the adoption of efficient technologies. As a result, higher investment levels do not automatically translate into improvements in energy performance. The effectiveness of investment depends on its allocations to renovations, high-efficiency technologies, and structural measures. In many countries, a significant share of investment continues to be directed towards individual interventions rather than comprehensive building upgrades, which limit their long-term impact in energy savings.

Clean cooking requires only a small fraction of the efficiency investment needed, but current flows remain unevenly distributed. Reaching universal access globally would require just over USD 4 billion per year until the gap is closed – half of it in sub-Saharan Africa. Today, around USD 4.5 billion is invested each year in clean cooking; however, 80% of that is in Asia, signalling that much of the acceleration is still required in Africa, where investment would need to grow around 2.5-fold.

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Average annual investment in buildings efficiency, electrification, clean cooking and other end-use improvements at the global level, 2020-2035



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Note: MER = market exchange rate. 2026-2035e = estimated investment values.
Source: IEA (2026), World Energy Investment 2026.

Channelling finance where it is needed most

Mobilising the capital required to close the buildings investment gap will require a clear understanding of who makes investment decisions, where financing originates, and which instruments are most used. Analysis of investments across the sector highlights the key role of households and commercial finance in the deployment of efficiency and electrification measures.

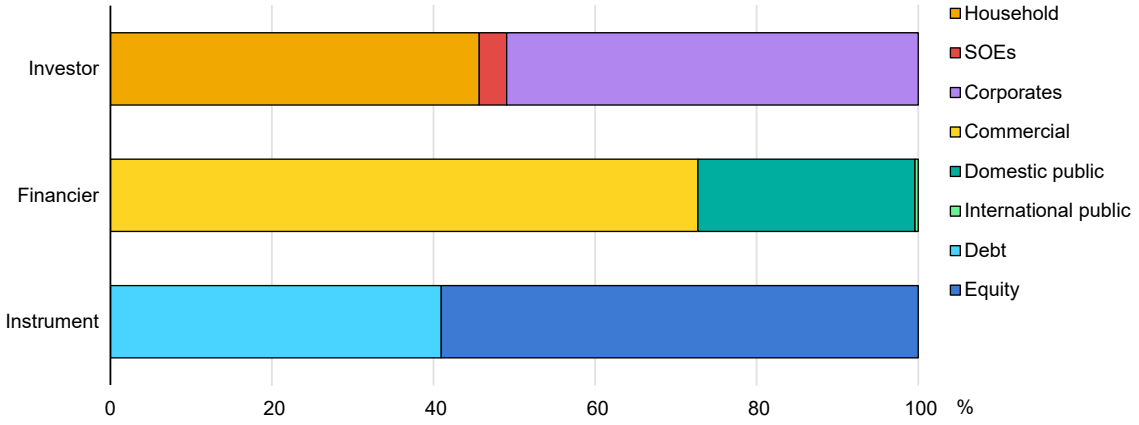
Households are the single most important group of investors in buildings. Unlike many other parts of the energy sector, where investment decisions are concentrated among state-owned enterprises like utilities or large corporations, spending on renovations, appliances, and heating systems is impacted by the decision-making of households. This makes affordability a central consideration for policy makers. Even when efficiency measures deliver positive savings, the high upfront costs of some efficient solutions can be a barrier to adoption, particularly among lower-income households. Other barriers can also deter investment, including long payback periods, transaction costs, and split incentives between building owners and tenants. Addressing the different barriers requires a combination of financial support and measures to make investment easier to undertake. Expanding access to grants, low-interest loans, tax incentives, and support schemes, particularly for vulnerable households, can play a role in overcoming financial constraints while ensuring benefits are broadly shared.

On the financing side, commercial capital provides most of the funding for buildings investment. Mortgage lending, consumer loans, and commercial bank credit are key channels through which capital reaches households and building

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owners. Strengthening the capacity of financial institutions to assess energy efficiency investments, adapt lending practices, and develop standardised financing products can help unlock larger volumes of private capital and reduce transaction costs. Domestic public financial institutions can complement commercial lending by providing guarantees, concessional funding, and other mechanisms that help extend financing to households and projects that commercial lenders may otherwise struggle to serve.

Buildings investment by investor, financier, and financial instrument at the global level, 2025



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Note: SOE = state-owned enterprise.
Source: IEA (2026), World Energy Investment 2026.

International public finance, which encompasses financing from development finance institutions, multilateral climate funds and various bilateral sources, represents only a small share of total financing flows but plays an outsized role in enabling investment in EMDE. International public financiers can help address market barriers by providing concessional finance, technical assistance and risk mitigation mechanisms. Their contribution is particularly important in markets where high financing costs, perceived technology risks or weak institutional frameworks constrain private investment. By using concessional resources to reduce financing costs, absorb specific risks or support projects that would otherwise struggle to access finance, public finance can attract significantly larger volumes of commercial capital and help establish viable markets for energy efficiency and electrification investments.

IEA analysis indicates that the buildings sector accounts for one of the largest requirements for international public finance among different energy-related sectors in 2035, reflecting the scale of investment needs in EMDE and the persistent barriers faced by households and small businesses. Recent work under the COP 30 Baku to Belém Roadmap has similarly highlighted the importance of

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building-related clean energy investments. As countries prepare updated climate and energy strategies, scarce public resources must be deployed strategically to maximise the mobilisation of private capital.

The structure of financing instruments also provides important insights into the nature of investment in the sector. Equity financing accounts for more than half of total buildings investment globally. This category includes retained earnings used by private companies and state-owned enterprises, as well as household savings that directly fund renovation and equipment purchases. While equity financing demonstrates the significant contribution of private resources, its large share also highlights the limits of relying solely on self-financing. Many households and businesses lack sufficient savings to undertake major renovation projects, while financing for new construction does not necessarily favour higher-efficiency buildings. Expanding access to debt financing on affordable terms, including products that support both energy-efficient renovation and new construction, can broaden participation and direct investment towards better building energy performance.

Scaling investment in buildings ultimately requires a combination of stronger policy frameworks, innovative financing mechanisms, and targeted public support. Policies that reduce investment risk, improve access to financing, and address affordability constraints can help direct capital towards the regions and market segments where investment needs are greatest. Ensuring that finance reaches households, small businesses, and underserved markets will be critical to delivering the energy efficiency improvements needed to reach at least a 25% improvement by 2035.

The role of energy service companies in financing renovations

Energy service companies can support energy efficiency improvements by developing and implementing upgrades that are repaid through verified energy savings. By combining technical expertise, financing, and performance guarantees, energy service companies help address upfront investment cost and performance risks, facilitating greater investment in building renovation and efficiency measures.

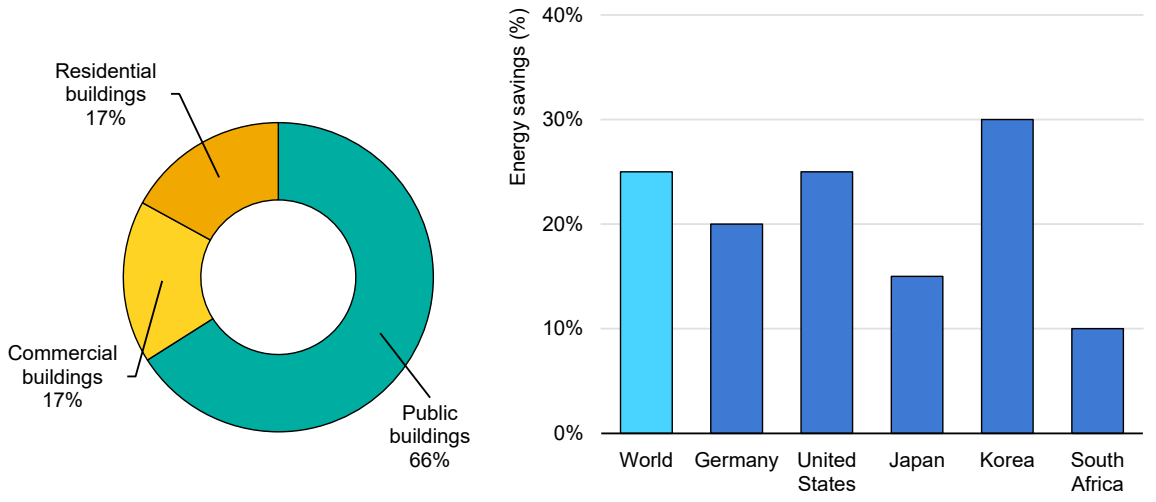
The size of the global energy service company market increased by 10% in 2024 to a record USD 42 billion, with average annual growth around 5% over the past five years. The buildings sector accounts for around 58% of energy service company projects, and public buildings represented roughly two-thirds of the buildings sector portfolio.

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Much of this investment is delivered through structured, long-term programmes that provide standardised contracting and financing frameworks, from federal retrofit programmes in the United States to concessional financing schemes in Europe. Similar approaches are also in place across countries including Argentina, the Balkans, China, India, and Malaysia. Such programmes support project aggregation, reduce transaction costs, and help mobilise investment in building efficiency.

In 2024, energy service company projects delivered average energy savings of 25% compared with baseline consumption. Established markets such as Europe, Korea, and the United States, typically reported savings of 20-30%, although outcomes varied by project type.

Distribution of energy service company projects in the buildings sector and savings in selected countries, 2024



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Source: IEA analysis based on IEA-UNEP annual global energy service company market surveys (2025), in collaboration with the Global Energy Service Company Network.

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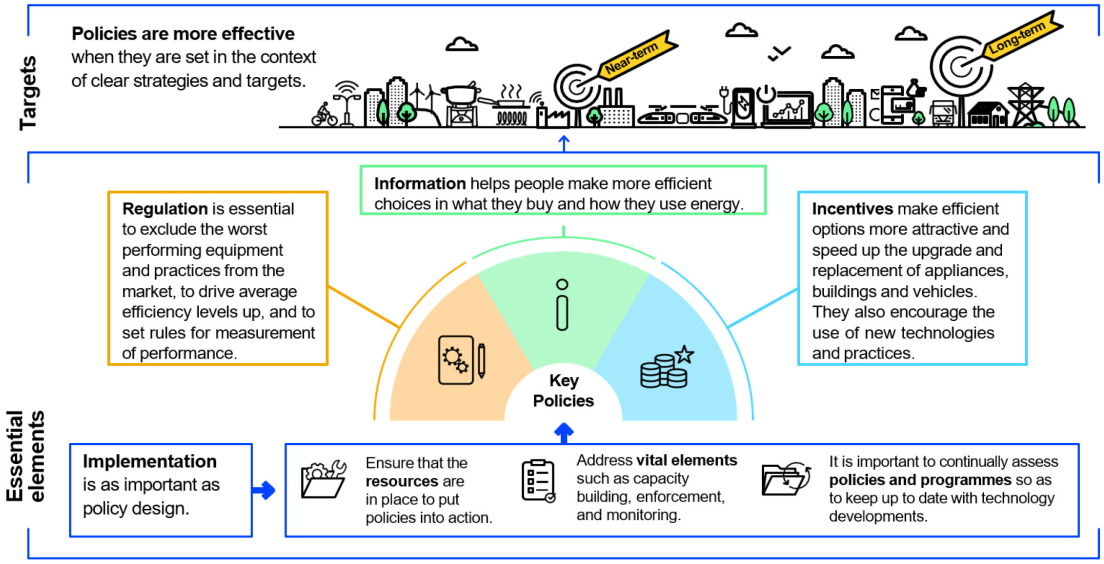
Chapter 5. Key policy options

Implementing an integrated policy approach

The greatest efficiency gains are achieved by implementing a package of policies that combine three main types of mechanisms: regulation, information, and incentives. **Regulations** set higher-efficiency baselines for products and buildings, excluding the worst-performing equipment and practices from the market and set clear rules for measuring energy performance. **Information** allows consumers to make better decisions when purchasing new products or homes, helping them use energy in a more efficient way. It also provides manufacturers with a way to differentiate themselves when offering efficient products. **Incentives** make high-efficiency options more economically attractive, accelerating their adoption and speeding up the upgrade and replacement of old equipment and buildings. Well-designed incentives also drive innovation, as they support manufacturers in developing more efficient alternatives.

Careful design and implementation of policy packages can enhance energy security, create jobs, increase living standards, cut energy bills, and reduce emissions. The IEA has developed energy efficiency policy packages for buildings, heat pumps, and appliances. These packages provide the key implementation policies to achieve the best results.

IEA's Energy Efficiency Policy Package



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Source: IEA (2026), Energy Efficiency Policy Toolkit.

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The following section maps out policy options that governments could choose to implement to achieve the proposed target. The balance between these instruments will vary by country, depending on their fiscal space, existing policy frameworks, and characteristics of the buildings sector.

No single policy instrument is sufficient to deliver the scale of efficiency improvements required to achieve the proposed target by 2035. Regulations provide the foundation by establishing minimum performance requirements and sending clear market signals. Information enables consumers and businesses to make better decisions and comply with these requirements. Incentives and financing are also critical to accelerating investment, particularly where high upfront costs and affordability constraints prevent efficient options from being adopted on an accelerated timeline.

Policy options for improving building envelopes

New buildings

Improving building envelopes is one of the most durable ways to reduce energy demand in buildings. Because buildings often remain in service for many decades, decisions taken on design, construction, and renovation will shape energy consumption well beyond 2035. The **highest priority** is to introduce and strengthen building energy codes for new construction. More specifically:

Regulation

- Strengthen and regularly update building energy codes, progressively moving towards zero-carbon-ready standards.
- Expand coverage across residential and commercial buildings, and integrate energy requirements into permitting, inspection, and compliance processes.

What makes a building code effective?

Effective building energy codes combine ambitious efficiency requirements with broad sectoral coverage, multiple compliance pathways, robust enforcement mechanisms, and regular updates to reflect evolving technology and climate. Top-tier codes increasingly incorporate energy management, smart technologies, grid-interactive capabilities, and provisions for zero-carbon readiness.

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Information

- Expand the use of energy performance certificates, operational ratings, and building performance disclosure programmes to improve transparency.
- Strengthen workforce training and technical assistance for designers, builders, inspectors, and local authorities.

Incentives

- Link financial support to measurable energy performance outcomes.
- Gradually shift support from broad-based subsidies towards financing mechanisms that mobilise private investment.

Overall, strong building codes provide the foundation for long-term progress, while information and financing measures help ensure buildings deliver their intended performance in practice.

Existing buildings

Globally, most of the buildings that will exist in 2035 have already been built. Achieving the proposed target therefore depends not only on improving new construction but also on accelerating retrofits across the existing building stock. The **highest priority** is to accelerate the rate and quality of retrofits, recognising that residential and non-residential buildings may need different approaches. More specifically:

Regulation

- Introduce minimum energy performance requirements linked to major renovation projects as part of building codes and other regulations.
- Strengthen requirements for public buildings and large commercial buildings to help develop markets and supply chains for deep retrofits.
- Progressively raise ambition over time to encourage movement towards zero-carbon-ready, grid-interactive buildings.

Information

- Establish one-stop shops and advisory services that help households and businesses identify renovation opportunities and financing options.
- Expand energy performance certificates, operational ratings, and renovation passports, with requirements triggered at property sales or rentals.

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Incentives

Residential buildings

- Expand access to financing products that leverage public funding to mobilise private investment and reduce barriers to renovations.
- Target public funding towards low-income and vulnerable households where affordability remains a significant constraint.

Non-residential buildings

- Support energy performance contracting and energy service company models that can reduce technical and financial risks.
- Expand access to green lending products and establish sustainable finance frameworks.

Overall, incentives remain a key policy lever to accelerate retrofits, but scaling up activity will require a shift from reliance on public subsidies towards a broader mobilisation of commercial finance, supported by targeted public intervention where it is most needed.

Policy options for electrifying end uses

Electrification is responsible for nearly one-third of the energy intensity reductions in the pathway presented in this report. However, progress will depend not only on technology availability but also on a clear business case for consumers, market confidence, and supporting infrastructure. The **highest priorities** are to improve the competitiveness of electric technologies and to create long-term certainty for investors and consumers. More specifically:

Regulation

- Establish clear, long-term pathways for electrifying heating and cooking, while ensuring that electricity grids are ready to accommodate the resulting demand growth.
- Introduce targets and standards that provide clear market signals, where appropriate.

Information

- Improve consumer information on life cycle costs, energy savings, and performance of electric technologies, such as efficiency labels.
- Expand installer training and certification programmes to address workforce constraints.

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Incentives

- Improve the competitiveness of electricity relative to fossil fuels where taxes, levies, or tariff structures create barriers to electrification.
- Use targeted support to overcome upfront cost barriers for heat pumps and efficient electric cooking technologies, prioritising support for vulnerable households rather than relying on broad-based subsidies.

As buildings become increasingly electrified, policy frameworks should also encourage flexibility, smart controls, and grid-interactive capabilities that enable buildings to support wider energy system objectives.

Policy options for strengthening equipment efficiency

Equipment efficiency delivers the largest share of energy intensity reductions in the pathway presented in this report. Improving the efficiency of appliances, cooling equipment, lighting, and heating technologies can moderate the energy demand growth while reducing costs for households. The **highest priorities** are to strengthen MEPS, introduce effective labelling programmes, and accelerate the uptake of the most efficient products in the market. More specifically:

Regulation

- Introduce and regularly strengthen MEPS for major appliances, cooling equipment, lighting, and heating technologies.
- Strengthen compliance and enforcement to ensure efficiency requirements are reflected in products sold on the market.

Information

- Implement comparative energy labels alongside MEPS using aligned testing procedures and performance metrics. Regularly rescale label classes to reflect technological progress.
- Expand consumer information on lifetime energy costs and savings.

Incentives

- If delivering support programmes, consider partnerships with retailers, utilities, and financial institutions, targeting lower-income households.
- Support bulk procurement schemes that reduce costs through economies of scale and accelerate market transformation.

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Overall, equipment efficiency offers some of the largest and lowest-cost energy savings available in buildings. Strong MEPS can raise efficiency across entire markets with limited fiscal spending, while labels and targeted incentives can help accelerate adoption of the highest-performing products.

Policy options for improving access to clean cooking

Clean cooking policy frameworks have strengthened significantly in recent years, but translating political commitment into implementation remains the central challenge. Based on successful, proven policy approaches in other countries, countries could prioritise measures that include turning national targets and strategies into funded implementation plans, making clean cooking affordable for low-income households, and building resilient supply chains for clean cooking fuels. More specifically:

Regulation

- Translate clean cooking targets and strategies into implementation roadmaps with clear funding strategies and measurable outcomes, embedded in broader energy system planning and including grid expansion where electric cooking is pursued.
- Integrate clean cooking requirements into building energy codes and into public procurement for schools, hospitals, and other public buildings.
- Introduce and enforce cookstove performance standards and safety standards for LPG cylinders and distribution.
- Strengthen the resilience of clean cooking supply through fuel stockholding, emergency protocols, and diversification of fuels and technologies.

Information

- Strengthen data collection and monitoring, complementing household surveys with supply-side data such as stove imports, fuel sales, and cylinder sales.
- Establish dedicated clean cooking delivery units within government to co-ordinate action across ministries and create accountability for implementation.
- Raise awareness of the health, time, and cost benefits of clean cooking through community campaigns, with a focus on women as users and entrepreneurs.

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Incentives

- Use targeted, time-bound fiscal measures such as VAT and import duty reductions on clean cookstoves, with clear sunset clauses and price monitoring to ensure savings reach consumers.
- Gradually reform untargeted fuel price subsidies and redirect support towards targeted instruments such as vouchers or cash transfers for low-income households.
- Mobilise concessional, results-based, and high-integrity carbon finance, underpinned by clear national carbon market frameworks, to de-risk investment in infrastructure and last-mile distribution.

Overall, clean cooking has gained unprecedented political momentum, but delivery will depend on turning targets into funded, well-sequenced plans. The second Summit on Clean Cooking in Africa, to be held in Nairobi in January 2027, provides a critical opportunity to secure new policy and financial commitments and to strengthen the resilience of clean cooking systems.

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Annex

Abbreviations and acronyms

ABS	Advanced biomass cookstoves
AC	Air conditioner(s), as used in the text
AE	Advanced economies
BEC / BECs	Building energy codes
CAPEX	Capital expenditure
CB	Compliant building
CFL / CFLs	Compact fluorescent lamps
DER	Distributed energy resource
EEIT	Energy Efficiency and Inclusive Transitions Office
EGIB / EGIBs	Efficient grid-interactive buildings
EMDE	Emerging markets and developing economies
EMS	Energy Markets and Security
EU	European Union
EV	Electric vehicle
GBCA	Green Building Council of Australia
GHG	Greenhouse Gas
HVAC	Heating, ventilation and air conditioning
ICS	Improved biomass cookstoves
IDB	Inter-American Development Bank
LPG	Liquefied petroleum gas
MEPS	Minimum energy performance standards
MER	Market exchange rate
NABERS	National Australian Built Environment Rating System
NCB	Non-compliant building
OPEX	Operational expenditure
SOE	State-owned enterprise
STEPS	Stated Policies Scenario
STO	Sustainability, Technology and Outlooks
US	United States
VAT	Value added tax
WHO	World Health Organisation
ZCRB	Zero-carbon-ready building

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Units of measure

EJ	Exajoule
Gt	Gigatonne
GW	Gigawatt
kW	Kilowatt
kWh	Kilowatt-hour
kWh/m²	Kilowatt-hours per square metre
kWh/m² per year	Kilowatt-hours per square metre per year
lm/W	Lumens per watt
m²	Square metre
TWh	Terawatt-hour
Wh/Wh	Watt-hours per watt-hour
°C	Degrees Celsius
CO_2	Carbon dioxide
CO_2-eq	Carbon dioxide equivalent
Gt CO_2	Gigatonnes of carbon dioxide
Gt CO_2-eq	Gigatonnes of carbon dioxide equivalent
USD	US dollar

See the IEA glossary for a further explanation of many of the terms used in this report.

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