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I4CE
INSTITUTE FOR CLIMATE ECONOMICS
Une initiative de la Caisse des Dépôts et de l'Agence Française de Développement

Accelerating investment for an energy-independent and low-carbon future

The State of Europe's Climate Investment 2026 edition

Authors: Clara **Calipel** | Caroline **Henry**

The Institute for Climate Economics (I4CE) is an independent, non-profit think tank that puts economic analysis at the service of climate action.

We work to translate climate objectives into public policies and economic decisions: setting priorities, guiding investments, and designing strategies to reduce dependence on fossil fuels and adapt to climate change.

It is grounded in ongoing dialogue with those who design, finance, and implement climate action—from local authorities to the national government, from the European level to international frameworks, as well as with businesses. Based on scientific rigor, independence, and transparency, our expertise helps strengthen the effectiveness, efficiency, and fairness of climate policies.

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The information and opinions expressed in this report are the sole responsibility of the authors.

Outcomes

2025 CLIMATE INVESTMENT IN THE EU

534
billion euros

+2.4% compared to 2024

ANNUAL INVESTMENT NEEDS

878
billion euros

between 2026 & 2030

2025 EU CLIMATE INVESTMENT GAP

344
billion euros

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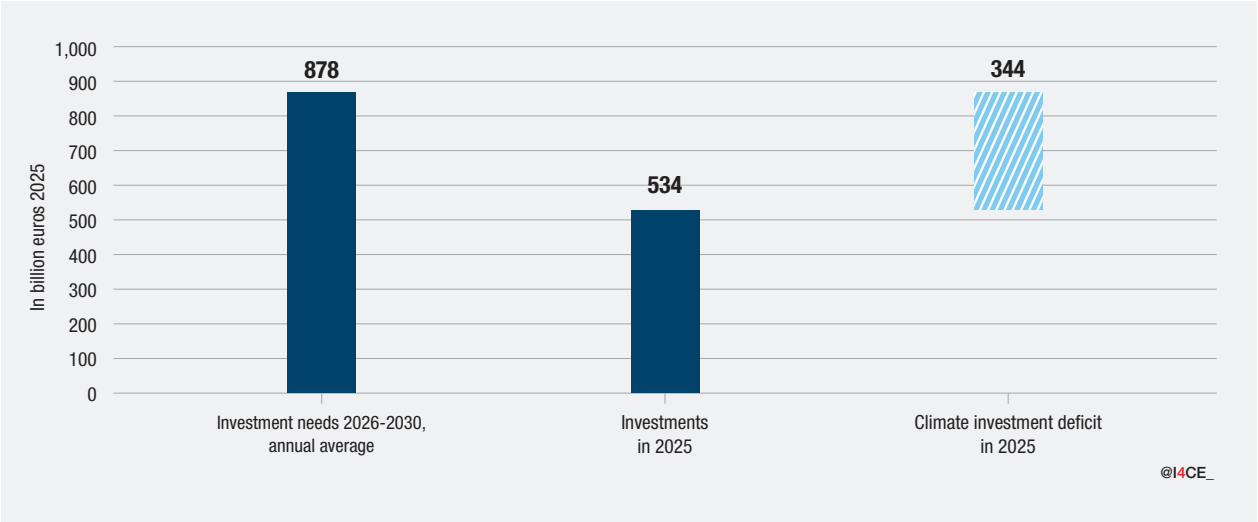
EXECUTIVE SUMMARY

The energy crisis exposes the European Union's (EU) structural vulnerabilities: accelerating investment in clean energy and low-carbon technologies is key to securing economic prosperity, energy independence, and households' purchasing power

The new energy crisis, in the wake of what the International Energy Agency's Executive Director describes as "the greatest threat to global energy security in history", once again highlights the EU's structural vulnerability to fossil-fuel dependence. Soaring oil prices increasingly weigh on households' purchasing power and undermine EU's energy security and industrial competitiveness. In this context, a fossil-free economy is no longer solely an environmental objective, but also a strategic economic imperative. Accelerating investment in low-carbon infrastructure, electrification, energy efficiency, and clean technology (clean tech) will reduce the EU's dependence on imported fossil fuels, strengthen its industrial base, and protect citizens from future energy price shocks.

After a sharp rise in 2022, following the energy crisis triggered by the war in Ukraine, clean investment has stagnated, reflecting a broader lack of long-term investment planning. At the time, public decision-makers, businesses, and citizens chose to invest more heavily in moving away from fossil fuels and improving energy efficiency, although this investment was still insufficient. Since then, however, momentum has faded. Investment in the low-carbon transition **reached 534 billion euros in 2025**, well below **the estimated 878 billion euros needed annually to meet the EU's 2030 climate targets**. An increase in investment across certain sectors in the first months of 2026 suggests that the EU economy could once again ramp up investment in response to the current energy price crisis. Yet, to translate this dynamic into a sustained upward trend, robust long-term investment planning is essential. Beyond sustaining long-term climate goals, such a forward-looking approach would also reduce the need for governments to implement costly emergency measures to shield citizens and businesses from energy price spikes in the future.

FIGURE 1. THE INVESTMENT DEFICIT IN ENERGY, BUILDINGS, TRANSPORT, AND CLEANTECH MANUFACTURING IS ESTIMATED AT 344 BILLION EUROS IN 2025

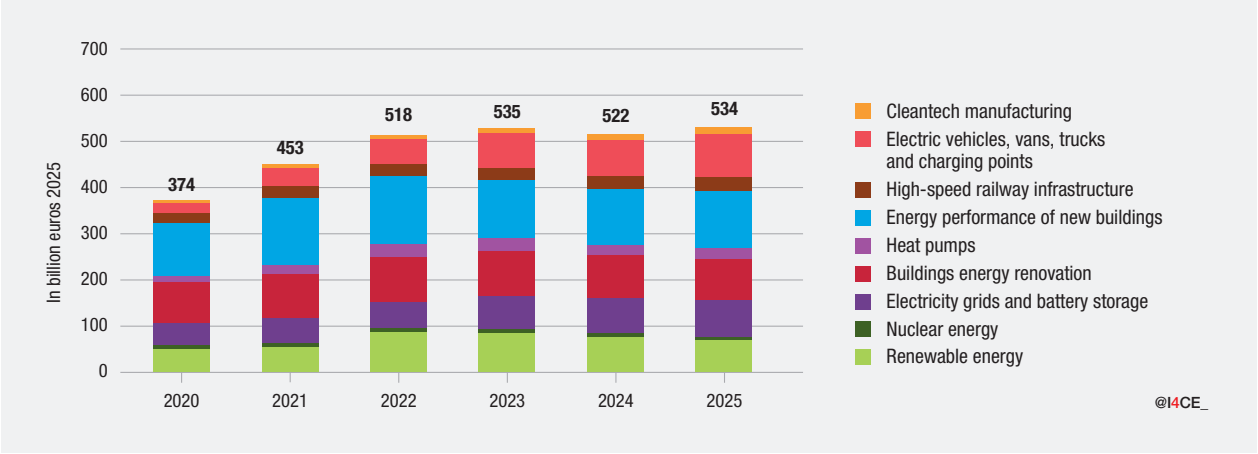


Source: I4CE. All figures are in 2025 euros. On the left, this graph represents the average climate investment needs per year for the EU to reach its climate objectives between 2026 and 2030 in the energy, buildings, transport, and clean tech manufacturing sectors (878 billion euros). It compares them to the 2025 investments for the same sectors (534 billion euros). The difference between the two gives the climate investment deficit (344 billion euros).

Investment rebounds slightly in 2025, but remains well short of what is needed to meet the EU's 2030 targets

After contracting in 2024, investment rebounded slightly in 2025 across the energy, buildings, transport, and cleantech manufacturing sectors, reaching 534 billion euros. This represents a 2.4% growth compared to 2024, bringing investment levels close to those recorded in 2023. The 2025 growth was mainly driven by a 23% increase in investment in electric road transport, supported by the continued uptake of battery electric passenger vehicles. Conversely, investment in renewable and nuclear energy fell by 9%, continuing a downward trend since 2022, reflecting slow permitting procedures, limited grid capacity (with grid investment stagnating since 2023), and slower-than-expected growth in electricity demand. Investment in residential and non-residential building renovation also declined by 5% in 2025, led by the reduction of certain public support schemes, specifically in the residential sector. Finally, investment in wind turbines, solar panels, batteries, electrolysers and heat pumps manufacturing stagnated in 2025 compared to the previous year, in a context of a global decline in cleantech manufacturing investment.

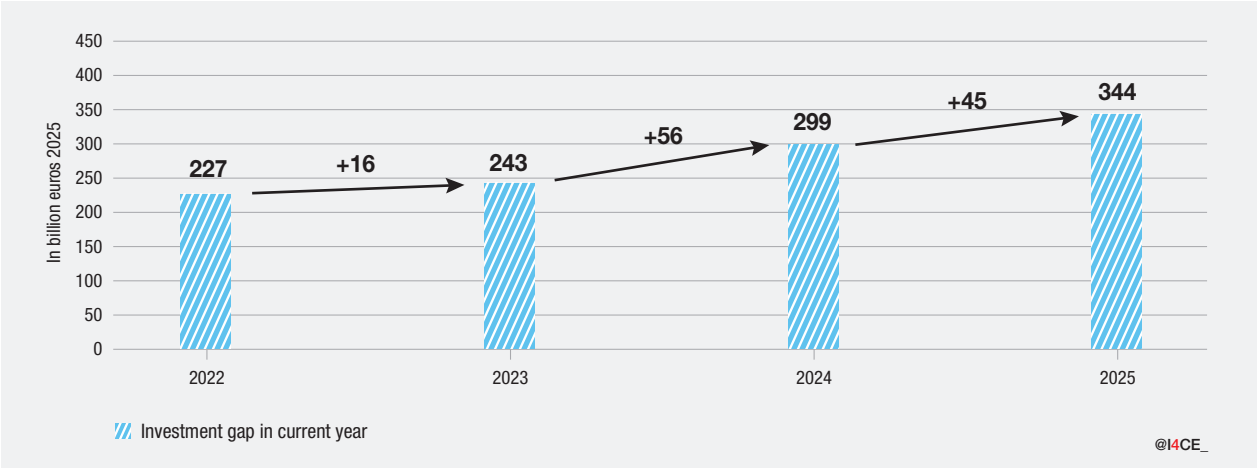
FIGURE 2. AFTER CONTRACTING BY 2% IN 2024, CLIMATE INVESTMENT IN THE EU ECONOMY GREW BY 2% IN 2025, REACHING 534 BILLION EUROS, CLOSE TO THE 2023 LEVEL



Source: I4CE. All data are in 2025 euros. It represents climate investments in the energy, buildings, transport, and clean technologies manufacturing sectors between 2020 and 2025.

With current investment covering only 61% of the 878 billion euros needed annually to meet the EU's 2030 targets, the investment gap stands at 344 billion euros, 45 billion wider than in 2024. While investment has grown overall, it has consistently fallen short of what is needed, creating a moving target effect. Every year of underinvestment adds to future requirements, widening the deficit and making the challenge progressively harder as 2030 approaches.

FIGURE 3. THE CLIMATE INVESTMENT GAP GREW BY 45 BILLION EUROS BETWEEN 2024 AND 2025, TO REACH 344 BILLION EUROS



Source: I4CE. All data are in 2025 euros. This figure represents the evolution of the climate investment gap between 2022 and 2025 at constant sectoral scope and methodology.

At the sectoral level, the trends shaping the investment gap tell a more varied story. A certain number of sectors are progressing well toward their 2030 objectives, reflecting both the effectiveness of targeted policy interventions and strong underlying demand. This is notably the case for solar power, battery storage, public charging infrastructure for light-duty vehicles, and cleantech manufacturing, where 2025 investment levels already exceed those required to meet the 2030 targets. By contrast, many sectors are still not investing at the pace required, and some sectors present a more critical situation than others. Wind energy is a striking example, with 2025 investments amounting to just 25% of identified needs. This deficit is largely driven by the investment gap in electricity grids which, despite reaching 78% of requirements in 2025, remains a critical bottleneck constraining progress across other sectors, from renewables deployment to the electrification of end uses, and needs to be tackled urgently.

Strengthening Europe's long-term policy frameworks to accelerate investment and reduce exposure to future energy crises

To reduce exposure to future energy crises and accelerate investment in the low-carbon transition, the EU and its Member States have a range of concrete policy levers at their disposal. On regulation for instance, the revision of the CO_2 standards for cars and vans regulation must preserve its ambition to sustain the shift to fossil-free mobility, ensure car affordability for households and protect investments already made in European battery manufacturing. On governance, the upcoming revision of the Energy Union Governance regulation should be seized as an opportunity to turn National Energy and Climate Plans into genuine national climate investment roadmaps. On planning, the development of electrification plans, both at EU and national levels, is essential to protect citizens and businesses from rising energy prices, through the implementation of measures aimed at accelerating low-carbon mobility and buildings decarbonisation. Finally, on budgetary issues, the EU budget plays an essential role in enabling climate investments in several Member States. The next EU budget for 2028-2034 must secure substantial and dedicated funding for climate investment across Member States.

These levers must send a clear and durable long-term signal to investors, businesses, and citizens willing to invest in the decarbonisation of the economy. The European Commission is set to publish its proposals for the post-2030 regulatory framework following the adoption of the 2040 emissions reduction objective. While the EU 27 is still far from meeting its 2030 targets, implementing and maintaining long-term commitments is essential to ensure a stable and predictable regulatory framework that fosters long-term investment. The EU and its Member States must break free from the pattern of crisis-driven investment and instead commit to **long-term investment strategies that durably protect citizens, businesses, and Europe's energy security from future energy shocks**.

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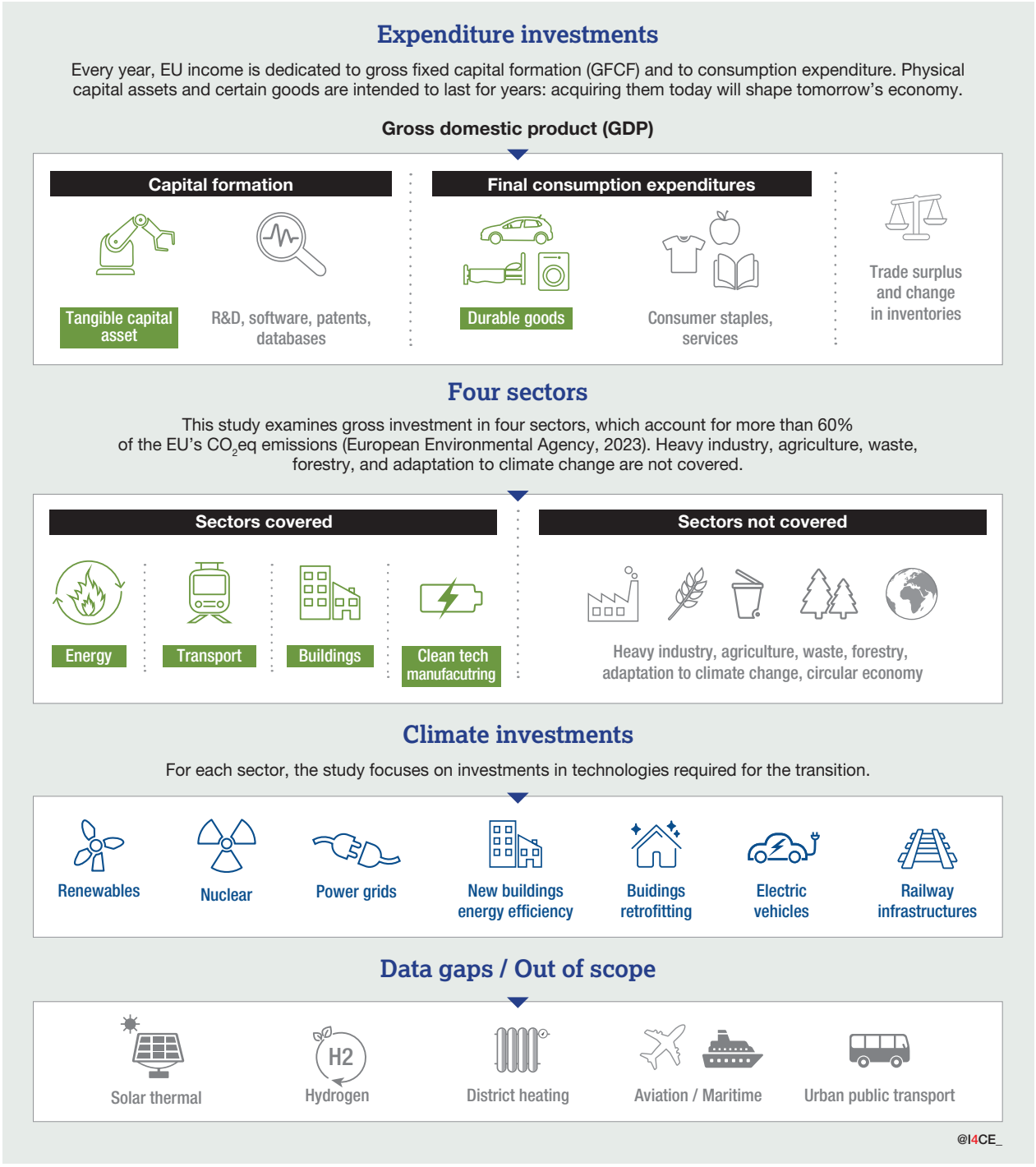
METHODOLOGICAL SUMMARY

This report estimates the gross climate investment, both public and private, required to meet the 2030 objectives set by EU legislation. The average investment needed between 2026 and 2030 is compared to 2025 levels, with all data presented in 2025 euros.

The methodology applied in this report is summarised below, and details about the model's design are provided in the Methodology section at the end of the report.

FIGURE 4. SCOPE OF THE CLIMATE INVESTMENT OVERVIEW



INTRODUCTION

Accelerating investment in decarbonisation is key to protect European Union households and businesses from future energy crises

EU Member States are facing a sharp increase in fossil fuel prices for the second time this decade, after the 2022 energy crisis triggered by the invasion of Ukraine. Logistical disruptions affecting supply chains in the Middle East once again expose the EU's dependence on imported fossil fuels. This dependence weighs on businesses, undermines industrial competitiveness, and erodes households' purchasing power.

As this new energy crisis may prove persistent, and as such disruptions may become more frequent in an increasingly unstable geopolitical context, policies supporting decarbonisation no longer serve environmental purposes alone. Beyond the climate transition, they offer an opportunity to strengthen the EU's energy sovereignty by relying on locally produced, clean energy. Combined with the deployment of low-carbon technologies manufactured across EU value chains, this could support industrial employment in Member States and more broadly strengthen the EU's prosperity.

Previous crises often triggered the development of new EU policy frameworks and financing instruments. The current geopolitical and energy context could similarly accelerate EU decarbonised investment policies and further consolidate the European Commission as an Investment Commission, in line with the orientation set out by its presidency (Ursula von der Leyen, 2024). These new initiatives would come as a complement and support to the central role played by national policies and budgets.

Climate investment is a progress indicator for EU's 2030 targets

The timing of climate investment is crucial. Every year, households, public institutions, and private entities spent billion euros to acquire tangible assets and durable consumption goods such as buildings, dwellings, transport infrastructures, vehicles, energy production and storage facilities, factories, and more. As these assets are supposed to last for years, acquiring them today shape the EU27's future economy, future dependencies, and future GHG emissions.

Climate investment is a good proxy to understand if the EU is on a path to reach the policy objectives set out in the EU Climate Law, as well as in sectoral regulations (see **Table 1**). This is why this report tracks annual climate investment flows across a number of sectors critical to the European economy and the low-carbon transition and compared them to what is needed to be invested to reach the EU's 2030 targets.

A methodology based on I4CE's French Landscape of Climate Finance

This report presents findings based on the methodology developed by the I4CE Landscape of Climate Finance in France (I4CE, 2025b). Since 2014, the Landscape has been gradually estimating climate and fossil investments made in France from 2011 until now, and documents their short-term outlook. It compares current investments with investment needs, based on the French Long-Term Strategy. In the latest edition, published in July 2025, the investment needs are assessed against France's draft national low-carbon Strategy (*Stratégie nationale bas-carbone*) (I4CE, 2025b).

Using a similar approach, this report estimates the investment required to achieve the EU 2030 objectives in four different sectors of the economy: energy, buildings, transport, and cleantech manufacturing. It compares these investment needs with the investments made in the same systems in previous years in the EU (see **Methodology section**). Due to data gaps, it excludes heavy industry, agriculture, forestry, and climate change adaptation.

It is important to note that investment needs depend strongly on the assumptions made and the policies

adopted. For example, in the case of strong technological progress, less climate investment may be needed. Consequently, this report relies on cost assumptions drawn from projections produced by public institutions (the IEA, the European Commission, National Energy Agencies) or academic research laboratories that study and project these costs. Moreover, current investment is also driven by cyclical developments and the general investment conditions (including regulatory stability, financing costs, and the overall policy framework).

This report presents detailed results on:

1. Current investment levels and 2026-2030 needs for the decarbonised energy sector, including renewable and nuclear energy.
2. Current investment levels and 2026-2030 needs for electricity grid flexibility, including the development and modernisation of electricity grids and the deployment of electricity battery storage systems.
3. Current investment levels and 2026-2030 needs for the energy renovation of residential and non-residential buildings, including building renovation works and the deployment of heat pumps.
4. Current investment levels and 2026-2030 needs for the construction of energy-efficient new buildings in both the residential and non-residential sectors.
5. Current investment levels and 2026-2030 needs for the road transport sector, including the deployment of electric passenger cars, vans, and trucks, as well as their supporting charging points.
6. Current investment levels and 2026-2030 needs for high-speed trans-European railway infrastructure.
7. Current investment levels and 2026-2030 needs for the clean technology manufacturing sector, including wind turbines, solar panels, batteries, heat pumps, and electrolysers.

1. DECARBONISED ENERGY GENERATION: FALLING INVESTMENT PUSHES THE EU'S SECTORAL TARGETS FURTHER OUT OF REACH

Key findings

- **Following strong growth between 2020 and 2022, climate investment in the renewable energy and nuclear sectors has shown a downward trend since 2022**. In 2025, climate investment for decarbonised energy reached 76 billion euros, marking a 9% decline compared to 2024. This contraction is due to lower investment in solar photovoltaic (PV), nuclear energy, and biomethane. Investment in wind power and hydropower increased by 16% and 29%, respectively.
- **Meeting the EU's 2030 decarbonised energy targets will require at least 169 billion euros in public and private investment annually between 2026 and 2030**. An additional 92 billion euros is needed to meet these annual investment needs, meaning that the 2025 yearly investment level will need to more than double over the 2026-2030 period.
- **Wind power continues to account for the largest share of the 92 billion euros additional investment needed, requiring 81 billion euros for onshore and offshore wind projects**. Initial projections for installed capacity in 2030 suggest that EU wind power targets are unlikely to be achieved on time. Biomethane and nuclear energy require 9 and 2 billion euros of yearly extra investment, respectively.
- **Investment levels in solar PV fell by 22% between 2024 and 2025**. Although the sector still managed to record a surplus of 3 billion euros in 2025, to remain on track to meet the 2030 target, both investment levels and annual installation rates must be maintained in the coming years, as the lead gained in the early 2020s is narrowing.
- In a context of rising fossil-fuel prices, **addressing the decarbonised energy investment gap is essential to ensure that EU citizens and businesses can benefit from an abundant, affordable, and home-grown energy**.

Investment in EU decarbonised energy has been falling since 2023 while the EU is still far from reaching its 2030 climate objectives

In 2025, the downward trend in renewable and nuclear energy investment, which began in 2022, continued. According to the latest EU-27 consolidated data, climate-related investment in the EU reached 76 billion euros in 2025, representing a 9% decline compared to 2024, after contractions of 9% in 2024 and 2% in 2023. This new decrease was mainly driven by a 11 billion euros drop in solar PV investment (-22% compared to 2024) and a decline in nuclear energy investment (-9%). By contrast, investment in wind power increased by 4 billion euros (+16%) over the same period.

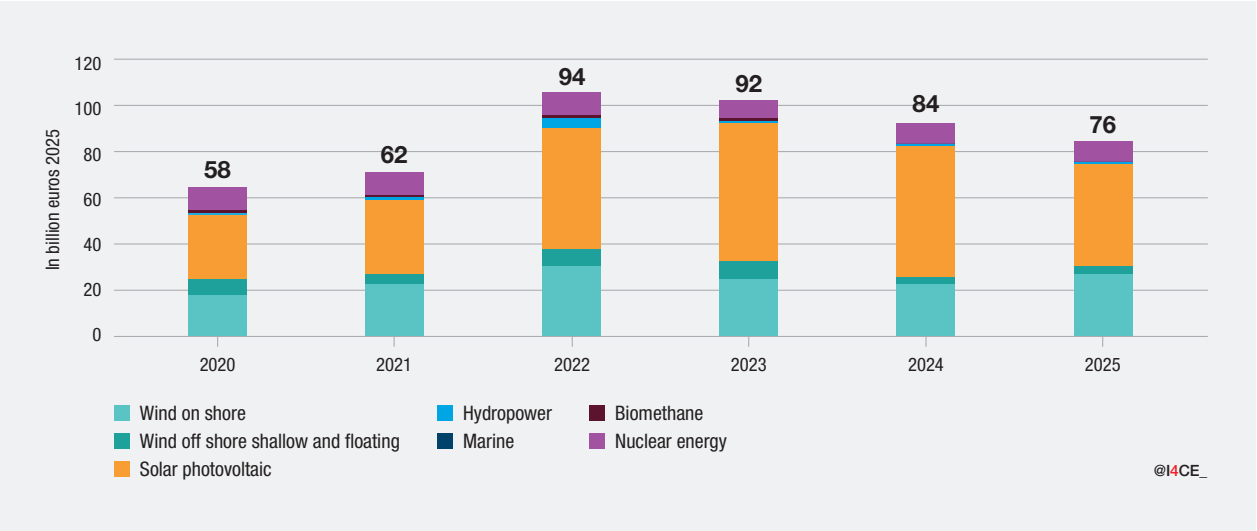
This declining investment trend is taking the EU further away from achieving its 2030 renewable energy targets. Under the Renewable Energy Directive (European Parliament and Council of the European Union, 2023b), the EU is required to reach a 42.5%[1] share of renewable energy by 2030, if possible 45%.

Achieving these objectives, while maintaining current nuclear capacity[2], will require a massive expansion of wind and solar power, and continued support for the refurbishment of the current nuclear fleet.

1 42.5% is the mandatory level. However, the 2023 Renewable Energy Directive states that "Member States should endeavour to collectively achieve an overall Union renewable energy target of 45% in line with the REPowerEU plan" (European Parliament et Council of the European Union 2023b). This plan has been used in this report for the sectoral analysis of wind power, solar PV and biomethane production.

2 The EU does not have precise global 2030 objectives concerning for the nuclear energy sector. Therefore, to estimate investment needs, this report used Member States' own national targets, which mainly include refurbishment investment to extend the lifetime of currently active plants. The new nuclear plant projects currently in development are also included, but represent only 38% of the total nuclear investment needs by 2030. Only six EU countries are currently pursuing new nuclear plant projects (Bulgaria, Czechia, France, Hungary, Poland, and Romania), and these are at various stages of development.

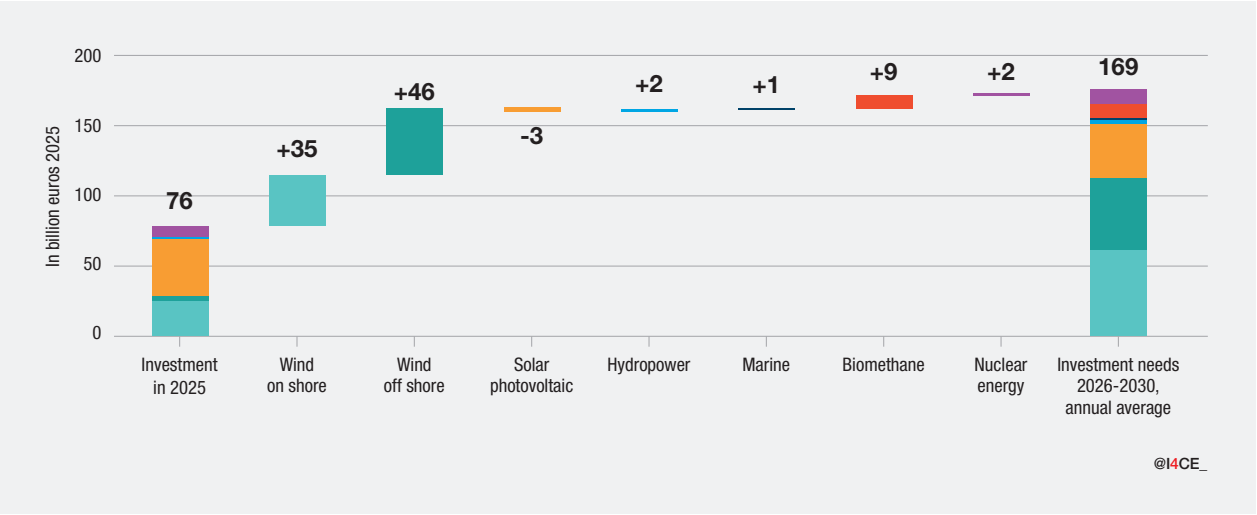
FIGURE 5. AFTER A 63% GROWTH BETWEEN 2020 AND 2022, INVESTMENT TOWARDS RENEWABLE AND NUCLEAR ENERGY DECREASED BY 19% BETWEEN 2022 AND 2025, REACHING 76 BILLION EUROS



Notes: I4CE. All data are in 2025 euros. They represent climate investment in renewable and nuclear energy generation between 2020 and 2025.

The investment implications of this energy transition are substantial. According to the analysis, at least 169 billion euros of public and private capital will need to be secured annually between 2026 and 2030 to remain on a trajectory consistent with these objectives (see **Figure 6**). On this basis, the current climate investment deficit in decarbonised and nuclear energy amounts to 92 billion euros in 2025, indicating that current investment volumes would need to more than double.

FIGURE 6. THE RENEWABLE AND NUCLEAR ENERGY CLIMATE INVESTMENT DEFICIT IS ESTIMATED AT 92 BILLION EUROS IN 2025, OF WHICH 88% IS ATTRIBUTABLE TO WIND ENERGY



Source: I4CE. All data are in 2025 euros. This graph represents the sectoral distribution of the renewable and nuclear energy climate investment deficit in 2025. For each sector, the deficit compares 2025 investment levels to the estimated investment required to meet the 2030 EU regulations. For instance, 35 billion euros of additional annual investment is needed between 2026 and 2030 in onshore wind compared to the 2025 investment level in this sector. Investment needs are averaged over the 2026-2030 period.

Among the six sub-sectors studied (wind power, solar PV, hydropower, marine energy, biomethane, and nuclear energy), **wind power shows by far the largest investment deficit**. Together, on and offshore wind accounted for an 81 billion euros investment deficit in 2025, representing 88% of the total decarbonised energy investment gap that year. **By contrast, solar PV is the only sector currently showing an investment surplus, with actual investment levels exceeding estimated needs**. However, while the sector recorded a 3 billion euros surplus in 2025, investment in the sector declined considerably compared to 2024. Any further slowdown could jeopardise the achievement of its sector-specific 2030 target.

These investment needs should be considered conservative (see **Box 1**). They do not include investment needs in other sectors such as biomass, waste, and renewable heat. Data limitations, together with the absence of common EU-wide sectoral targets, prevented the inclusion of these sectors within the report.

BOX 1. THE ESTIMATES OF DECARBONISED ENERGY INVESTMENT NEEDS ARE CONSERVATIVE, REFLECTING DECLINING CAPITAL EXPENDITURE (CAPEX) COSTS ACROSS MOST TECHNOLOGIES

These estimates for decarbonised energy investment should be interpreted as lower-bound values. To assess investment needs across various technologies, this report relies on multiple sources of cost projections. For all technologies (except solar PV, nuclear energy, and hydropower), it is assumed that their costs will continue to decline up to 2030. However, the evolution of technology costs is inherently uncertain, as they are influenced by multiple factors that are difficult to predict several years in advance. For example, costs are highly sensitive to raw material prices, which can fluctuate significantly depending on many factors, including geopolitical events or energy shock prices.

The sources and assumptions used for each technology in the decarbonised energy sector are detailed below:

- For **wind power**, the latest investment cost projections from the European Commission were used, developed using the PRIMES model (European Commission, 2024). Between 2025 and 2030, this model projects a cost reduction of 14% for onshore wind, 13% for offshore shallow wind, and 23% for offshore floating wind, which remains less mature as a technology than the two others.
- For **solar PV**, this report assumes stable costs across all PV segments between 2025 and 2030. Historically, most solar PV modules installed in the EU have been imported from China (Bruegel, 2024). As the dominant global producer, the Chinese industry has achieved significant economies of scale, driving substantial cost reductions (IEA, 2022). However, under the NZIA (European Parliament and Council of the European Union, 2024b), at least 40% of the deployed needs for net-zero technologies is expected to originate from EU-based generation by 2030. Given that EU-based generation is unlikely to reduce costs below current import prices in the medium term, this report assumes stable cost evolution between 2025 and 2030.
- To estimate investment needs for the EU **hydropower sector**, which is mainly refurbishment until 2030, 2025 cost estimations from the latest European Commission's Clean Energy Technology Observatory were used (Quaranta *et al.*, 2025) the European Commission established the Clean Energy Technology Observatory (CETO). As hydropower is a rather mature technology, this report assumes stable cost evolution between 2025 and 2030.
- For **marine and nuclear energy**, cost estimations from the World Energy Outlook's stated policies scenario (STEPS)[3] was used (International Energy Agency, 2025). This projection reflects the direction that the energy system is taking, based on existing policy implementation. The scenario projects a 27% decline in marine energy infrastructure costs between 2025 and 2030. For nuclear energy, it assumes that the construction cost of new plants will slightly decrease by 11% over the same period, while the cost of extending the lifetime of existing nuclear plants is assumed to remain stable.
- To estimate the cost of scaling up **biomethane** production to 35 billion cubic meters as targeted by the REPowerEU plan (European Commission, 2022), this report relies on projections from the Danish Energy Agency's forecast of a 10% cost reduction for biogas production plants and a 20% decrease for biogas upgrading facilities by 2030 (Energistyrelsen, 2026).

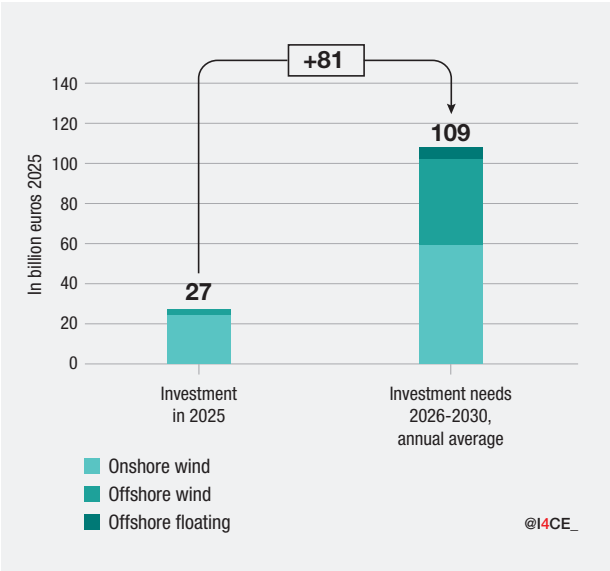
3 The most recent two editions of the State of Europe's Climate Investment Report have used the World Energy Outlook's Announced Pledges Scenario (APS). However, this scenario was not included in the 2025 edition of the World Energy Outlook, in the anticipation of an assessment of the new round of nationally determined contribution (NDCs) (IEA, 2025a).

Focus on wind energy: investment in wind energy is on the rise but remains well below the levels needed

Investment in onshore and offshore wind reached 27 billion euros in 2025, representing a 16% increase compared with 2024. After two consecutive years of contraction, wind power investment is showing a modest recovery, driven by a 18% increase in onshore investment (+4 billion euros), while offshore investment recorded only a marginal growth, of 4%. Various factors have been identified to explain this deployment shortfall. On the one hand, slow grid development and limited grid capacity are slowing down project development (Ember, 2026). On the other hand, persistent delays in permitting processes across EU Member States, combined with slower-than-expected growth in electricity demand (WindEurope, 2026) are further slowing investment and new capacity grid connection (see **section 2**).

Although the return to growth in the wind power sector is positive, this development must be viewed in the context of the remaining gap relative to sectoral needs. 109 billion euros of investment will be required in wind power through to 2030 to meet the EU targets. As 27 billion euros were invested in 2025, this implies a wind power investment deficit of 81 billion euros in 2025 (see **Figure 7**).

FIGURE 7. 81 BILLION EUROS OF ADDITIONAL ANNUAL INVESTMENT WILL BE NEEDED BETWEEN 2026 AND 2030 TO SUPPORT THE DEVELOPMENT OF ONSHORE, AND OFFSHORE SHALLOW AND FLOATING WIND PROJECTS



Source: I4CE based on Eurostat (2026a), 4C Offshore (2026), and European Commission (2024a). All data are in 2025 euros. Current investment in wind power is estimated at 27 billion euros in 2025. The annual average investment needed to meet the EU's climate objectives is estimated at 109 billion euros between 2026 and 2030. The difference between these two levels of investment corresponds to the climate investment deficit, estimated at 81 billion euros.

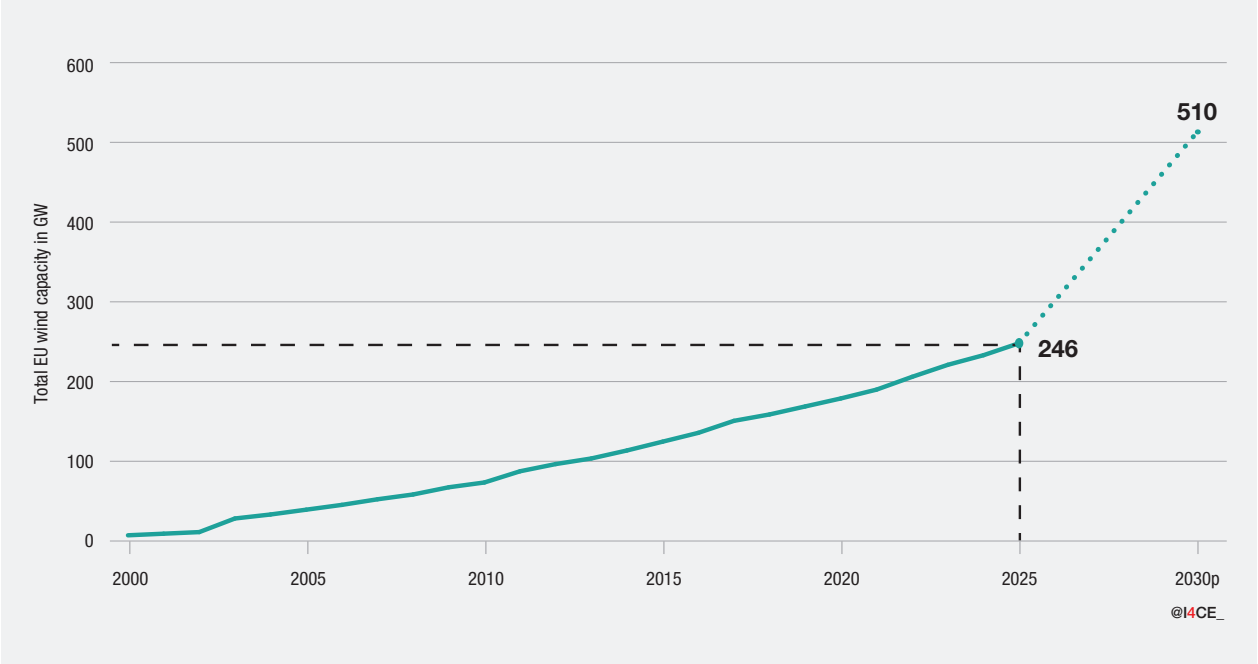
The European Commission, under the REPowerEU plan (European Commission, 2022) and the European Wind Power Action Plan (European Commission, 2023a), is targeting a total installed wind capacity of 510 GW[4] by 2030. This implies more than a doubling of current installed capacity, which currently stands at 246 GW (see **Figure 8**). Achieving this target requires an average of 53 GW of new capacity installations every year until 2030, compared to only 15 GW installed in 2025. From an investment perspective, this implies a nearly fourfold increase in current annual investment levels. However, as WindEurope expects an average yearly installation of 22 GW between 2026 and 2030 (WindEurope, 2026), it remains highly unlikely that the 2030 target will be achieved.

In addition to new capacity installation, a second structural constraint will be emerging by 2030: the need to replace onshore turbines reaching the end of their operation lifetime. Onshore wind turbines have a lifetime of around 25 years (IRENA, 2024), and their installation began to take off around the 2000s. Based on WindEurope estimations (2026), a yearly average of 3 GW of capacity will have to be repowered between 2026 and 2030, which this report estimates to represent an average investment need of 4 billion euros per year.

Compared with onshore wind, the offshore wind sector shows the more significant delay relative to targets. Under the Trans-European Networks for Energy (TEN-E) framework (European Parliament and the Council of the EU, 2022), Member States have agreed to deploy 111 GW of offshore wind capacity out of the overall 510 GW target. Based on current project pipelines in the EU, an estimated 4 GW of this total is expected to come from floating offshore wind (4C Offshore, 2026), while the remainder will be fixed-bottom offshore. To meet this target, offshore capacity, currently standing at 21.6 GW, would need to increase more than fivefold. Given that offshore projects take longer to develop than onshore projects (Agence de l'Environnement et de la Maîtrise de l'Énergie *et al.*, 2017), WindEurope is already projecting that around only 40 GW of offshore capacity will be installed by 2030 (WindEurope, 2026), far from the initially committed 111 GW target.

4 This REPowerEU target, set in 2022, is tied to a 45% renewable energy target in the EU's Renewable Energy Directive (RED) III, which was under discussion at that time. However, the RED III directive set a lower legally binding minimum target, of 42.5%. In this new context, no other projections from the European Commission were made. This research therefore keeps the 510 GW target as a 2030 objective, but has undertaken a sensitivity analysis based on Wind Europe's own calculations (see **Box 2**).

FIGURE 8. TO MEET THE EU 2030 WIND POWER TARGET OF 510 GW, INSTALLED CAPACITY WILL NEED TO MORE THAN DOUBLE BETWEEN 2025 AND 2030



Source: I4CE based on Eurostat (2026a), the REPowerEU plan (European Commission, 2022), Wind Europe (2026), and EU wind energy action plan (European Commission, 2023a). This graph represents total wind power installed capacity in GW. In 2025, the total wind power installed capacities reached 246 GW in the EU. By 2030, a total capacity of 510 GW is targeted by the REPowerEU plan, including 111 GW of offshore wind (of which 4 GW will be floating (4C Offshore, 2026) with the rest coming from onshore installations. The data between 2025 and 2030 have been projected on a linear basis.

BOX 2. 510 OR 425 GW BY 2030? DEBATES OVER THE EU-WIDE INSTALLED WIND CAPACITY TARGET

This report estimates the investment needs in the wind power sector based on the REPowerEU plan, which set a target of 510 GW of installed wind power capacity by 2030. The European Commission based this estimate on a 45% renewable energy target, as proposed in the REPowerEU plan in 2022.

However, the 2023 Renewable Energy Directive (European Parliament and Council of the European Union, 2023a) ultimately sets a binding target of 42.5%, which would likely imply a downward revision of the corresponding wind power capacity target. In addition, the 510 GW estimate was based on capacity factor assumptions that are not widely agreed upon in the industry.

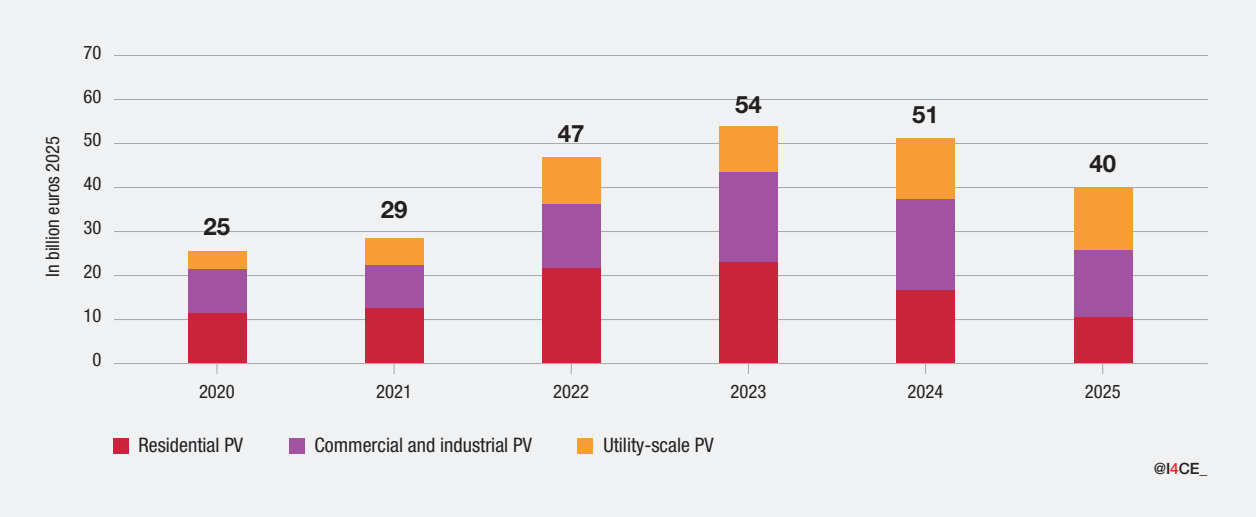
To address these two issues, WindEurope developed an alternative methodology to estimate the 2030 wind power target, taking into account the revised renewable energy share and differing capacity factor assumptions. According to its approach, approximately 425 GW of installed capacity would be required by 2030 to reach 42.5% of renewable energy (WindEurope, 2025).

Based on a 425 GW scenario, the 2026-2030 investment needs for wind power would be reduced from 109 billion euros to 84 billion euros. The investment gap would thus also be reduced from 81 billion euros to 57 billion euros.

Focus on solar power: the solar PV sector still shows an investment surplus in 2025, but a much smaller one than in 2024

After reaching its peak in 2023, investment in the solar PV sector declined for the second consecutive year in 2025, down by 22% to 40 billion euros (see **Figure 9**). This 2023-2025 downward trend is driven by significant declines in two segments: residential PV (-55%) and commercial and industrial PV (-35%). The overall decline in solar power investment is driven by two main factors. First, annual capacity additions decreased by 7 GW in 2025, marking the first annual contraction in installations since 2020. Second, the growing portion of utility-scale PV in total new installations has reduced the average cost per GW installed, as this segment benefits from stronger economies of scale than the other PV segments.

FIGURE 9. AFTER REACHING A PEAK IN 2023, TOTAL INVESTMENT IN SOLAR PV CAPACITY HAS DECREASED IN 2024 AND 2025 TO 40 BILLION EUROS, DUE TO REDUCED INVESTMENT IN THE RESIDENTIAL AND INDUSTRIAL & COMMERCIAL PV SEGMENTS

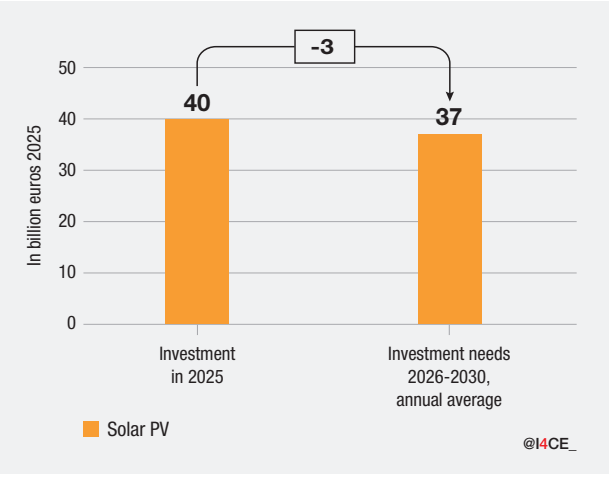


Notes: I4CE. All data are in 2025 euros. The graph represents climate investment in the three solar PV segments between 2020 and 2025 in the EU.

The 2022 surge in electricity and gas prices triggered a strong wave of investment in households' and companies' own PV capacity in 2022 and 2023. However, following the phase-out of public support schemes in several Member States and as the urgency created by the 2022 energy crisis faded, demand for residential and commercial and industrial PV declined significantly in 2024 and 2025 (SolarPower Europe, 2025a). By contrast, investment in utility-scale PV continued to grow over the period, reaching 14 billion euros in 2025. This segment accounted for only 19% of total PV investment in 2023, compared with 36% of the 40 billion euros invested in 2025.

However, for now, the 2025 solar power investment level is still above that required to reach the EU's 2030 target. Between 2026 and 2030, 37 billion euros will need to be invested annually in solar PV to achieve the 592 GW target by 2030 (see **Figure 10**). As 40 billion euros were invested in 2025, this results in an investment surplus of 3 billion euros.

FIGURE 10. ACHIEVING EU CLIMATE TARGETS IN SOLAR POWER WILL REQUIRE 37 BILLION EUROS PER YEAR ON AVERAGE BETWEEN 2026 AND 2030, LEAVING A 3 BILLION EUROS INVESTMENT SURPLUS IN 2025



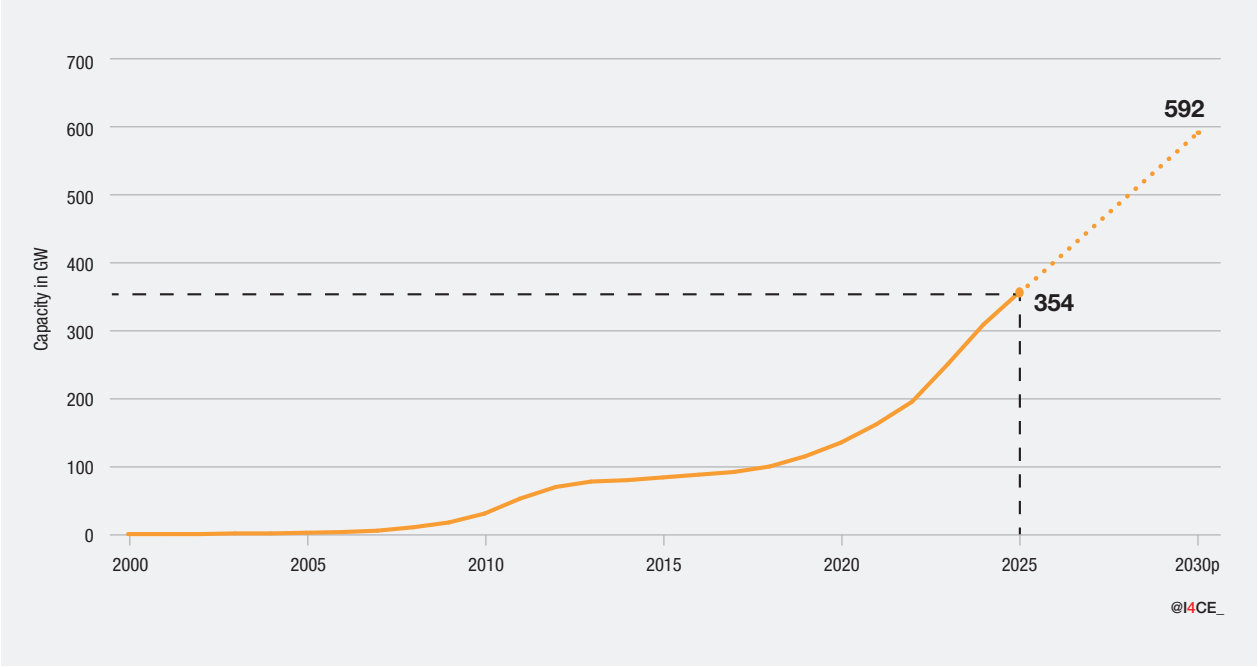
Source: I4CE based on Eurostat (2026a), SolarPower Europe (2025), IEA (2025), and European Commission (2024a). All data are in 2025 euros. Investment in solar PV in 2025 is estimated at 40 billion euros. Based on fleet projection favouring utility-scale PV deployment, the annual average investment required to meet the EU's climate objectives is estimated at 37 billion euros between 2026 and 2030. The difference between these two levels of investment corresponds to the climate investment surplus, estimated at 3 billion euros in 2025.

Under the REPowerEU plan (European Commission, 2022), the European Commission set a target of 320[5] GW of solar PV capacity to be made available to the grid by 2025 and 592[6] GW by 2030. The first 2025 milestone was achieved on time, with total installed capacity reaching 354 GW by the end of the year (see **Figure 11**). To reach the 2030 target, 47 GW of new capacity will need to be installed every year between 2026 and 2030, a volume in line with the 51 GW installed in 2025.

Unlike wind power, the need for solar panels to be replaced remains limited until 2035. Solar panels have a lifetime of around 25 years (IRENA, 2024), and their deployment began only in the early 2010s (Eurostat, 2026a). The analysis estimates that 180 million euros on average per year will be required for solar panel refurbishment between 2026 and 2030.

While this investment surplus suggests that the sector is on track to meet its 2030 target, the margin remains narrow. Investment could quickly turn into a deficit if it continues to decline at the pace observed between 2024 and 2025. Moreover, as SolarPower Europe expects further declines in installed capacity in 2026 and 2027 (SolarPower Europe, 2025a), achieving the 2030 target should not be taken for granted.

FIGURE 11. THE SOLAR PV SECTOR REACHED ITS 2025 TARGET OF 320 GW OF INSTALLED CAPACITY TARGET ON TIME AND IS ON TRACK TO MEET THE EU'S 2030 OBJECTIVE OF 592 GW



Source: I4CE based on Eurostat (2026), European Commission (2022), and SolarPower Europe (2025a). This graph represents total solar PV installed capacity in GW. In 2025, the total solar power installed capacity was 354 GW. According to REPowerEU, 592 GW need to be installed by 2030. The data between 2025 and 2030 have been projected on a linear basis.

5 320 GW in alternating current (AC), equivalent to around 405 GW in direct current (DC).
6 592 GW in AC, equivalent to around 750 GW in DC.

2. ELECTRICITY GRIDS AND BATTERY STORAGE: ADDITIONAL INVESTMENT REQUIRED TO INTEGRATE NEW RENEWABLE ENERGY CAPACITY AND SUPPORT INCREASED ELECTRIFICATION

Abstract: In the context of a significant increase in the share of decarbonised electricity in the EU and rising electricity demand driven by end-use electrification, improved grid flexibility will be essential to balance supply and demand in real time. Efficient electricity management and storage will therefore play a key role.

Key findings

- **Investment in electricity grids, while growing by 10% annually on average between 2020 and 2023, has since been stagnating at 64 billion euros**. This level of investment remains insufficient to meet the EU investment needs by 2030 estimated at 82 billion euros annually on average every year until 2030.
- **As renewable electricity generation expands across the EU, as well as the electrification of end-use, investment in electricity grids must increase rapidly to ensure that supply can meet demand**. Regulatory levers will also need to be mobilised across Member States, particularly to accelerate the permitting of new grid infrastructures.
- **Battery storage investment levels increased rapidly between 2020 and 2023, at an average yearly rate of 111%. In 2025, investment reached 17 billion euros – a 20% year-on-year increase**. As average investment needs in the sector are estimated at 16 billion euros per year over the period 2026-2030, the sector is, for the first time since 2020, in a slight investment surplus of around 1 billion euros.

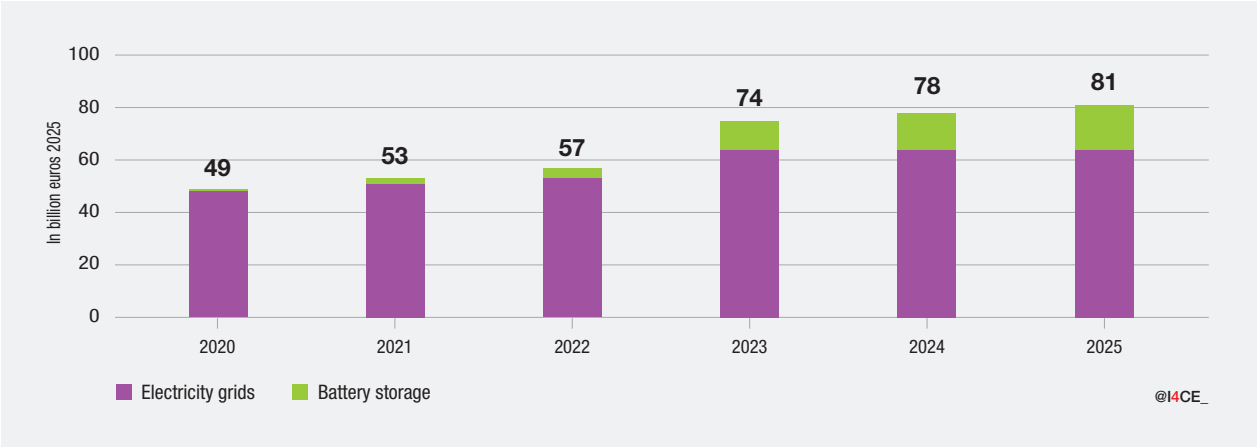
Grid investment has been stagnant for three years, while battery storage investment is experiencing a significant surge

This report estimates that investment in 2025 in electricity grids and battery storage reached 81 billion euros, a 4% increase compared to 2024 (see **Figure 12**). This continued growth reflects a longer-term upward trend since 2020, but masks two diverging dynamics between electricity grids and battery storage.

After recording strong average annual growth of 111% between 2020 and 2023, investment in battery storage increased by 37% and 20% in 2024 and 2025 respectively, reaching 17 billion euros. This slowdown in investment growth is mainly explained by the increasing share of utility-scale battery storage systems in total installations, which entails lower costs per unit of capacity than other battery segments. At the same time, investment in small-scale residential batteries declined following the scaling back of certain emergency public support measures introduced by several EU Member States during the 2022 energy price crisis (SolarPower Europe, 2026a).

Investment in electricity grids grew by around 10% on average per year over the period 2020-2023 and has since stagnated at approximately 64 billion euros. This figure, estimated on the basis of the European Investment Bank (EIB, 2026) and the IEA (2024b, 2025c), reflects three types of grid investment in EU transmission and distribution systems: replacement of ageing grids as 40% of the EU distribution grids are over 40 years old (European Commission, 2023b); adaptation to rising electricity demand driven by electrification; and integration of new renewable capacity into the grid.

FIGURE 12. WHILE INVESTMENT IN BATTERY STORAGE HAS SIGNIFICANTLY ACCELERATED SINCE 2020, REACHING 17 BILLION EUROS IN 2025, INVESTMENT IN ELECTRICITY GRIDS HAS BEEN STAGNATING SINCE 2023, AT 64 BILLION EUROS A YEAR



Source: I4CE based on IEA (2025b), and European Investment Bank (2026). All data are in 2025 euros.

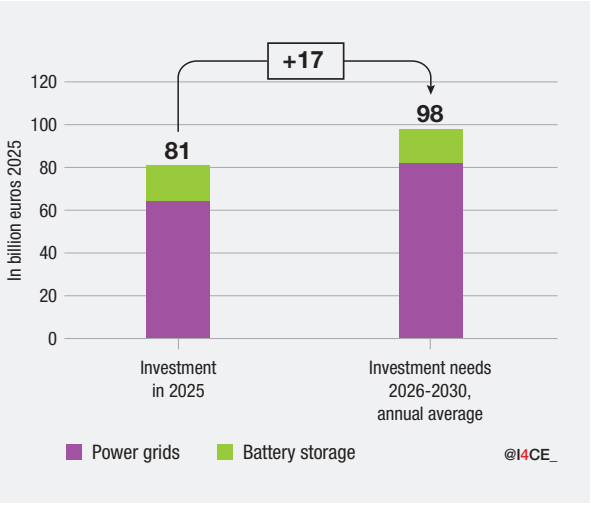
The investment deficit in electricity grids and storage still stands at 17 billion euros, even though such investment is essential to support the deployment of renewable energy and to meet electrification needs

Between 2026 and 2030, the European Commission estimates that 82 billion euros will need to be invested on average every year in EU electricity transmission and distribution networks (European Commission *et al.*, 2025). Given that 64 billion euros were invested in 2025, this report estimates a 17 billion euros investment deficit in the electricity grid sector (see **Figure 13**).

This investment deficit is partially offset by the investment surplus in battery storage of 1 billion euros. According to the ENTSOE's latest estimation (ENTSOE, 2025), 110 GWh of battery storage capacity will need to be installed in the EU market by 2028, and 280 GWh by 2030. This includes all three battery storage segments: residential, commercial & industrial, and utility scale. Using the latest segmented investment cost estimation from the National Laboratory of the Rockies (NLR, 2024), **this report estimates that 16 billion euros of investment will be needed on average every year over the period 2026-2030 to increase the EU's battery storage capacity**.

This level of investment needs, above the 17 billion euros invested in 2025, does not imply that the current pace of deployment should slow down. The surplus is the result of several factors: declining cost assumptions over the decade[7], an increasing share of utility-scale battery storage in future deployments[8], and an installation trajectory currently aligned with projected capacity needs[9].

FIGURE 13. 98 BILLION EUROS ARE NEEDED EVERY YEAR BETWEEN 2026 AND 2030 TO SUPPORT GRIDS EXTENSION AND MAINTENANCE, AS WELL AS BATTERY STORAGE DEPLOYMENT



Source: I4CE based on Solar Power Europe (SolarPower Europe, 2025b, 2026b), and the NLR (National Laboratory of the Rockies, 2024). All data are in 2025 euros.

7 The NLR's medium assumptions expect the CAPEX to decrease by 16% to 18% between 2025 and 2030, depending on the battery storage segment (NLR, 2024).

8 While the utility-scale segment represented 26% of the total EU fleet in 2024, Solar Power Europe (2026b) expects that the share of this segment within the EU fleet will more than double and reach close to 60% in 2029.

9 To reach the 2028 and 2030 target, 12 GWh of capacity must be installed every year between 2026 and 2028, and 80.7 GWh in 2029 and 2030. The 27 GWh installed in 2025, while above the rate required for the 2028 target, represents a head-start on a pace that will need to increase drastically in 2029 and 2030.

3. BUILDING ENERGY RENOVATION AND THE DEPLOYMENT OF MORE EFFICIENT HEATING SYSTEMS: ACCELERATE INVESTMENT TO COPE WITH RISING ENERGY PRICES

Key findings

- **Following the post-Covid period of increased investment, the downward trend in energy renovation activities and heat pump deployment is persisting**. In 2025, combined investment reached 112 billion euros, which represents a 2% decrease compared to 2024. The decline is mainly driven by a continued contraction in renovation activity in both the residential and non-residential sectors since 2022. The 11% investment growth in heat pump deployment (+3 billion euros) is not enough to offset this negative trend.
- **Achieving the EU's 2030 renovation and heat pump deployment objectives will require at least 276 billion euros per year between 2026 and 2030. Compared to 2025 investment levels, 164 billion euros is still missing**, around 78% of which comes from building renovation sector. Investment in heat pump investment alone falls short by 36 billion, meaning that annual investment will need to more than double to reach the EU target of 50 million installed units by 2030.
- **Deep renovations offer the most cost-effective pathway to reducing primary energy consumption in buildings. Achieving the same energy savings through medium-depth renovations alone would increase total investments needs by around 50%.** Yet, the high upfront costs of deep renovations remain a major barrier for households and businesses, highlighting the need for targeted EU and national support schemes to accelerate their deployment.
- **The current increase in fossil-fuel prices could represent an opportunity for public policy to support the acceleration of heat pump deployment**. In the first three months of 2026, heat pumps sales had already increased by 25% in France, Germany and Poland combined, compared to the same period last year. The EU Electrification Action Plan, expected during the summer 2026, could make a targeted contribution to supporting their deployment.

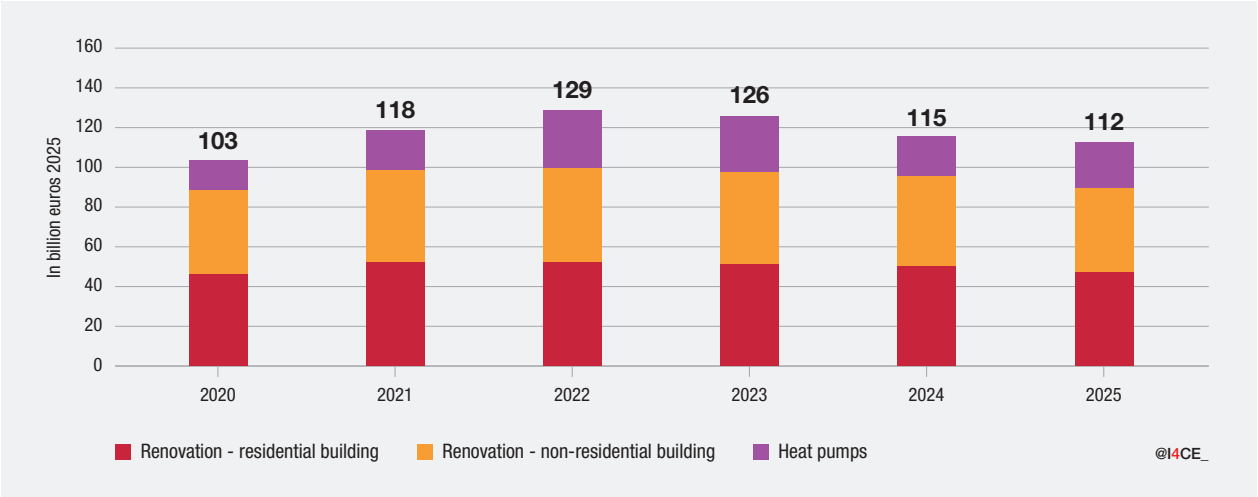
Declining investment in building energy renovation is driven by a reduction in public support for renovation and the transition to new heating systems

The decline in energy renovation and heat pump deployment investment, which began in 2023, continued in 2025. This report estimates that investment reached 112 billion euros, a 2% decrease compared to 2024, after contracting by 9% in 2024 and 2% in 2023 (see **Figure 14**).

This overall decline is driven by falling investment in the renovation of both residential and non-residential buildings. After rising in the post-Covid period up to 2022, investment in the energy renovation of buildings has trended downward, falling by a further 5% in 2025, to reach 89 billion euros. One of the factors that may have contributed to this trend is the reduction, or in some cases the phase-out, of certain public support schemes, especially in the residential sector. In Italy, for example, the downward adjustment of tax incentives under the **Superbonus** programme explains a large part of the 30% decrease in housing renovation activity in the country (FIEC, 2026).

In contrast, after two years of decline, investment in heat pump deployment recovered in 2025. It reached 23 billion euros, representing a 11% increase compared to 2024. This rebound follows two contrasting phases for the sector. Between 2020 and 2022, rising gas prices relative to electricity prices significantly improved the competitiveness of heat pumps over fossil-fuel

FIGURE 14. AFTER PEAKING IN 2022, INVESTMENT IN THE RENOVATION OF RESIDENTIAL AND NON-RESIDENTIAL BUILDINGS AND THE DEPLOYMENT OF HEAT PUMPS FELL BY 2% IN 2025 COMPARED TO 2024, REACHING 112 BILLION EUROS



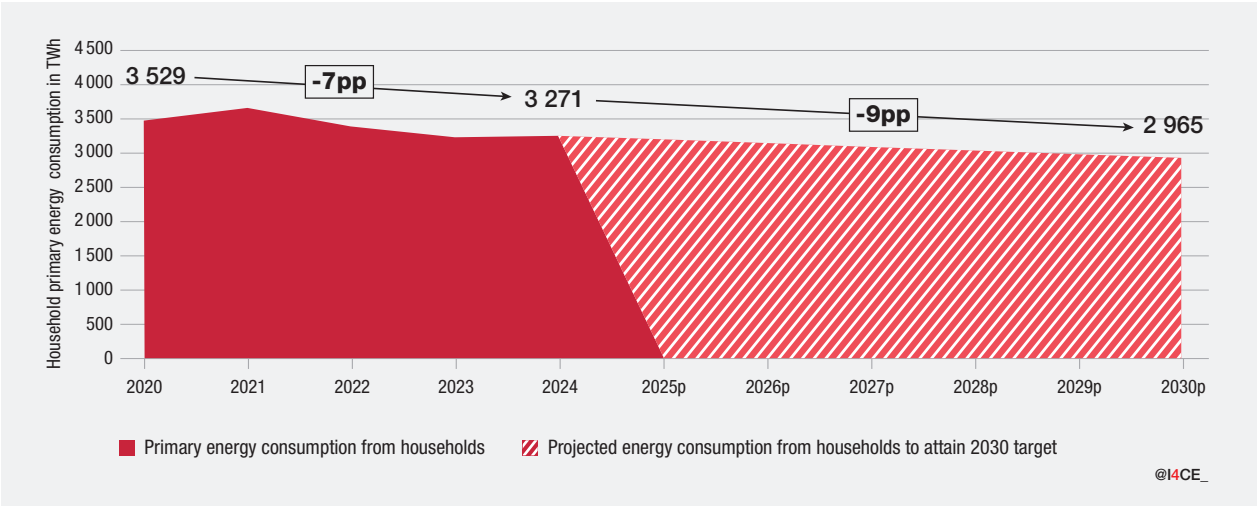
Notes: I4CE. All data are in 2025 euros. The graph represents climate investment in building energy renovation and the deployment of heat pumps between 2020 and 2025.

heating systems (EHPA, 2025b). This led to a doubling of investment over the period. This momentum then reversed in 2023 and 2024, with investment falling by 3% and 27%, respectively. This decline was driven by higher electricity prices, a slowdown in building construction activities, and persistent inflation, all of which weighed on demand for heat pumps (EHPA, 2025c). Additionally, uncertainty around regulatory frameworks and public support schemes delayed investment decisions by households (EHPA, 2025c). At the EU level, the delay in publishing the EU Heat Pump Action Plan, initially scheduled by the European Commission in 2023 and ultimately dropped in 2025, also sent negative signals to investors.

While the 2025 recovery in heat pump investment is encouraging, it remains modest and still well below the 2022 peak of 29 billion euros. Early signs for 2026 suggest a more favourable outlook. The recent increase in fossil-fuel prices, linked to the ongoing geopolitical tensions in the Middle East, could make the purchase of heat pumps more financially attractive for households and support higher deployment. In the first three months of 2026, heat pump sales had already increased by 25% in France, Germany and Poland combined, (EHPA, 2026a). Together, these countries accounted for 37% of total EU investment in heat pumps in 2025.

Massive investment needs to meet building energy consumption targets by 2030

FIGURE 15. CURRENT AND TARGETED PRIMARY ENERGY CONSUMPTION IN THE RESIDENTIAL SECTOR

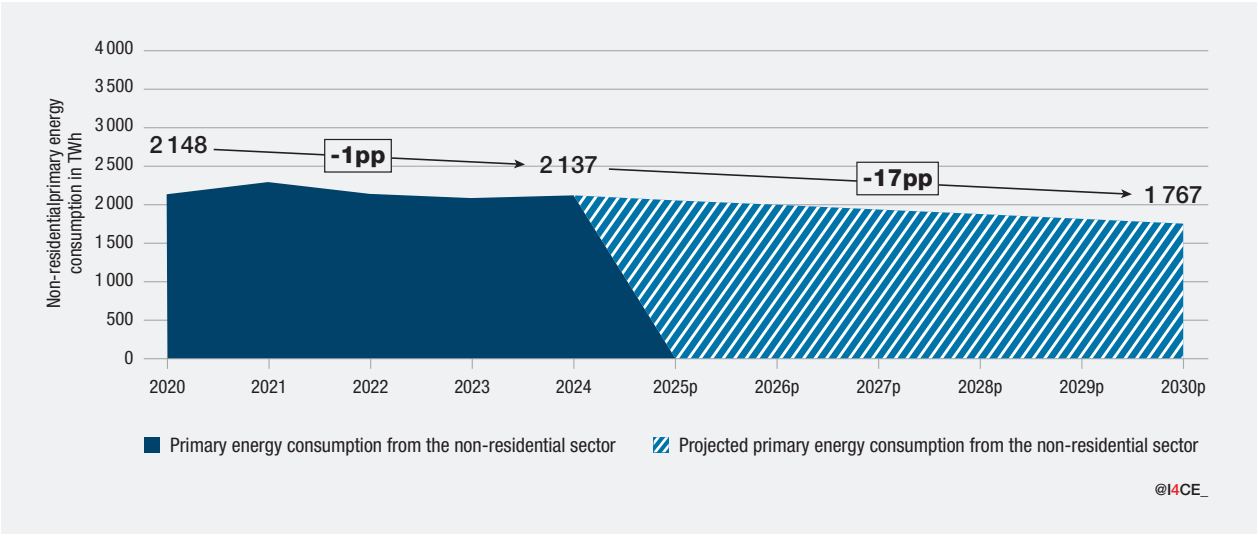


Notes: I4CE based on Eurostat (Eurostat, 2026h, 2026i) and the EPBD. By 2030, primary energy consumption in the residential sector should be reduced by 9 percentage points in comparison to 2024.

The EU remains far from achieving its 2030 targets for both renovation activity and heat pump deployment. On energy renovation in the residential sector, the Energy Performance of Buildings Directive (EPBD) 2024 revision (European Parliament et Council of the European Union, 2024) targets a reduction in average primary energy use across residential buildings by at least 16% in 2030 compared to 2020 (see **Figure 15**). Of this reduction, 55% should be coming from the 43% worst-performing buildings. This implies primary energy savings of around by 2030 compared to 2020 (see **Figure 16**).

565 TWh, of which we estimate that 40% will come from heat pumps. The remainder will come from building envelope insulation measures and the replacement or upgrading of other heating systems. **In the non-residential sector**, the EPBD also foresees a 16% renovation of the worst-performing buildings by 2030, based on their energy performance. The analysis in this report estimates that this would imply around 381 TWh of primary energy saved

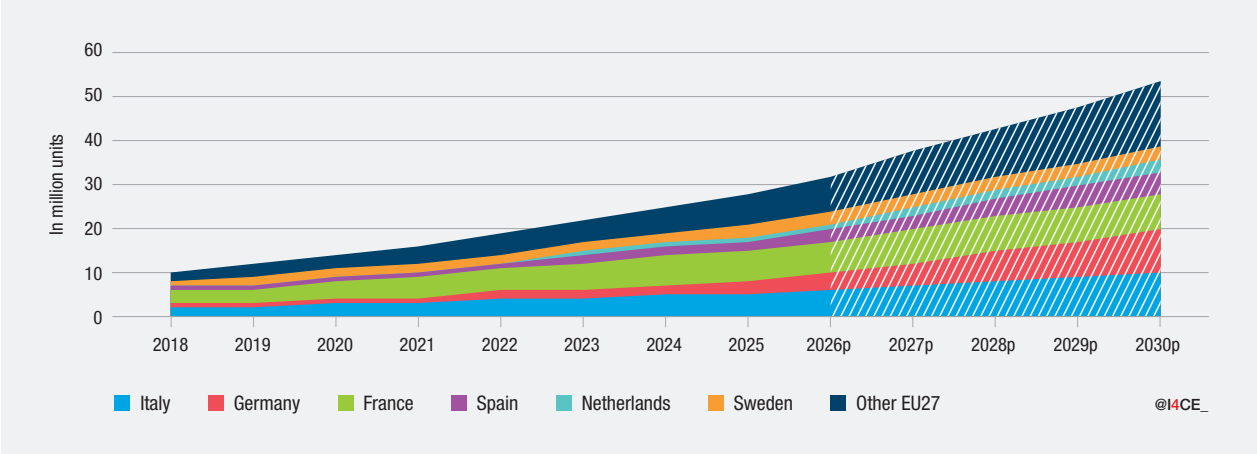
FIGURE 16. CURRENT AND TARGETED PRIMARY ENERGY CONSUMPTION IN THE NON-RESIDENTIAL SECTOR



Notes: I4CE based on Eurostat (Eurostat, 2026h, 2026i) and the EPBD. By 2030, primary energy consumption in the non-residential sector should be reduced by 17 percentage points in comparison to 2024.

On heat pump deployment, the REPowerEU Action Plan (European Commission, 2022) and the Green Deal Industrial Plan (European Commission, 2023c) foresees the installation of 30 million heat pumps by 2030 compared to 2020. Under this scenario, the total heat pump stock would reach around 54 million units in 2030, doubling the current stock of 27 million units (see **Figure 17**). In 2030, Italy is expected to have the largest stock, representing 19% of the 54 million units, followed by Germany (18%), and France (15%). In 2025, it is France that had the largest stock in the EU, estimated at around 7 million units.

FIGURE 17. THE EU HEAT PUMP STOCK IS EXPECTED TO REACH 54 MILLION UNITS IN 2030, FIVE TIMES MORE THAN IN 2020



Source: I4CE. Stock is defined as accumulated sales. This graph represents the evolution of the total stock of heat pumps in the EU until 2030. In 2025, the EU stock of heat pumps reached 27 million. The EU expects the installation of 27 million additional units in existing buildings by 2030, compared to 2020, and 10 million units in new buildings. 2020-2025 historical data is based on EHPA market reports (EHPA, 2025a, 2026a) and the IEA (IEA, 2021b). Data from 2026 to 2030 is a linear projection.

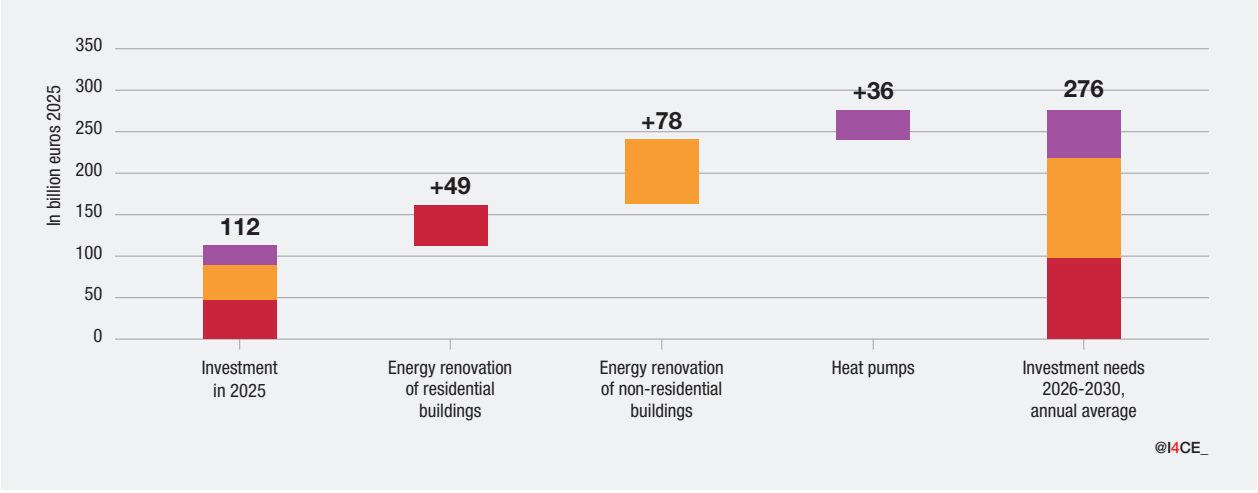
Based on these three targets, this report estimates climate investment needs for building renovation and heat pump deployment at 276 billion euros per year between 2026 and 2030. Given the 112 billion euros invested in 2025, this implies an annual investment gap of 164 billion euros. Of this gap, 78% (or 127 billion euros) comes from energy renovation activities (see **Figure 18**).

To meet the needs, investment in the energy renovation of residential and non-residential buildings would need to more than double. This investment need estimate should be considered a minimum, as it is based on deep renovation costs only. While deep renovations require higher upfront investment, they deliver lower costs per unit of energy saved than medium or light renovations (see **Box 3**). This analysis estimates that using only medium renovation to attain the renovation target in the residential sector would increase the 97 billion euros needed by 50%. In the coming years, expanding public policy support at both EU and national levels will be essential to improve the affordability of home renovation for households, for example through dedicated financing instruments such as the EU Renovation Loan (Climate Strategy & Partners, 2022).

To achieve the target of 30 million heat pumps installed between 2020 and 2030, annual investment needs to increase from 23 billion euros today to 59 billion euros. While the energy crisis could increase the demand for heat pumps in 2026, supportive policies within Member States and the EU institutions will be key to accelerate deployment. In this regard, the role of heat pumps in the announced EU Heating and Cooling Strategy and EU Electrification plan will be decisive to send the right signal businesses and Member States.

Finally, this analysis is subject to important data limitations regarding energy renovation activity at the EU level. Monitoring practices and reporting requirements vary among Member States, and much of the available EU-level data on renovation costs remains relatively outdated (DG forEnergy *et al.*, 2019). As a result, the investment figures presented in this section should be interpreted as estimates, primarily based on data from the European Commission report (DG for Energy *et al.*, 2019) and the FIEC (2026). They should therefore be seen as indicative of broad investment trends rather than precise measurements.

FIGURE 18. ACHIEVING THE EBPD TARGET FOR BUILDING RENOVATION WILL REQUIRE 276 BILLION EUROS PER YEAR ON AVERAGE BETWEEN 2026 AND 2030, LEAVING A CLIMATE INVESTMENT DEFICIT OF 164 BILLION EUROS IN 2025, OF WHICH 78% ACCOUNTS FOR ENERGY RENOVATION ACTIVITIES



Source: I4CE. All data are in 2025 euros. This graph represents breaks down the distribution of the climate investment deficit for the building sector by sub-sector. The deficit corresponds to the difference between the annual average investment needed for the EU to reach its climate objective by 2030 and the investment that was made in 2025. For example, for the heat pumps sector, the climate investment deficit of 36 billion euros corresponds to the difference between the average investment needs (59 billion euros) and the 2025 investment (23 billion euros).

BOX 3. DEEP RENOVATION AND MEDIUM RENOVATION DEFINITIONS

- Medium and deep renovations are included in our scope in accordance with the criteria adopted by the European taxonomy.
- According to EPBD Art. 2, an energy renovation is defined as the change of one or more building elements, (i.e. building envelope and technical building systems), having the potential to significantly affect the calculated or measured amount of energy needed to meet the energy demand associated with one or several building services, such as: space heating and cooling, hot water, ventilation, lighting, etc.
- As stated in the EPBD 2024 revision, the concept of deep renovation has not been defined in UE law. In the context of achieving objectives, the Directive provides only the following point: "With a view to achieving the long-term vision for buildings, deep renovation should be defined as renovation that transforms buildings into zero-emission buildings but, as a first step, as a renovation that transforms buildings into nearly zero-energy buildings (NZEBs)" (European Parliament and Council of the European Union, 2024).
- Therefore, the research presented in this report uses the same definition of the different levels of renovation as employed by the European Commission itself (DG for Energy *et al.*, 2019). The extent of a building energy renovation thus corresponds to the primary energy savings achieved through a specific measure or package of measures that have been implemented in a calendar year. Four renovation depths can be identified:
  - below threshold ($x < 3\%$ savings),
  - light renovations ($3\% \leq x \leq 30\%$ savings),
  - medium renovations ($30\% < x \leq 60\%$ savings),
  - deep renovations ($x > 60\%$ savings).
- The different depths do not necessarily need to cover a specific minimum number of measures. They are just classified depending on the savings achieved compared to the primary energy performance level of the building in the calendar year before the energy renovation.

BOX 4. METHODOLOGY ON HEAT PUMP COSTS

The data concerning past and current heat pump investment costs, categorised by type of heat pump, has been derived from the IEA (2021a) and indexed to price levels indices by country.

The estimate of heat pumps investment needs uses the average investment cost of air-water heat pumps in the EU. These investment costs differ between Member States, and are indexed to the harmonised index of consumer prices for heaters in each country (Eurostat, 2026e). Based on IEA data by country (2021a), the average investment cost for an air-water heat pump in the EU has been estimated to be around 10,100 euros in 2025, a 5% reduction in price compared to 2024. It is assumed that this investment cost will remain constant until 2030.

The analysis presented in this report estimates that 42% of sales in 2025 were air-air heat pumps, which have a lower investment cost than air-water heat pumps (at around 6,420 euros in 2025).

4. THE CONSTRUCTION OF ENERGY-EFFICIENT NEW BUILDINGS: INVESTMENT IN LINE WITH THE TRAJECTORY FOR NEW BUILDING CONSTRUCTION IN THE EU

Abstract: Investment in the energy performance of new buildings refers to expenditure on energy-related components in new residential and non-residential constructions.

Key findings

- **In 2025, the downward trend in investment in the energy performance of new buildings observed since 2023 came to a halt, with investment stabilising at 125 billion euros**. This represents a slight increase on the 124 billion euros invested in 2024 but remains well below the 2022 peak of 149 billion euros.
- **The downward trend observed between 2022 and 2024 in the residential sector is mainly driven by a slowdown in residential buildings construction**. Higher interest rates and rising construction costs have significantly increased financing costs for households, leading to a 23% decrease in new building energy performance investment over the period. **The non-residential segment, although less volatile, has also declined since 2022, resulting in a 9% reduction investment over the 2022-2025 period**.
- **Average annual investment needs are estimated at around 85 billion euros over the 2026-2030 period. This implies an apparent investment surplus of 39 billion euros in 2025**. This surplus is mainly driven by an expected slowdown in non-residential construction activity, while investment needs in the residential segment are projected to broadly stabilise through 2030.
- **This apparent surplus** is largely structural and could, in principle, provide the opportunity to **redirect the funds towards other areas facing significant investment gaps** - in particular, towards building renovation, which is one of the most underfunded sectors analysed in this report.
- **The lack of updated and accurate public data continues to limit the assessment of past investment in the energy performance of newly constructed buildings**. The investment figures up to 2025 presented in this section are therefore estimates and should be interpreted with caution. Among all sectors covered in this report, building construction remains the area where access to robust, timely, and open data is the most challenging.

The expected slowdown in new building construction in the EU reduces energy efficiency investment needs for new buildings through 2030

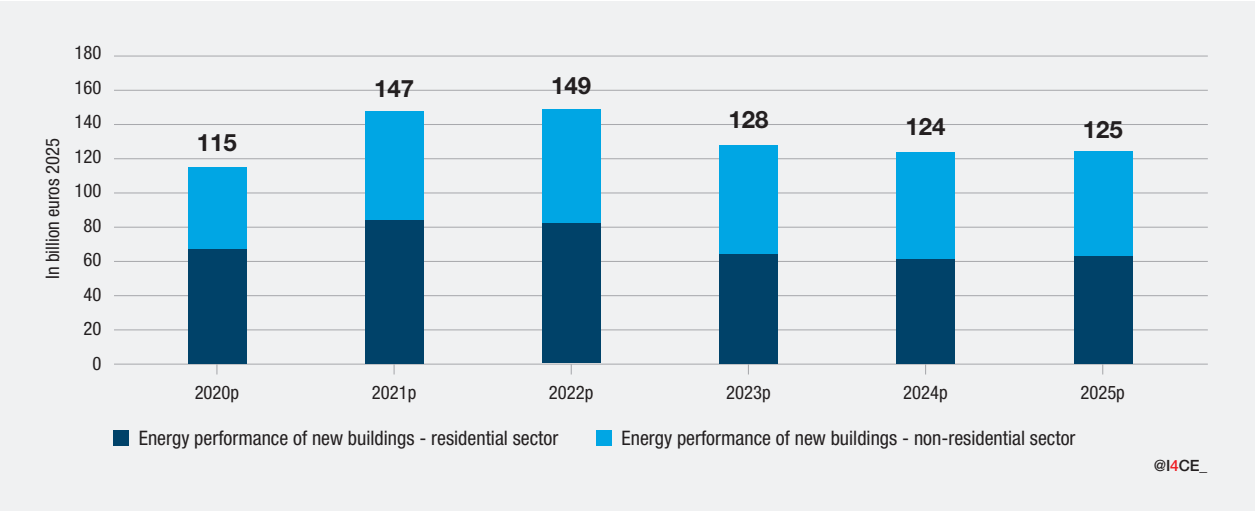
In 2025, the downward trend observed since 2023 came to a halt, with investment stabilising at 125 billion euros. This represents a slight increase on the 124 billion euros invested in 2024 but remains well below the 2022 peak of 149 billion euros.

Investment in the energy performance of new residential buildings alone reached 63 billion euros in 2025. This represents a 3% increase compared to 2024 but remains 23% below the 2022 peak. The decline observed since 2022 mainly reflects the slowdown in residential construction activity across the EU. Between 2021 and 2024, the number of square meters granted building permits fell by 31% (see **Figure 20**). Higher interest rates have been a key driver of this trend, increasing financing costs and limiting households' access to credit (FIEC, 2026). At the same time, construction costs have risen sharply since 2021. In Germany, for instance, construction prices in 2024 were around one-

third higher than at the end of 2021, largely due to higher raw material costs (FIEC, 2026). Early data for 2025 point to a stabilisation in investment volume year-on-year. However, it remains too early to determine whether this marks the end of the downturn in residential construction across the EU.

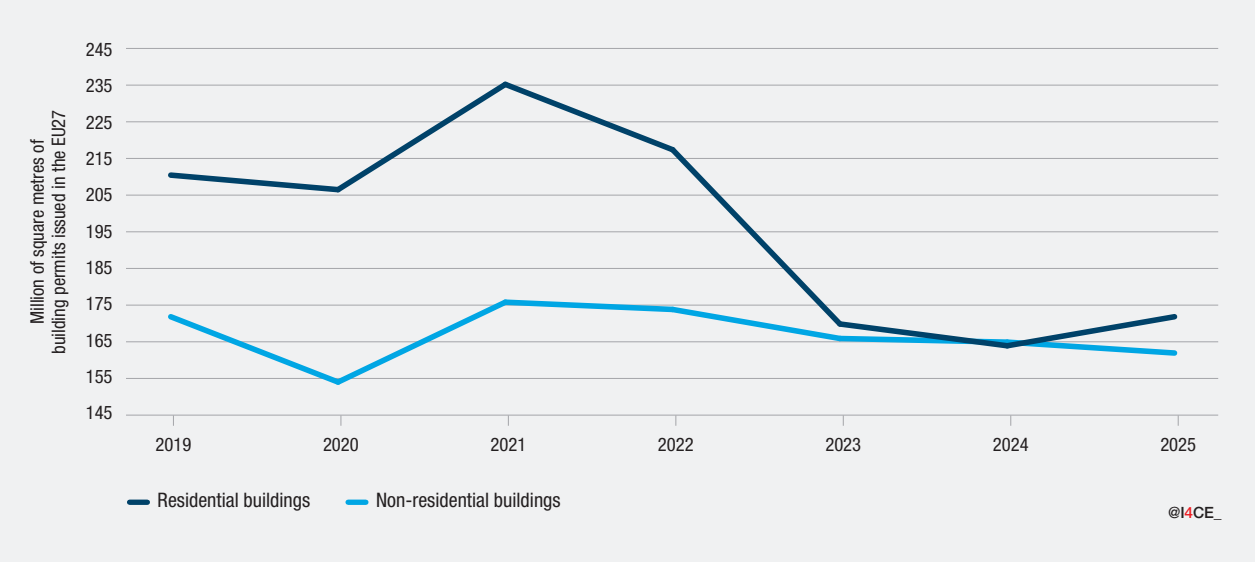
Non-residential new buildings, while less affected than the residential sector, also experienced a gradual decline between 2022 and 2024. Investment in this segment reached 61 billion euros in 2025, representing a 3% decrease compared to 2024, and a 9% decline compared to the 2021 segment peak. This reduction in the construction rate of non-residential buildings can be illustrated by the 8% contraction in the number of square meters granted building permits over the period (see Figure 20).

FIGURE 19. IN 2025, INVESTMENT IN THE PERFORMANCE OF NEW RESIDENTIAL AND NON-RESIDENTIAL BUILDINGS BEGAN TO STAGNATE, FOLLOWING 2 YEARS OF CONTRACTION



Notes: I4CE based on the ECB (European Central Bank, 2026), Eurostat (2026d). All data are in 2025 euros. The graph represents climate investment in the energy performance of newly constructed buildings in the residential and non-residential sectors, between 2020 and 2025.

FIGURE 20. BETWEEN 2022 AND 2024, THE NUMBER OF SQUARE METERS GRANTED BUILDING PERMITS IN THE EU FELL BY 25% AND 5% IN THE RESIDENTIAL AND NON-RESIDENTIAL SEGMENTS, RESPECTIVELY



Source: I4CE based on Eurostat (2026d).

Looking ahead, investment in the energy performance of new buildings is expected to decline significantly, reflecting a slowdown in construction activity. In the Staff Working Document accompanying the European Commission's proposal on the 2040 target (European Commission, 2021a), residential floor area is projected to increase by 21% between 2015 and 2040 compared to 2015. This corresponds to only a 0.6% annual growth of the stock, compared to a 1% averaged growth between 2017 and 2020. For non-residential buildings, total floor area is expected to grow by only 5% between 2015 and 2040. Considering the growth in floor area between 2015 and 2026, it is therefore expected that the stock will reduce by an annual rate of 0.7% between 2026 and 2040.

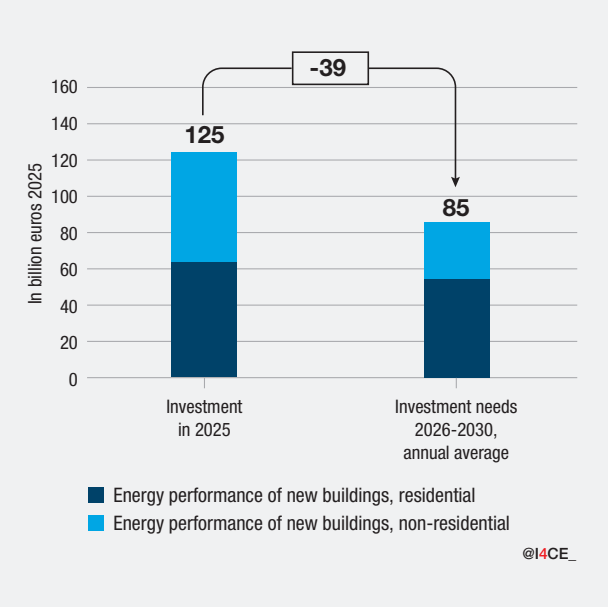
This slowdown in construction rate explains the projected reduction in investment needs for energy performance in buildings between now and 2030. Average annual investment needs are estimated at around 85 billion euros over the 2026-2020 period, implying an apparent investment surplus of 39 billion euros in 2025 (see **Figure 21**). This surplus is primarily driven by the expected slowdown in non-residential construction activity, while investment needs in the residential segment are projected to broadly stabilise until 2030.

Translating a projected decline in the non-residential building stock into an annual construction rate is not straightforward. In the absence of more granular data, this report assumes a 50% reduction in the construction rate of non-residential buildings in the coming years. This assumption is primarily illustrative: it is intended to show that a structural slowdown in new construction would mechanically reduce investment needs in this segment.

This apparent surplus is largely structural and, in principle, could provide the opportunity to redirect the funds towards other areas facing significant investment gaps, particularly building renovation, which remains one of the most underfunded sectors analysed in this report. However, reallocating this surplus across sectors is not straightforward. The transition involves significant sectoral transformations, with different parties involved, and public authorities will need to play an active role in managing and supporting these changes.

Finally, due to the lack of available data, the estimations for the new buildings sector should be treated with caution. For more information, see **Box 5**.

FIGURE 21. THE EXPECTED DECREASE IN NON-RESIDENTIAL NEW BUILDING CONSTRUCTION TOGETHER WITH THE STAGNATION IN RESIDENTIAL BUILDING CONSTRUCTION RESULT IN AN INVESTMENT SURPLUS OF 39 BILLION EUROS IN 2025



Source: I4CE. All data are in 2025 euros. Investment in 2025 in the energy efficiency of new buildings is estimated at 125 billion euros. The annual average investment needed to meet the EU's climate objectives is estimated at 85 billion euros between 2025 and 2030. The difference between these two investment levels corresponds to an investment surplus of 39 billion euros.

BOX 5. UNCERTAINTY IN DETERMINING CURRENT CLIMATE INVESTMENT IN NEW BUILDINGS

The 2024 recast of the 2018 EPBD requires all new buildings to be NZEBs from 2021.

The investment cost for achieving NZEB standards represents the total cost of insulating the new building. It includes insulation costs for the roof, basement, and walls, as well as the cost of double- or triple-glazed windows. It does not include every other non-energy-related construction cost; nor does it include a change of heating system, which is covered in a separate section of the report. These costs vary among the different member states, depending on the cost of labour and raw materials in each country (Cravezero, 2018). No increase in investment cost has been projected over the 2025-2030 period.

Estimations of current and past investment reflect significant uncertainty. The methodology assumes that all new buildings have met NZEB standards since 2021. In 2016, around 21% of new residential buildings in the EU were considered NZEB, compared to 15% in 2012. For non-residential buildings, the equivalent figure was 11% (European Commission DG for Energy *et al.*, 2019). This is a strong assumption, as there is currently no data available on the exact number of new buildings that meet NZEB standards.

5. THE ELECTRIFICATION OF ROAD TRANSPORT: SWITCHING TO ELECTRIC VEHICLES TO KEEP CARS AFFORDABLE FOR HOUSEHOLDS

Key findings

- **After a stagnation in 2024, investment in clean road transport rose to 96 billion euros in 2025, a 23% growth compared to 2024**. A significant portion of this growth can be attributed to Germany, where sales of passenger battery electric vehicle (BEV) grew by 43% in 2025. Early 2026 data confirm this momentum, supported by a rise in public incentives for BEV purchases and the ongoing energy crisis. **Yet, achieving the EU's 2030 transport decarbonisation targets will require at least 198 billion euros of investment per year between 2026 and 2030**.
- **In the meantime, investments in fossil-fuel passenger cars stagnated to 299 billion euros in 2025**. Based on the growth rate observed over the past five years, climate investment in passenger BEVs is not expected to surpass investment in fossil-fuel vehicles until 2030. **To remain in line with existing regulations, these investments should fall to 149 billion euros by 2030**.
- The pace of charging point installation for light duty vehicles (LDVs) has been very strong in recent years, **reaching 7.5 billion euros in 2025, and putting the EU on track to reach its 2030 target for this sector**.
- For several EU Member States, **switching to a BEV is a matter of purchasing power for households, as electric vehicles now cost less over their lifetime than their internal combustion engine (ICE) counterparts**, a phenomenon further reinforced since the 2026 energy crisis.
- To keep cars affordable for households, **it is essential that the EU maintains its current objectives for CO_2 standards for cars and vans, by 2030 and 2035**. Introducing flexibility for alternative vehicle types such as plugin hybrid electric vehicles (PHEVs) or e-fuels would offer no economic or environmental benefit to consumers, while significantly increasing their costs over the vehicle's lifetime.

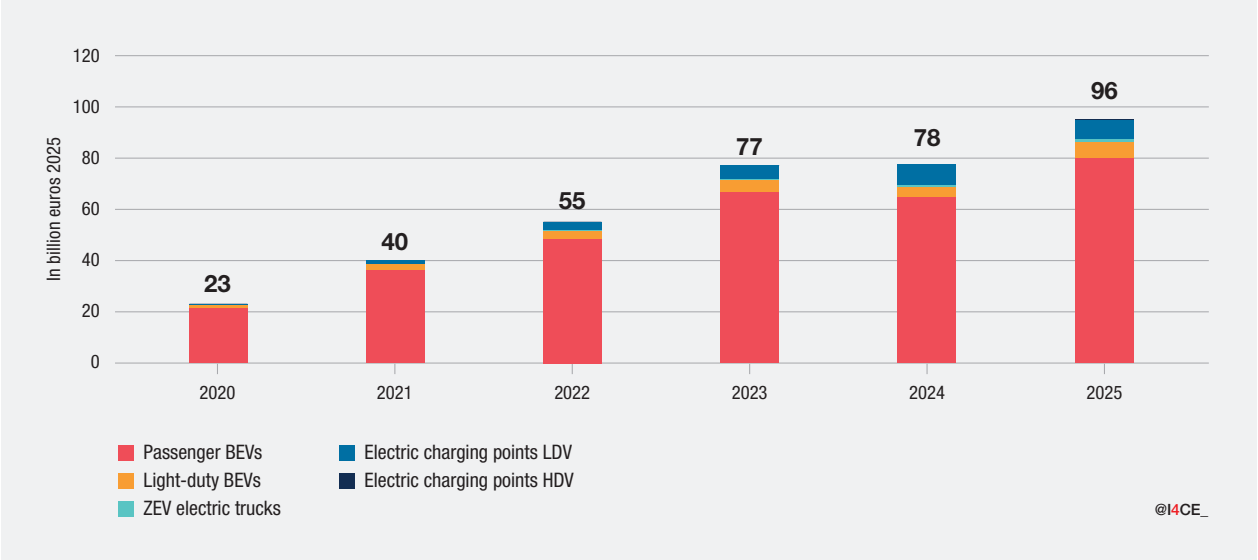
Investment in EVs is on the rise, after a sluggish year

After a stagnation in 2024, investment in clean road transport rose to 96 billion euros in 2025, a 23% growth compared to 2024 (see **Figure 22**). Investment in passenger BEVs, totalling 80 billion euros in 2025, accounts for a significant share of this overall investment. A large portion of this growth can be attributed to Germany, whose passenger BEV sales grew by 43% in 2025 (ACEA, 2026a). However, this growth is largely attributed to a rebound after a muted year in 2024, following the end of the federal government subsidy schemes for BEVs (IEA, 2025b). In terms of BEV market penetration, Denmark presents the highest BEV rate[10] for passenger cars, representing 69% of new car registration in the country, followed by the Netherlands (40%). France and Germany, which have the highest number of electric cars in absolute value, have a BEV rate of only 20% and 19% respectively (ACEA, 2026a). Investment in battery electric vans also showed strong momentum in 2025, growing by 53% compared to 2024. Finally, the deployment of electric charging infrastructure for LDVs has also kept pace, with investment increasing thirteenfold since 2020, to reach 6.4 billion euros in 2025 (see **Figure 22**).

The first quarter of 2026 continues to send positive signals, as battery electric passenger vehicles sales continue to rise (+32%), driven by the 3 largest market Italy (+66%), France (+50%) and Germany (+41%) (ACEA, 2026b). This coincided with recent national purchase schemes supporting car electrification in Germany, France, and Italy and with a sharp rise in crude oil prices following the closure of the Strait of Hormuz and (International Council on Clean Transportation, 2026). If the growth rates observed in the first quarter of 2026 continue, **climate-related investment in the road transport sector could reach 122 billion euros in 2026**.

10 The BEV rate corresponds to the proportion of new BEV registrations among total new vehicle registrations for a given year.

FIGURE 22. AFTER A STAGNATION IN 2024, INVESTMENT IN CLEAN ROAD TRANSPORT ROSE TO 96 BILLION EUROS IN 2025 (+23%)

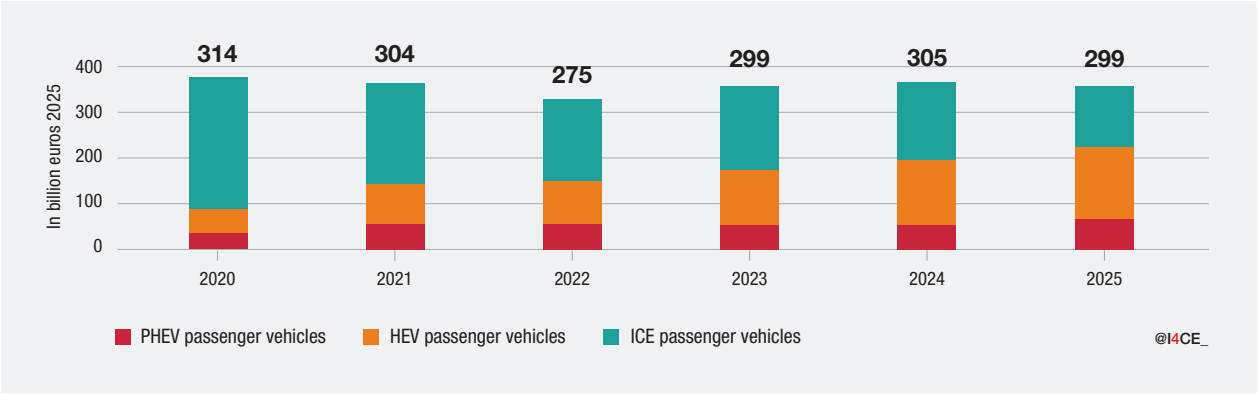


Notes: I4CE based on the European Alternative Fuel Observatory (European Commission, 2026c), T&E (2026c), and (Tsiropoulos *et al.*, 2022). All data are in 2025 euros and represent yearly climate investment in the road transport sector between 2020 and 2025. ZEV is the abbreviation of zero-emission vehicle; LDV is the abbreviation of light-duty vehicle; HDV is the abbreviation of heavy-duty vehicle.

Investment in fossil-fuel vehicles is stagnating, while the crossover point with BEVs is still a long way off

Meanwhile, investment in fossil-fuel passenger cars has been slightly decreasing since 2020, to 299 billion euros in 2025. The large decrease in investment in ICE vehicles (-14% annually between 2020 and 2025) has been compensated by the increase in hybrid electric vehicles (both plugin and non-plugin) over the same period (+22%). This switch from ICEs investments to hybrid electric vehicles investments are partly linked to the EU's tariffs on Chinese EVs which has exacerbated the growth of PHEV imports. Based on the growth rate observed over the past five years, climate investment in electric passenger cars is not expected to surpass investment in ICE vehicles until 2030. **To remain in line with existing regulations, these investments should fall to 149 billion euros by 2030** (see Figure 25).

FIGURE 23. INVESTMENT IN ICE PASSENGER CARS HAS BEEN DECLINING SLIGHTLY SINCE 2020, AS THE DROP IN PETROL AND DIESEL CAR SALES HAS BEEN OFFSET BY THE RISE IN HEV SALES



Notes: I4CE based on ACEA and T&E (2026c). All data are in 2025 euros, and represent yearly climate investment in the road transport sector between 2020 and 2025. PHEV is the abbreviation of plug-in hybrid electric vehicles; HEV is the abbreviation of hybrid electric vehicles; ICE is the abbreviation of internal combustion engine vehicles.

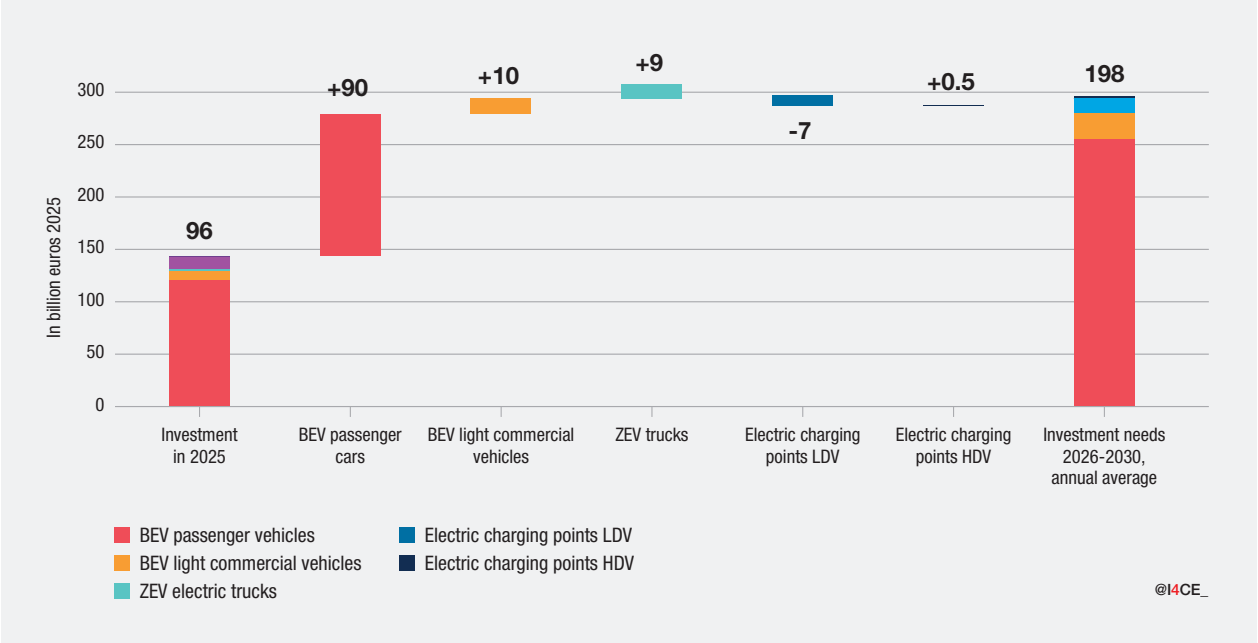
A sector still far from reaching its 2030 climate targets

However, this growth in investment is far from being sufficient to meet the 2030 climate targets on time. Domestic road transport in 2025 accounted for approximately one quarter of the EU's total CO_2 emissions (Eurostat, 2025). By 2050, the EU aims to achieve a 90% reduction in transport related GHG emission (European Commission, 2021c). To support this long-term goal, intermediate sector-specific targets have been set for 2030, especially through its regulation that fix CO_2 emissions standards for new vehicles and through the Alternative Fuel Infrastructure Regulation (AFIR) (European Parliament and Council of the European Union, 2023), which stipulates mandatory deployment of public charging points.

To meet these 2030 targets, this report estimates that around 198 billion euros will need to be invested annually between 2026 and 2030 (see **Figure 24**). In other words, on average, yearly road transport climate investments will need to more than double during the 2026 to 2030 period to reach the stated targets. In the meantime, investment in PHEVs and ICEs should decrease by approximately 21% and 12% respectively every year until 2030 to reach the EU's 2030 target for the transport sector (see **Figure 25**).

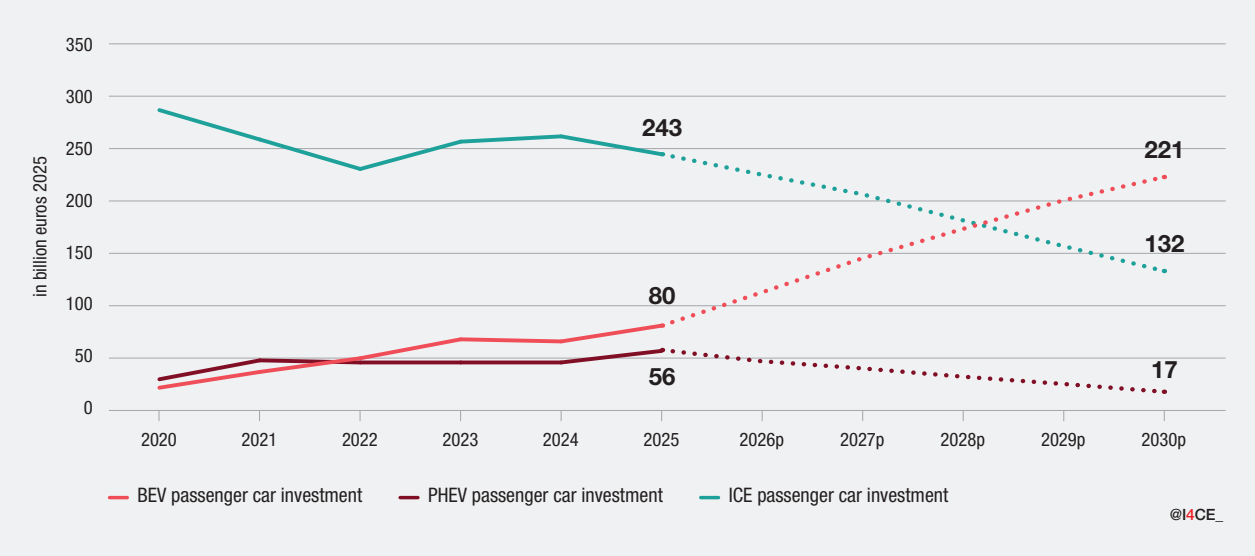
By contrast, investment in charging points for LDV sector, showed a surplus of 7 billion euros in 2025, as the EU is already far exceeding the target set by the AFIR for 2025 and is very close to reach what would be needed to be installed in 2030 based on the BEV stock target for 2030. This estimation is based on the total number of public charging points installed in the EU but does not evaluate whether their positioning complies with the regulatory requirement, that there must be a charging station at least every 60km along main European transport corridors.

FIGURE 24. THE CLIMATE INVESTMENT DEFICIT FOR THE ROAD TRANSPORT SECTOR IS ESTIMATED AT 95 BILLION EUROS. THE DEFICIT IS MAINLY MADE UP OF PASSENGER BEVS, WHICH REPRESENT 89% OF THE TOTAL AVERAGED YEARLY INVESTMENT NEEDS ON THE PERIOD 2026-2030



Source: I4CE. All data are in 2025 euros. This graph represents the distribution of the climate investment deficit for the transport system. For each sector, the investment deficit compares the 2025 investment to the estimation required to meet the European regulations. For instance, 90 billion euros of additional investment is needed annually between 2026 and 2030 for passenger electric vehicles. Investment needs are averaged between 2026 and 2030.

FIGURE 25. CLIMATE AND FOSSIL-FUEL PASSENGER CAR INVESTMENT CURVES MUST CONVERGE BEFORE 2030 IF THE EU IS TO MEET ITS 2030 TARGETS



Source: I4CE, based on T&E (2026b) and the European Commission (2025b). All data are in 2025 euros and represent actual annual investment until 2025, and the investment required annually until 2030 for the EU to reach its 2030's climate objectives.

In the wake of recent energy crises, switching to an electric car has become a matter of household purchasing power

With the oil crisis and the recent surge in oil prices, the economic advantage of electric vehicles over their fossil-fuel alternatives has become increasingly significant, even for consumers that who do not have an immediate need to replace their vehicle. There is a convergence in the literature on the fact that the Total Cost of Ownership[11] (TCO) of electric cars is lower than that of hybrid vehicles, both plug-in hybrid electric vehicles (PHEVs) and HEVs, as well as ICE vehicles and e-fuels vehicles (ERM, 2024). There is therefore a significant issue of car affordability for households when it comes to switching to a BEV compared with its ICE equivalent (see **Box 6**).

Many households cannot afford to buy a new car and will have to wait for electric models to become widely available on the second-hand market, before they can make the switch. While this market in EU countries is largely supplied by corporate fleets, which purchase new vehicles and resell them after three or four years of use, in some countries, the electrification rate of corporate fleets remains lower than that of the private consumer market (13.2% vs 16.2% for Germany, 12.1% vs 22.3% for France in 2024) (T&E, 2026b). A large proportion of these companies are leasing firms, many of which are owned by car manufacturers themselves. They therefore have an important role to play in determining the range of electric models offered within their portfolios (T&E, 2024).

To ensure that car ownership remains affordable for lower- and middle-income households, it is essential that the EU stays the course on its regulation on CO_2 standards for cars and vans. Beyond the consequences that any revision could have for the battery industry (see **section 7**), pushing back these regulations could significantly reduce the share of BEV sales in 2030, estimated by T&E to drop from 57% to 47% (T&E, 2026e). Reducing the share of new electric cars could have a significant impact on car affordability for households, as households buying on the second-hand market are very dependent on new car sales.

11 The TCO corresponds to all costs that accrue from initial purchase to re–sale, including depreciation, fuel costs, taxes, insurance, and repair and maintenance. It can also include all forms of subsidies or tax reliefs that the vehicle buyer benefits from.

BOX 6. COMPARING PASSENGER CAR AFFORDABILITY BETWEEN ELECTRIC VEHICLES AND FOSSIL-FUEL VEHICLES IN GERMANY AND FRANCE

- **Passenger car affordability in Germany: car owners can save €10,000 over 4 years by choosing an electric model**

  The European Alternative Fuels Observatory has published a tool that analyse the TCO of BEVs compared to the ICE's alternative for several EU countries (European Commission, 2026a).

  For example, let us compare the Volkswagen ID.3 Pure Performance (Segment C electric vehicle) and the Volkswagen Golf Life 1.5 TSI OPF (Segment C gasoline vehicle) for German car owners. The TCO calculation takes into account the vehicle purchase price, subsidies for BEVs (averaging €4,500 per vehicle according to Germany's latest subsidy scheme (European Commission, 2026b)), recent average electricity (0.26€/kWh) (Eurostat, 2026b) and fuel price (1.9€/l) prices in Germany, as well as maintenance and insurance costs and the vehicle's residual value.

  While the purchase prices of these two vehicles are respectively €38,000 and €31,000, their TCO, over an average usage period of four years, amounts to €26,794 for the electric Volkswagen and to €36,796 for its ICE equivalent. **The Volkswagen ICE vehicle will cost €10,000 more than the electric one for its owner over a period of four years in Germany**.

- **Passenger car affordability in France: under current conditions, buying a second-hand electric car is becoming more advantageous than continuing to drive an old ICE car**

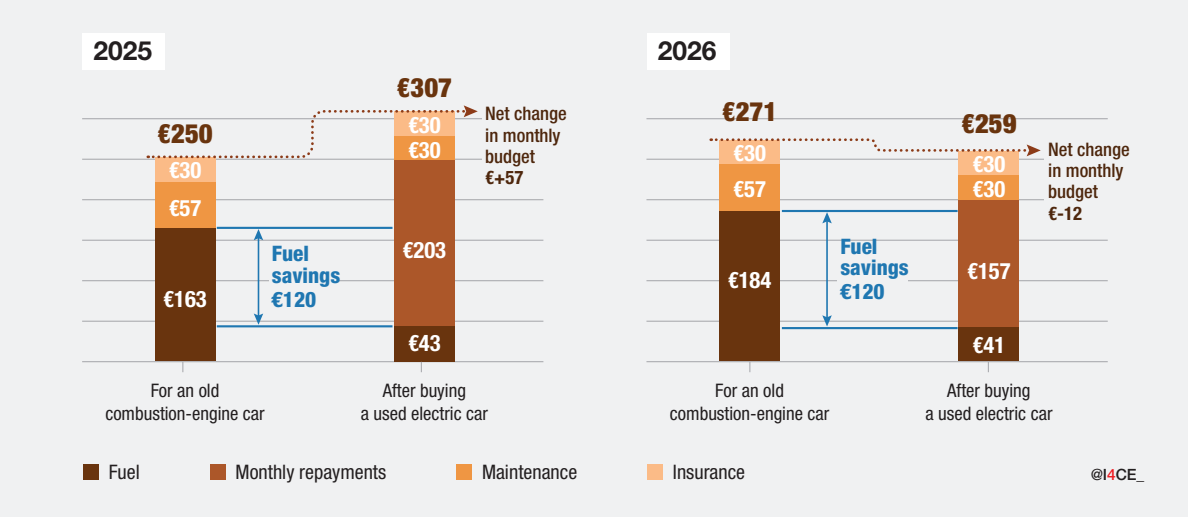
  I4CE publishes every year an Observatory of access conditions to the ecological transition for households in France (I4CE, 2025a), in which it studies the affordability conditions for several types of households. This analysis has recently been updated in light of the 2026 energy crisis (I4CE, 2026a).

  At the beginning of 2025, purchasing a second-hand BEV on credit to replace their old ICE vehicle would have strained the budget of a middle-income household, living in a rural area. The fuel savings, which we estimated at €120 per month, were insufficient to cover the loan repayments, even considering the down payment obtained from selling their old vehicle. Switching to a BEV would thus have cost this household nearly €60 more per month, taking into account fuel, maintenance, insurance, and the zero-interest eco-loan (éco-PTZ) repayments.

  Recent changes in energy prices and the price of used electric cars have changed the game. This household can now afford to buy a used electric car, saving around ten euros a month under current conditions. The price of a used electric city car has fallen since the previous year, as have interest rates, thus reducing loan repayments. At the same time, with petrol prices exceeding two euros per litre in March 2026, the energy savings from switching to electric would now amount to more than €140 per month (see **Figure 26**).

In conclusion, not only is it more attractive to buy an electric vehicle compared to a combustion engine vehicle in France, but it is now also more economically advantageous to switch to electric even if the household had no intention of changing their vehicle.

FIGURE 26. TOTAL COST OF OWNERSHIP OF A SECOND-HAND ELECTRIC CAR COMPARED TO AN OLD ICE CAR IN 2025 AND IN 2026



Source: I4CE (2026a).

6. RAILWAY INFRASTRUCTURES: SCALING UP INVESTMENT TO DELIVER A HIGH-SPEED RAIL NETWORK ACROSS THE EU

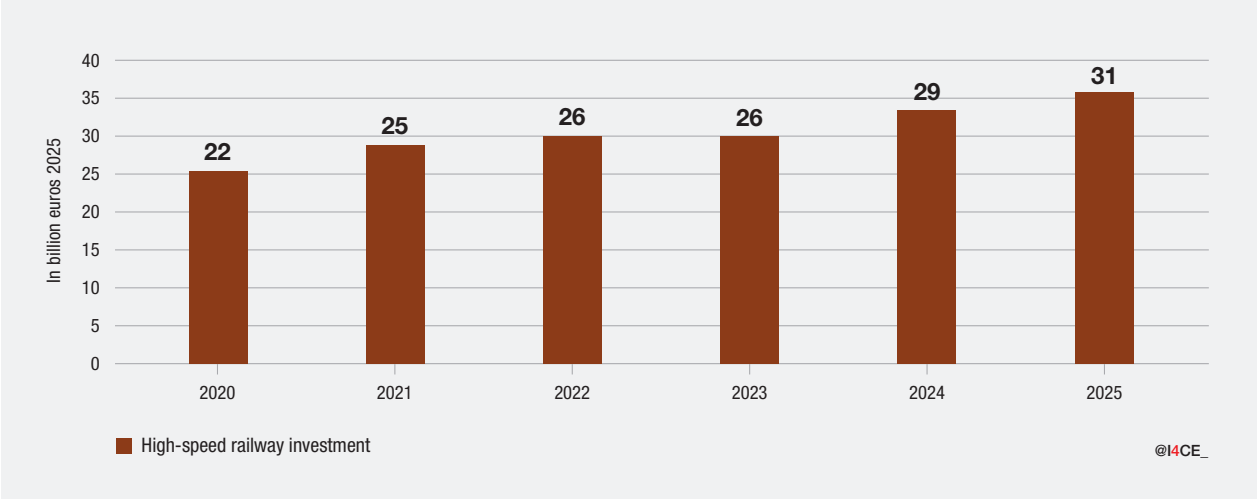
Key findings

- **Investment in high-speed rail infrastructure reached 31 billion euros in 2025**, a 6% growth compared to 2024.
- **Estimated investment in the rail sector is far from sufficient to meet the 2030 EU targets, as 50 billion euros would need to be invested annually between 2026 and 2030**.
- Investment in railways is largely undertaken by the public sector, as railway infrastructure is often a natural monopoly. **Meeting investment needs in long-distance railway infrastructure will therefore require an additional 20 billion euros in public funding**.
- Reinforcing the Connecting Europe Facility (CEF) in the next EU 2028-2034 budget will be essential as well to bridge the investment gap in rail infrastructure.

Investment in long-distance rail infrastructure has increased significantly in recent years, but remains insufficient to meet the 2030 targets

In 2025, investments in rail infrastructure for long-distance travel amounted to 31 billion euros, a 6% growth compared to 2024. These investments include expenditure for new infrastructure, and for infrastructure renewal and upgrade.

FIGURE 27. HIGH-SPEED RAILWAY INVESTMENT UNDER CORE TEN-T GREW BY 6% ANNUALLY ON AVERAGE SINCE 2020 TO REACH 31 BILLION EUROS IN 2025

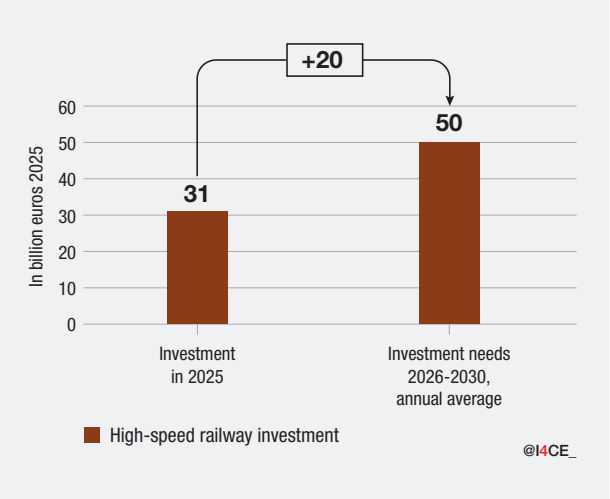


Source: I4CE. All data are in 2025 euros and represent yearly climate investment in the rail transport sector between 2020 and 2025. 2025 investment is estimated.

Estimated investment in the rail sector is far from sufficient to meet the 2030 EU targets. The 2013 Trans European Transport - Network (TEN-T) regulation (European Parliament and the Council of the European Union, 2013), revised in (2024a) aims to develop transport infrastructure at the continental scale. It defines high-priority infrastructure that must be installed by 2030, called Core TEN-T. For railways, this mainly includes the development of high-speed and long-distance rail transport and sets EU standards. Based on the TEN-T objectives, **installing rail infrastructure for long-distance travel would require** 50 billion euros of investment annually between 2026 and 2030. Consequently, an average extra 20 billion euros needs to be invested annually in order to meet the stated targets.

The revision of the TEN-T[12] accounts for 5.7 billion euros of annual investment needs, representing 11% of the investment needs for the Core network. The remaining 89% are attributed to the previous regulation. 39.4 billion euros refers to the Core TEN-T initial investment needs estimated by the European Commission in 2016[13], onto which was added the delayed investment spanning from 2016 to 2025. Between 2025 and 2030, this research projects that catching up on this investment will cost 5.2 billion euros annually.

FIGURE 28. MEETING THE 2030 OBJECTIVE FOR TRANS-EUROPEAN RAILWAYS (CORE TEN-T) WILL REQUIRE 50 BILLION EUROS ANNUALLY, LEAVING A CLIMATE INVESTMENT DEFICIT OF 20 BILLION EUROS IN 2025



Source: I4CE. All data are in 2025 euros. The 2025 investment is estimated. Investment needs reflect the investment required to achieve the 2030 targets of the TEN-T regulation.

Reinforcing the Connecting Europe Facility in the next EU budget will be essential to bridge the investment gap in rail infrastructure

Rail investment is largely carried out by the public sector, as railway infrastructures is often a natural monopoly. **Fixing the 20 billion climate investment deficit in long-distance railway infrastructure will therefore require additional public funding**. This may include extra EU-level funding, given the trans-European nature of much of the infrastructure.

Reinforcing the Connecting Europe Facility (CEF) in the next EU 2028-2034 budget will be essential to bridge the investment gap in rail infrastructure. The Connecting Europe Facility is a dedicated funding mechanism for the infrastructure needed to realise the Trans-European Networks (TEN). Between 2021 and 2023, 15.5 billion euros of CEF Transport funds were dedicated to rail projects. 20% of CEF transport rail funds were allocated to electrification, 18% to line speed improvements (T&E, 2026a). The European Commission's legislative proposal for CEF in the EU 2028-2034 budget is planning to increase it, from 33.71 billion euros in the current 2021-2027 budget to 81.4 billion euros. It would also include a tenfold increase in military projects, from 1.7 billion euros to 17.6 billion euros. These military projects include an upgrade in railways infrastructure (European Commission, 2025d). Rail infrastructure investment is therefore critical on two fronts: decarbonising mobility and fulfilling military requirements.

This estimate provides a minimum level, focusing on the investment needs of the Core TEN-T infrastructure before 2030. Investment that is needed to meet the 2040 and 2050 goals, which should start to be undertaken during the 2020s, is not included. It also excludes the numerous investments needed to develop the network not covered by the TEN-T, or just to maintain it.

This study provides figures for European railway infrastructure investment needs before 2030. Dealing with the limited up-to-date accessible data, it is therefore inevitably subject to uncertainties. The research shows that current EU regulation focuses only on a small part of the network. To really understand the need for extra investment, the entire rail network should be considered.

12 Figures were estimated based on the Staff Working Document accompanying the proposal (European Commission, 2021b) for measures specific to railways objectives for the Core-Network.
13 Converted in euros 2025.

7. CLEAN TECHNOLOGIES MANUFACTURING: THE EU IS ON TRACK TO MEET ITS 2030 TARGETS, PROVIDED IT STRENGTHENS ACTUAL PRODUCTION CAPACITY AND UPHOLDS CO_2 STANDARDS

Abstract: Clean technologies are a key pillar of the decarbonisation of the economy and offer an opportunity for the EU to strengthen its competitiveness on the global stage by reviving its manufacturing base. Manufacturing cleantech in the EU is also key to reducing EU global dependencies. The manufacturing of five key technologies is included in the scope of this study: wind turbines (blades, nacelles and towers), solar panels (polysilicon, cells, ingot, and wafers and modules), battery cells, electrolysers, and heat pumps. These technologies have been designated as strategic by the EU under the Net-Zero Industry Act (NZIA).

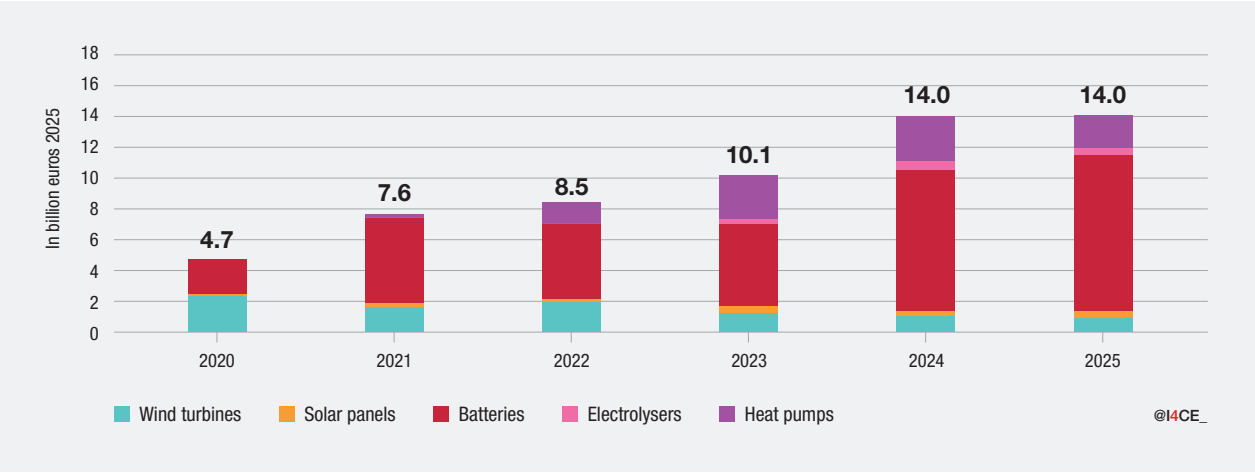
Key findings

- **In 2025, 14 billion euros were invested in wind turbines, solar panels, batteries, heat pumps, and electrolysers manufacturing across the EU, broadly in line with 2024 levels**. This investment is largely driven by the battery sector, which accounted for 73% of this total.
- **The stagnation of investment in the EU is set within a context of a global decline in cleantech manufacturing investment**. Chinese cleantech investment has been hit by the tariffs imposed by the United States (US) and Europe, while US cleantech investment has been affected by President Trump's substantial cuts to the 2022 Inflation Reduction Act (IRA).
- **The EU economy has already attained the manufacturing capacity objectives set by the NZIA, to reach 40% of domestic deployment demand for heat pump, wind and battery manufacturing**. It led to an investment surplus of 12.2 billion euros in 2025 for the sector.
- Despite progress in scaling up battery manufacturing capacity, **gigafactories are struggling to produce the number of batteries they were designed for**. This shows that the cleantech race is still far from won for the EU. **Relaxing EU standards on CO_2 emissions could bring additional risks to the investment already made in the battery manufacturing sector, in a sector that is still fragile**.
- The investments presented in this report do not capture the full value chain needed to produce these technologies. In the battery sector in particular, investments across the entire supply chain, from anodes and cathodes to raw materials such as lithium, are critical to securing Europe's long-term industrial sovereignty and competitiveness in this field.

European cleantech investment stagnates as global cleantech investment hits a rough patch

Investment in clean technologies remained stable in 2025, at 14 billion euros in the EU-27 for the five sectors studied in this report. This stagnation follows a sharp increase in investments in recent years (+33% per year on average). Battery cell manufacturing investments corresponded to 73% of 2025 investments, followed by heat pump manufacturing which represent 15% of the 2025 investments.

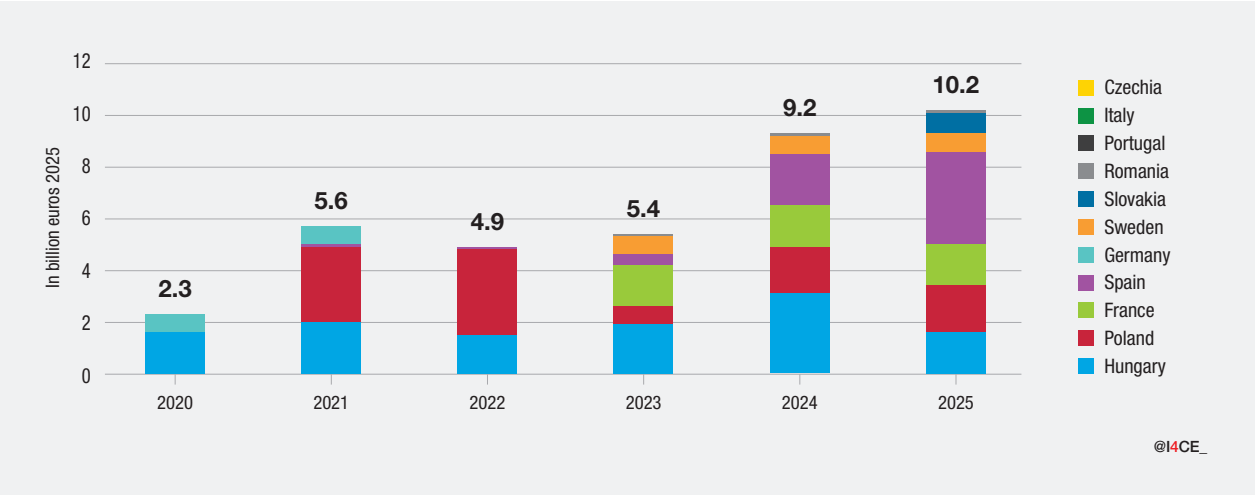
FIGURE 29. INVESTMENTS IN CLEANTECH MANUFACTURING ARE STAGNATING IN 2025 FOLLOWING STRONG GROWTH IN 2024



Source: I4CE from Bruegel (2026a) and the IEA (2024a). All investments data are in 2025 euros. See **Box 7** *for methodology.*

As gigafactories proliferate in the EU, investment in battery cell manufacturing amounted to 10.2 billion euro in 2025, twice as much as in 2023. Investment in battery manufacturing is particularly strong in Spain, amounting to 3.6 billion euros in 2025, with three new gigafactories currently under construction. Handled by AESC, Volkswagen, and Stellantis, these gigafactories have manufacturing capacity up to 30, 40, and 50 GWh respectively. Other gigafactories have been built over the past few years, especially in Hungary, Poland, France and Germany. In terms of cumulative investment over recent years, Hungary and Poland hold the highest share, with cumulative investment since 2020 amounting to 11.6 billion euros and 10.5 billion euros respectively (see **Figure 30**). It should be noted that, among the 276 GWh of operational capacity in 2025, only 62 GWh was built by European manufacturers.

FIGURE 30. INVESTMENT IN EU BATTERY MANUFACTURING HAS BEEN BOOMING SINCE 2024, LED BY HUNGARY, POLAND, SPAIN AND FRANCE



Source: I4CE from Bruegel (2026a) and the IEA (2024a). All investments data are in euros 2025, and cover wind turbines, solar panels, batteries, electrolysers and heat pumps manufacturing. See **Box 7** *for methodology.*

Investments in solar panels manufacturing amounted to 0.36 billion euros in 2025 as Enel's 3SUN module and cell manufacturing plant project in Sicily scaled up to 1.8 GW capacity in 2025, with the ambition to reach 3 GW capacity in 2026. However, **the sector is suffering from many factory closures**. In May 2025, Swiss solar panel manufacturer Meyer Burger declared insolvency for its German subsidiaries, including its 1.4 GW of solar cell production in Talheim, Saxony. French company Photowatt, one of the world's oldest PV manufacturers, closed its operations in early 2025, after years of increasing losses and failure to find a buyer for its business. Finnish cell and module manufacturer Valoe also went bankrupt, in April 2025, and the German branch of the Taiwan-based Sino-American Silicon closed its PV module production. These plant closures have not prevented other facilities from opening or expanding their operations. The French start-up Carbon opened a new facility of cells, ingots, wafers, and modules manufacturing in Fos-sur-Mer in 2025, but the project was ultimately

abandoned in 2026. The French start up argued that the demand was too low (see **section 1**) and that the European Commission's proposed Industrial Acceleration Act (IAA) (European Commission, 2026c), presented in March 2026, has diluted the "Made in Europe" criteria too broadly to render European solar panels genuinely competitive (Roux-Goeken et Tandjaoui, 2026).

This EU 2025 cleantech manufacturing investment trend contrasts with those of the US and China, which experienced a significant decline in cleantech investment in 2025, especially in the battery and solar sectors. Chinese cleantech investment suffered from US tariffs on Chinese clean technologies and European tariffs on EVs (Bruegel, 2026b), and from the consolidation of its domestic market (Davidson et Qian, 2026). This has led some Chinese companies to shift investment overseas (Bruegel, 2026b). As a result, **China's cleantech manufacturing investment global share fell from 71% in 2023 to just 39% in 2025** (Bruegel, 2026b). In the US, cleantech investment had surged following the adoption of the 2022 IRA. The US saw their **cleantech manufacturing investment global share rising from 4% in 2022 to 26% in 2025** (Bruegel, 2026b). However, substantial cuts to the IRA which had previously provided major cleantech subsidies (Bruegel, 2026b), triggered a wave project cancellations worth 7 billion euros in the first quarter of 2025 and another 5 billion euros in the second quarter (Rhodium group, 2025).

Against this backdrop of retreating US and Chinese investment, the EU has moved in the opposite direction. Its global manufacturing investment global share has tripled from 4% in 2022 to 12% in 2025, reflecting its success in attracting substantial investment, even if it remains below the peak US trajectory over the same period (Bruegel, 2026b).

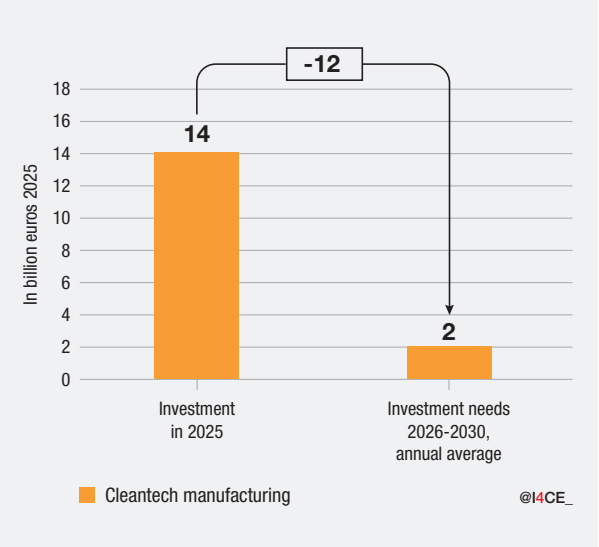
Several cleantech sectors have already met NZIA targets, putting the EU on track to boost its technological independence, but only if actual production levels succeed in taking off

To address the growing global competition in cleantech, the EU launched the NZIA in 2023, to support the continent's decarbonization efforts, reduce strategic dependencies, and foster the EU cleantech industry. The NZIA has set a target for domestic production to meet 40% of the domestic deployment needs for net-zero technologies by 2030 (European Parliament and Council of the European Union, 2024b) across a wide range of cleantech sectors. **For three of the five sectors analysed in this study, the EU has already met the NZIA targets in terms of potential operational capacity, giving a total investment surplus of 12.2 billion euros in 2025** (see **Figure 31**). It is worth noting that the targets initially set by the European Commission (European Commission, 2023d) for these five sectors were intended to cover a much larger share of domestic demand. The observed surplus may therefore also reflect the fact that European targets were set at a relatively modest level compared to the sector's actual trajectory.

The number of heat pumps manufactured in the EU, which amounts to 7.7 million units (Volt *et al.*, 2025), is already above the deployment need for 2030 (5.4 million units) (see **section 4**). The heat pump manufacturing sector had an annual investment surplus of 2.2 billion euros in 2025, and has thus already reached the NZIA objectives.

The annual manufacturing capacity of blades, nacelles and towers for wind turbines (30, 43, and 42 GW respectively) also exceeds NZIA target (of around 23 GW each in 2030). However, it does not exceed the total annual wind turbine installation needs (of around 59 GW in 2030). The wind turbine manufacturing sector had an annual investment surplus of 0.9 billion euros in 2025 and thus has already reached the NZIA objectives.

FIGURE 31. THE EU IS ON TRACK TO REACH ITS 2030 CLEANTECH MANUFACTURING TARGETS FOR KEY SPECIFIC TECHNOLOGIES BUT WEAK DEMAND AND CURRENT REGULATION REVISION PUT FUTURE CAPACITY AT RISK



Source: I4CE. All data are in 2025 euros. This investment covers wind turbines, solar panels, batteries, electrolysers, and heat pumps manufacturing. Investment needs are estimated to meet the NZIA target of manufacturing capacity of 40% annual deployment in 2030. See **Box 7** *for methodology.*

Finally, the battery manufacturing sector reached the NZIA targets as well in 2025, in terms of potential operational capacity. The annual battery manufacturing operating capacity was 276 GWh in 2025. The European Commission estimated that 610 GWh of domestic battery capacity would be needed in 2030 to meet the BEV deployment needs and battery storage investment needs (European Commission, 2023), which would lead to an annual manufacturing capacity need of 244 GWh. The battery manufacturing sector had an annual investment surplus of 10.2 billion euros in 2025, and thus has already reached the objective set by the NZIA. If all currently announced projects come to fruition, domestic actual production capacity could reach up to 820 GWh by 2030, which is above the EU's total 2030 domestic needs (T&E, 2026d). These figures should be treated with caution. Given the high volatility and uncertainty of the sector, many of these projects may never materialise. Fraunhofer has estimated that around 50% of planned projects could fail to come to fruition by 2035 (Miraux *et al.*, 2026) yet announced projects face high uncertainty. Using a new database of project announcements, a probabilistic framework and a system dynamics model of battery demand, aging, and second-life use, this study estimates effective capacities for European Gigafactories, Spokes and Hubs over 2020-2035. Results indicate that cell production could reach 750-855 GWh/yr by 2035 (45-51% of announcements.

It should be noted that, while, in theory, the EU has the production capacity to reach the NZIA objectives for several sectors, it remains on a fragile footing. Given the difficulty in finding data on the actual production and utilisation rates of these capacities in the EU, foreign trade data can serve as a proxy. In the battery sector, for instance, the EU is a significant net importer. In 2025, net imports of batteries in the EU amounted to 23.8 billion euros (Bruegel, 2026a). Besides, this snapshot of investment does not cover the entire cleantech supply chain. In the battery sector in particular, investments spanning the entire supply chain, from anodes and cathodes to raw materials such as lithium, are critical to securing the EU's long-term industrial sovereignty and competitiveness in this field. According to Bruegel (Bruegel, 2026a), investment in critical minerals amounted to 0.4 billion euros in 2025 in the EU. Yet, investing in critical raw materials is also key to tackling EU's dependency in cleantech manufacturing.

By contrast, investment in solar panel and electrolyser manufacturing has still not reached the level required by NZIA targets, both presenting investment deficits of 0.7 billion and 0.4 billion euros respectively. Only the production capacity of polysilicon is sufficient to meet the NZIA target for the solar panels manufacturing sector, thanks to Wacker's polysilicon factory in Germany.

Relaxing EU standards on CO_2 emissions for new cars and vans could put at risk the investment already made in the battery manufacturing sector

Postponing and relaxing the EU regulation on CO_2 emissions performance standards for new cars and vans (European Commission, 2025) could undermine the profitability of the investment already made in EU battery gigafactories. Even though existing battery manufacturing capacity could in theory be sufficient to reach the NIZA target of covering 40% of annual domestic battery demand in 2030, it is very likely that these gigafactories are actually producing fewer batteries than initially announced. Yet, with the production of electric cars in Europe potentially moving from 14.6 million EVs in 2030 under the current regulation to 10.1 million under the Commission's proposal, this could have the consequence to reduce battery manufacturing capacity by 56% by 2030 (T&E, 2026d). Staying the course on the EU's vehicle electrification targets is therefore essential if the EU wishes to gain sovereignty over its battery production.

BOX 7. METHODOLOGY FOR ESTIMATING THE CLEANTECH MANUFACTURING INVESTMENT

This report tracks the investment deficit in the cleantech manufacturing sector, focusing on five key strategic technologies: wind turbines, solar panels, batteries, heat pumps and electrolysers. It tracks current investment and investment needs based on the EU's 2030 cleantech objectives set in the NZIA.

Past and current investment

Past and current investment was estimated according to the capacity of factories built in recent years, to which an average European investment cost was applied. Factory capacity were derived from public announcements made by various plant developers in Europe, and from Bruegel's European Cleantech tracker (Bruegel, 2026a).

To translate this capacity into an investment figure, an average cost per unit of capacity was used. These cost assumptions are derived from the IEA (International Energy Agency) and correspond to overnight facility costs, including the core equipment and construction costs of a factory, but excluding land purchases and financing costs (IEA, 2024a). The IEA presents assumptions on the 2023 manufacturing investment cost for all the technologies studied. This cost was indexed using the evolution of EU manufacturing prices for industry to obtain a 2025 investment cost (Eurostat, 2026g).

The past and current investment take into account investment in capacity under construction. This investment, spent over the entire construction period of the plant, was divided equally between the construction start, or by default the date of Final Investment Decision, and the date on which the plant became operational.

Investment needs

The NZIA sets a target for domestic production to meet 40% of the deployment needs for net-zero technologies by 2030 across a wide range of cleantech sectors (European Parliament and Council of the European Union, 2024b). I4CE estimates the 2030 annual deployment need by sector using the various European targets (REPowerEU, the regulation on CO_2 emissions standards for cars and vans regulation, and the European Resource Adequacy Assessment (ERAA).

To translate these capacities into investment figures, the 2025 investment cost per unit of capacity was used. No account has been taken of the evolution of the investment cost over the decade.

CONCLUSION

STRENGTHENING EUROPE'S LONG-TERM POLICY FRAMEWORKS TO ACCELERATE INVESTMENT AND REDUCE EXPOSURE TO FUTURE ENERGY CRISES

After a sharp rise in 2022, following the energy crisis triggered by the war in Ukraine, investment in clean energy has since stagnated. At the time, public decision-makers, businesses, and citizens chose to invest more heavily in moving away from fossil fuels and improving energy efficiency, but the momentum has faded since then. Investment in the low-carbon transition **reached 534 billion euros in 2025**, well below **the estimated 878 billion euros needed annually to meet the EU's 2030 climate targets**. An increase in investment across certain sectors in the first months of 2026 suggests that the EU economy could once again ramp up investment in response to the current energy price crisis.

To reduce exposure to future energy crises and accelerate investment in the low-carbon transition, the EU and its Member States have a range of concrete policy levers at their disposal. Such measures may span from regulation, governance, planning, to public budget.

- **On regulation**: the revision of the CO_2 standards for cars and vans regulation must preserve its ambition to sustain the shift to fossil-free mobility, ensure car affordability for households and protect investments already made in European battery manufacturing and charging infrastructure. While the European Commission (European Commission, 2025c) has proposed easing the regulation under pressure from car manufacturers, introducing flexibility for alternative vehicle types such as PHEVs or e-fuels would offer no economic or environmental benefit to consumers, while significantly increasing their costs over the vehicle's lifetime. It would also send a damaging signal to investors in the decarbonisation of the automotive sector, undermining confidence in the EU's commitment to its long-term climate targets (I4CE, 2025c).
- **On governance**: the forthcoming revision of the Governance Regulation of the Energy Union and Climate Action (European Commission, 2025e) offers a unique opportunity to transform the NECPs into genuine investment plans. These plans could enable Member States not only to address the current energy price crisis by accelerating the energy transition, but also to drive the modernisation and economic development of their countries. This would also serve to meet investors' demand for clear and predictable national investment strategies in the medium term (I4CE, 2026b).
- **On planning**: the development of electrification plans, at both national and European level, is essential to protect citizens and businesses from rising energy prices. These plans must include measures aimed at accelerating low-carbon mobility and the decarbonisation and renovation of buildings. These plans could for instance introduce social leasing schemes for electric vehicles prioritising households most dependent on their car and least able to afford the upfront cost of switching to an electric vehicle (I4CE, 2026c). On building electrification, these plans could combine targeted renovation support for low-income households and small businesses with regulations aimed at strengthening the electrification of buildings (I4CE, 2026c).
- **On public budget**: the EU budget plays an essential role in enabling climate investments in several Member States that depend on it to invest in the low-carbon transition. The next EU budget for 2028-2034 must secure substantial and dedicated funding for climate investment across Member States. National public budgets will also play an important role in accelerating climate investment, both to de-risk certain private investments and to support lower-income households and small businesses in financing the transition.

These levers must send a clear and durable long-term signal to investors, businesses, and citizens willing to invest in the decarbonisation of the economy. The European Commission is set to publish its proposals for the post-2030 regulatory framework following the adoption of the 2040 emissions reduction objective. While the EU27 is still far from meeting its 2030 targets, implementing and maintaining long-term commitments is essential to ensure a stable and predictable regulatory framework that fosters long-term investment. The EU and its Member States must break free from the pattern of crisis-driven investment and instead commit to **long-term investment strategies that durably protect citizens, businesses, and Europe's energy security from future energy shocks**.

METHODOLOGY

Scope of the study

This report covers climate investment in four major sectors of the EU economy:

- the energy sector, which includes decarbonised electricity generation, electricity transmission, and distribution grids, and battery storage;
- the building sector, which includes energy-efficient investment in the construction of new buildings, the energy renovation of existing ones, and the deployment of heat pumps;
- the transport sector, which includes investment in transport infrastructures and vehicles;
- the cleantech manufacturing sector, which includes wind turbines (blades, turbines and towers), solar panels (polysilicon, ingots and wafers, cells and modules), electrolysers, heat pumps and battery cells.

In these sectors, some activities are not yet covered by investment records. The analysis of the energy sector considers investment made in the power system and does not include, for instance, solar thermal or geothermal energy. In the transport sector, the analysis does not include several investments in rail and public urban transport infrastructure, nor clean aviation or maritime transportation. Agriculture, heavy industry, centralised waste treatment and land use sectors are not covered in this study, as the lack of data makes it difficult to identify investment. Finally, the study does not document investment in research and development, or in climate change adaptation.

For each sector, climate investment is considered. This is defined as any investment that contributes to reducing greenhouse gas (GHG) emissions in the EU (see **Table 1** for an outline of the scope of the study).

Perimeter variations between the 2025 and 2026 edition

This 2026 edition of the report revises the investment levels presented in the 2025 edition (I4CE, 2025d). The revision includes new data sources, methodological changes for tracking current investment, new EU 2030 targets for some sectors, and sectoral scope modification. These changes apply for the historic tracking (2020 to 2025), so that the investment presented each year are in the same perimeter, and thus comparable.

Scope variation of this edition includes the exclusion of plug-in hybrid vehicles from the road transport analysis. EU regulation (European Parliament and Council of the European Union, 2019) sets a 100% reduction of the average CO_2 emissions of the new passage car fleet by 2035. While the European Commission presented in December 2025 an Automative Package which provides a revision proposal of this regulation (European Commission, 2025a), the 2019 version regulation remains in force at the time of this report drafting (April 2026). The scope of the study also evolved to include the nuclear energy sector, which had not been examined in the previous two editions.

Measuring past and current climate investment

Defining investment

The report examines:

- gross fixed capital formation (GFCF), i.e., in national accounts, expenditure on the acquisition of tangible and intangible assets (Eurostat, 2026c). The notion of assets implies that expenditures will serve to provide goods or services for more than a year, which distinguishes them from consumer goods. The assets covered by the study are physical equipment such as buildings, transport and network infrastructure, boiler houses, power plants, etc., which will be used to produce goods and services for more than one year.
- the consumption of goods considered durable, in the sense that they provide services to consumers for more than one year. For example, this includes households' purchases of new vehicles.

Measuring investment

Investment is measured at the EU-economy scale, and includes all actors, whether it's public or private, transnational or local.

Investment costs are based on the acquisition cost, and correspond to capital expenditure (CAPEX) in company accounting. These costs cover various expenses like studies, authorizations, equipment acquisition, and construction. They exclude taxes for companies and public authorities but include taxes (VAT) for households. Project financing costs, such as interests paid, are excluded.

Investment is carried on a specific year. Depending on the sector and the national accounting policies, this reference date for costs can be the date of when the work is carried out (in the case of construction or energy

retrofitting), registration (in the case of vehicles), or equipment installation (in the case of renewable energies). For the biggest projects, such as transport infrastructure, the costs are spread over several years.

Reporting past and future investment in today's currency

To make it easier to compare past and present climate investment with future needs, and to account for the effects of inflation, we report all investment expenditure in today's currency (2025 euros); in other words, in constant currency. Neutralising the effect of inflation makes it easier to measure the real financial effort required to undertake investment. To calculate this, we divide the current expenditure for the historical period by the chain-linked price index of gross domestic product, also known as the "GDP deflator", provided by the Eurostat (2026d).

Future investment needs describe the quantities of equipment to be deployed, as well as certain price expectations. These expectations relate to sectoral phenomena specific to energy transition activities. For example, when our sources anticipate that batteries will cost less in the future, what they mean is that the price of batteries is expected to fall relative to other products in the economy. Expressed in today's currency, their price will decrease. In other words, price expectations do not comment on the price level of the overall economy, but on the gap between future prices in a sector and overall inflation.

FIGURE 32. METHOD USED TO CORRECT THE INFLATION EFFECT OF HISTORICAL DATA

Gross investment

Our analysis compares gross investment only, not net investment against a fossil-fuel baseline. For instance, in our analysis, we estimate the cost of an electric car to be around 34,000 euros in 2030. Our approach being centred on gross investment, the cost of the alternative (an ICE car) does not impact our climate investment deficit estimate.

Macroeconomists may also be interested in a complementary, net-investment approach. Such an approach would compare the cost of the climate investments with its alternative. For instance, it would look at the cost of both an electric car (34,000 euros) and of an internal combustion engine car (27,000 euros), leading to a gross climate investment of 34,000 euros and a net climate investment of 7,000 euros. We have not included this approach in these third edition of the report.

Measuring climate investment needs

The EU has set itself the objective to reduce its greenhouse gas (GHG) emissions by 55% by 2030 compared to 1990 levels and to achieve carbon neutrality by 2050. To achieve these objectives, it has implemented several legislative measures and presented action plans, as part of the EU Green Deal.

Investment targets in terms of volume

We determine the number and characteristics of the equipment deployed based on the targets set by the EU. For instance, we consider the number of homes renovated, the installed wind or solar power capacity, and the number of electric cars or rail transport infrastructure.

In this report, the volumes that need to be deployed for each technology from 2026 to 2030 are determined based on legislative documents and action plans from the EU. Where possible, investment targets are determined based on binding EU objectives concerning volumes. This is, for example, the case for the renovation rate and energy-efficiency targets for new buildings, as enshrined in the 2018 EPBD and 2024 revision. The same applies to the targets for the deployment of charging stations within the Alternative Fuels Infrastructure Regulation (AFIR), or the targets for the development of rail within the Trans-European Transport Network (TEN-T) regulation.

When volume targets are not explicitly mentioned in EU regulations, we take targets from EU scenarios,

the European Commission's action plans, such as the REPowerEU plans, the Climate Target Plan, or the European Commission Staff Working Documents. Finally, where the EU does not have any specific targets that can be translated into volume deployment, figures from the industry are used (see **Table 1**).

Future prices

We assign unit prices to equipment. These prices are projected from their most recent observed levels, typically in 2025. Our projections for 2026 and beyond reflect the cost expectations expressed in several recent studies.

Lower investment costs assumptions over the period 2026-2030 have been assumed for certain technologies, particularly for some power generation technologies, as well as in the price of batteries for electric vehicles. By contrast, renovation and construction costs, are projected to remain stable. The investment costs are expressed in 2025 euros.

Cost projections are taken from various sources, including the European Commission Reference Scenario, the IEA, Ipsos and Naviguant, Cravezero, Bloomberg NEF, the International Council on Clean Transportation, etc.

Economic conditions

The estimation of investment needs assumes favourable economic conditions. It presupposes a supply that can be met by labour and equipment at prices close to or below current levels. Rapidly increasing demand can lead to bottlenecks if supply is not properly supported and sized. Furthermore, future prices are uncertain and are based on assumptions about price trends for the main sectors. Several investment costs are expected to fall by 2030, particularly for wind plants and electric vehicles.

Climate investment needs

The report determines future investment needs in relation to the levels of investment observed in 2025. The investment target is based on average annual investment over the period 2026-2030. This means that, to achieve the EU's 2030 climate objectives, investment in the EU economy must be at the target level on average over the period 2026-2030. Every year, any unmade investment will contribute to an increase in the climate investment needs of the following year. Conversely, any investment that matches or exceeds the required investment in a particular year will help to reduce the climate investment deficit.

Understanding the investment deficit

The report defines an investment deficit as the difference between: (1) the average investment required every year between 2026 and 2030 for the EU to reach its climate objectives, and (2) the 2025 levels of investment in constant 2025 euros.

TABLE 1. EUROPEAN REGULATIONS AND TEXTS ASSOCIATED WITH CLIMATE OBJECTIVES BY SECTOR

System	Sub-sector	Climate investments considered	European regulations and texts associated with climate objectives	Technology covered in the scope of climate investments	Technologies not covered
Energy	Decarbonised energy	Renewable electricity,	RED, REPower EU plan, EU reference scenario	Wind power, solar power, hydropower, marine, biomethane	Solar thermal, biomass, waste, geothermal
		Nuclear energy	Member States' NECPS	Nuclear energy	
	Networks and flexibility	Electricity grids Battery storage	No EU specific target for electricity grids, except for cross-border infrastructures ERAA	Transmission and distribution power grids Utility-scale and residential battery storage	

(suite...)

(Tableau 1, suite)

System	Sub-sector	Climate investments considered	European regulations and texts associated with climate objectives	Technology covered in the scope of climate investments	Technologies not covered
Residential and non-residential buildings	New buildings construction	Energy performance of construction	EBPD 2018	Building envelop insulation	Non-energy related construction items
	Energy-efficient renovation	Medium and deep renovation [14]	EU Renovation Wave, EPBD 2024 revision	Building envelop renovation	Light renovation, renovation below energy savings threesholds, non-energy renovation
	Heating devices	Heat pumps installation	RepowerEU	Heat pumps	Other heating devices (wood heating, biomass, heating networks, …)
Transport	Road transport	Electric vehicles, Recharging infrastructures for electric vehicles	Monitoring CO_2 emissions for passenger cars and light commercial vehicles Monitoring CO_2 emissions for Heavy-Duty vehicles Alternatives Fuel Infrastructure Regulation (AFIR)	Battery electric Passenger cars & Light-commercial vehicles Battery electric trucks, fuel cell electric trucks Public electric charging points for light-duty vehicles and heavy-duty vehicles	Other heavy-duty vehicles (buses, coaches, …), hybrid electric vehicles Private charging points and other refuelling station (hydrogen, gas, …)
	Rail transport	Infrastructure for a modal shift toward railways	Trans-European Transport Network regulation (TEN-T)	Long-distance trans-European railways infrastructures for 2030 (CORE TEN-T Network)	Maintenance and upgrade of existing railways Development of other infrastructures Urban transport
Cleantech manufac-turing	Cleantech manufacturing	Wind turbines, solar panels, electrolysers, batteries and heat pumps production	The Net Zero Industry act (NZIA)	Wind turbines, solar panels, electrolysers, batteries and heat pumps	All the other clean technologies

Note: This table presents the systems and sectors considered in the study and the European regulations they are based on. Sectors not covered in the study and not shown in the table are agriculture, heavy industry, centralised waste treatment, land use, adaptation to climate change.

14 See definition in section 3.2

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LIST OF ABBREVIATIONS

AC	alternative current
ACEA	European Automobile Manufacturer's Association
AFIR	Alternative Fuels Infrastructure Regulation
APS	Announced Pledges Scenario (IEA, WEO)
BEV	battery electric vehicle
CAPEX	capital expenditure
CEF	Connecting Europe Facility
CO_2eq	carbon dioxide equivalent
DC	direct current
ECB	European Central Bank
EIB	European Investment Bank
EHPA	European Heat Pump Association
EPBD	Energy Performance of Buildings Directive
ERRA	European Resource Adequacy Assessment
EU	European Union
EV	electric vehicle
FID	Financial Investment Decision
GDP	gross domestic product
GFCF	gross fixed capital formation
GHG	greenhouse gas
GW	gigawatt
GWh	gigawatt hours
HDV	heavy-duty vehicle
HEV	non-plugin hybrid electric vehicle
HICP	Harmonised Index Consumer Price
I4CE	The Institute for Climate Economics
IAA	Industrial Accelerator Act
ICE	internal combustion engine
IEA	International Energy Agency
IRA	Inflation Reduction Act
JRC	Joint Research Centre
LDV	light-duty vehicle
MFF	Multi-annual Financial Framework
MS	Member States
NDCs	Nationally Determined Contributions
NECP	National Energy Climate Plan
NZEB	nearly zero-energy building
NZIA	Net-Zero Industry Act
PHEV	plugin hybrid electric vehicle
PV	photovoltaics
RED	Renewable Energy Directive
STEPS	Stated Policies Scenario (IEA WEO)
SWD	Staff Working Document
T&E	Transport & Environment
TCO	total cost of ownership
TEN	Trans-European Networks
TEN-E	Trans-European Networks for Energy
TEN-T	Trans-European Networks for Transport
TWh	terawatt hours
US	United States
VAT	value-added tax
WEI	World Energy Investment (IEA report)
WEO	World Energy Outlook (IEA report)
ZEV	zero-emissions vehicle

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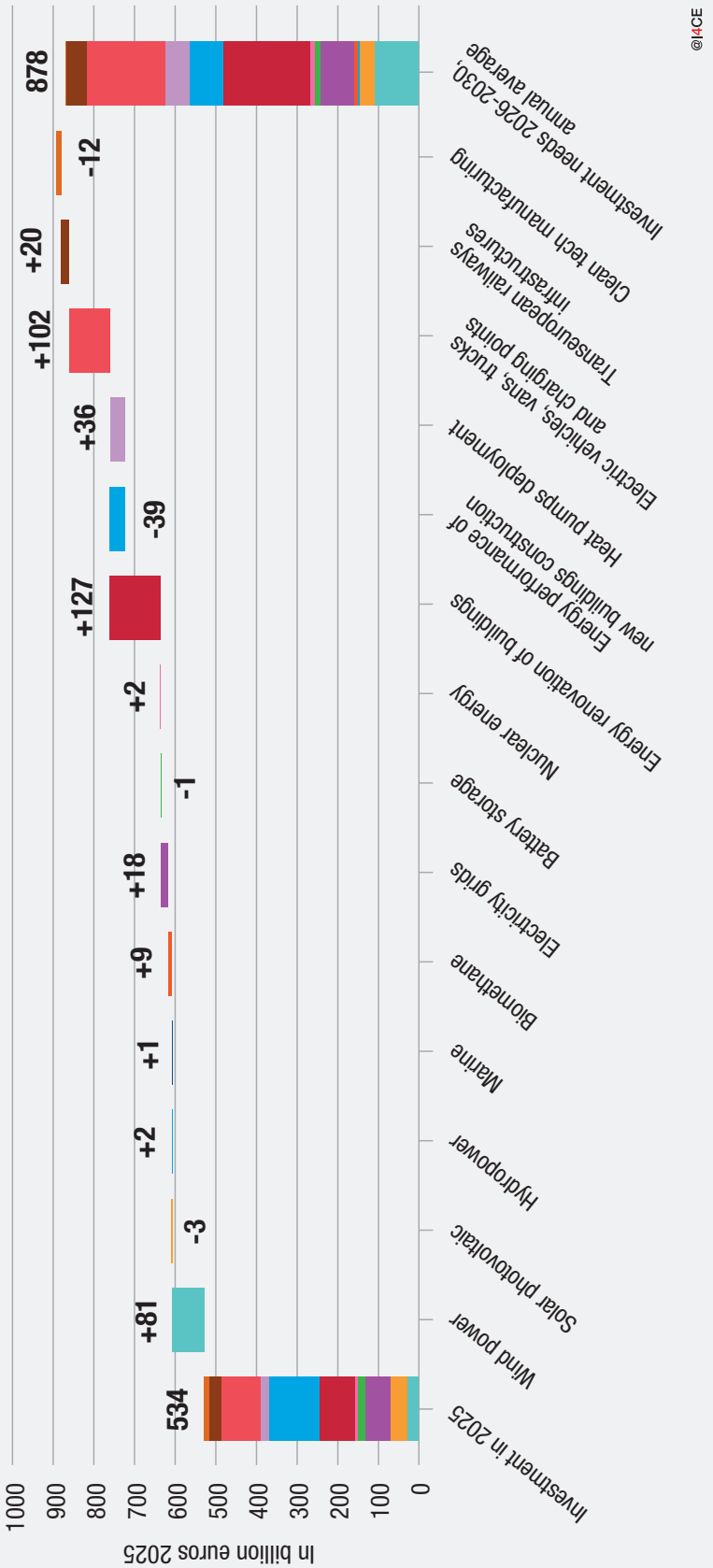
ANNEX

FIGURE 33. THE EU'S OVERALL CLIMATE INVESTMENT DEFICIT OF 344 BILLION EUROS IN 2025 IS THE SUM OF SECTORAL EU CLIMATE INVESTMENT DEFICITS AND SURPLUSES. THE BIGGEST ADDITIONAL INVESTMENT NEEDS ARE IN THE ENERGY-RENOVATION OF BUILDINGS (127 BILLION EUROS), ELECTRIC ROAD TRANSPORT (102 BILLION EUROS) AND WIND ENERGY (81 BILLION EUROS)



Source: I4CE. All data are in 2025 euros. This graph indicates breaks down the climate investment deficit by sector. This deficit corresponds to the difference between the annual average investment that is needed for the EU to reach its climate objective by 2030 and the investment that occurred in 2025. For example, in wind power, the climate investment deficit of 81 billion euros corresponds to the difference between the average investment needs (109 billion euros) and the 2025 investment (27 billion euros).

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