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Energy efficiency policies & investments

European developments create cross-asset class investment opportunities

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- Europe's goals for energy security, net zero emissions, competitiveness and to address cost of living pressures, require higher levels of investment in energy efficient technologies, especially in buildings.
- To #JoinUpTheDots, we describe how energy efficiency is a cross-asset class opportunity for Europe's Transformation through real estate (private & listed), infrastructure, direct lending, project finance funds, tech commercialisation, investor and lender engagement with companies, and policymakers.
- We analyse the Energy Performance of Buildings Directive (EPBD) which will become European law in Q2 2024. The following provisions[1] will be put into national law over the next 2 years:
  - Minimum Energy Performance Standards: buildings must meet an energy use standard when undergoing a major renovation, or when a building is sold, leased or has a change of purpose.
  - Phase-out date for fossil fuel boilers by 2040 or earlier
  - Mandatory roof-top solar if "technically suitable, economically and functionally feasible"
  - EV charging in buildings; Future mandatory Smart Readiness Indicator for commercial buildings
  - Mortgage Portfolio Standards: first ever voluntary regulation to improve portfolio energy efficiency
  - New buildings in 2030 must be zero emissions and have embodied carbon targets for construction
- The parallel Energy Efficiency Directive[2] sets public sector building renovation targets, requires data centre disclosures, utility companies to achieve energy savings & companies to carry out energy audits.
- Enhanced cooperation and dialogue between policy-makers and financial institutions is necessary for policy implementation to be as effective as possible to help reach climate, energy, and financial goals.
  - Enhanced dialogue is the aim of the EU Energy Efficiency Finance Coalition, an evolution of the Energy Efficiency Financial Institutions Group (EEFIG) where DWS was an active, founding member.
  - Participating in the Coalition is a way to help meet asset owners' expectation for asset managers to undertake sector & policy engagement[3]. However, politicisation of retrofit/heat pump policies is growing. Clear public messages and financing partnerships are needed to meet EU retrofit goals.
- We will publish a parallel report with policy recommendations, but in summary[4] we believe there should be better alignment between efficiency policies and: sustainable finance policies, electricity market reform, and energy tax reform; an EU supported Renovation Loan incentives; a 'trusted data' sharing strategy to reduce 'green red tape' for companies and to address real estate stranded asset risk.
- Efficiency related investments could contribute to the 2030 EUR 2.5trn green & digital investment gap and help countries improve their ranking on our recent European Transformation Scorecard[5]

[1] Council of the European Union (Dec 2023) Council and Parliament reach deal on proposal to revise energy performance of buildings directive
[2] European Commission 2023 Energy Efficiency Directive
[3] Net Zero Asset Owners Alliance (Feb 2024) Serving Asset Owner Clients through Climate Stewardship: a call to action to asset management
[4] See DWS speech at EEFIG final event June 2023: https://download.dws.com/download?elib-assetguid=bbbf9d548e4845b689a2978a82f208d5
[5] DWS Research Institute (March 2024) www.dws.com/insights/global-research-institute/european-transformation-research-hub/

1 / Energy efficiency across asset classes

Illustrating the financial, climate, and policy relevance of a cross-asset class approach

Despite Europe drastically cutting its dependence on Russian energy imports, since 2022, European countries have spent four times as much on Russian energy imports (US$187bn) as on military aid to Ukraine[6]. However, energy efficiency and electrification in transport (i.e electric vehicles), buildings and industry (i.e. heat pumps), could provide ~33% of a net zero scenario's carbon reductions, support industrial competitiveness, improve energy security and create wider health benefits[7].

With many fossil fuel companies largely continuing with their current business models, some asset owners[8] are stating that they will increase their focus on energy demand and energy efficiency. Our report therefore serves as an investor guide to public policy developments to inform capital allocation and the use of investor influence to improve energy efficiency.

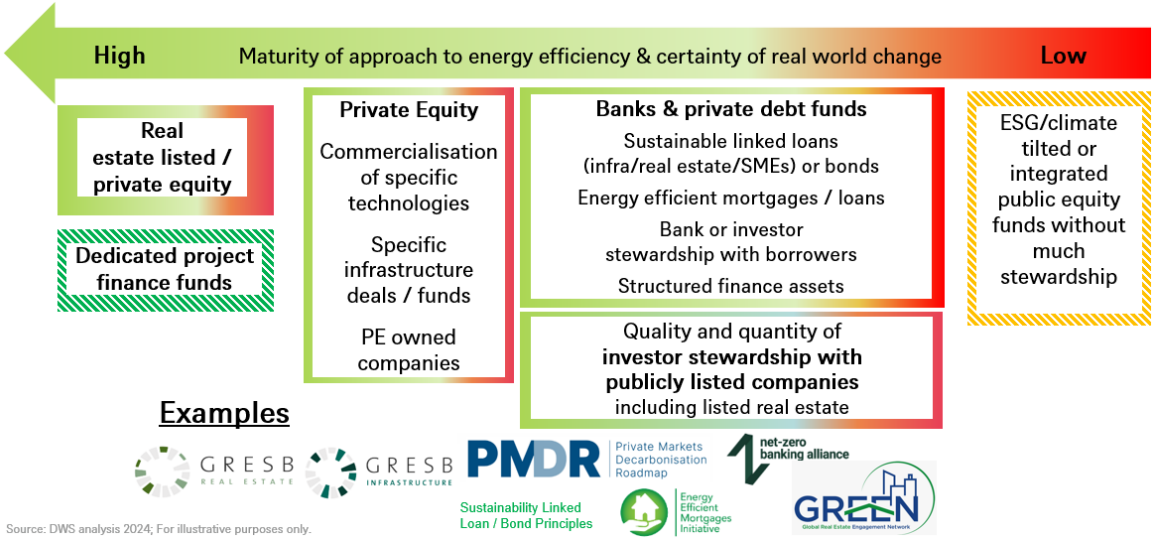
The first section of our report presents how energy efficiency is a cross asset class opportunity. The second section explains the investor implications of the updated Energy Performance in Buildings Directive while the third section focuses on the updated Energy Efficiency Directive.

The updated laws aim to double the EU's efforts to cut energy use compared to 2007-20 when energy use fell by ~9%.

- ~11% of buildings are renovated/year but only 1% of buildings have a renovation impacting energy performance and 0.2% optimise for energy efficiency. The EU aims to double renovations: 35m by 2030 requiring EUR 275bn+/year.
- Even though energy prices have declined over the last two years, millions of Europeans cannot afford to keep their homes warm with healthy indoor environments[9]. Buildings are thus also a social cohesion/equality policy priority.

Different asset classes as shown in Figure 1, involve different types of financial institutions, market rules/practices and regulations that have different abilities and maturities and examples of sector initiatives to support create real world change such as contributing to improving society's energy efficiency. The shading from dark green to red, illustrates that within specific asset classes financial institutions/funds are evolving their approach to net zero and energy efficiency. All institutions can continue to improve. Figure 2 illustrates the ways in which energy efficiency are relevant to major asset classes.

Figure 1: Asset classes have different maturities and approaches to energy efficiency



Source: DWS analysis 2024 based in part on University of Zurich (2020) Investor Impact - How Can Investors Change the World?; GRESB 2024; Net Zero Banking Alliance (2024) Target Setting for Real Estate; Private Markets Decarbonisation Roadmap (2023); Energy Efficient Mortgages Initiative (2023); SLLP (2023); SLBP (2023); Global Real Estate Engagement Network (2023); For illustrative purposes only.

[6] Beyond Fossil Fuels (2024) Russian fossil fuel tracker

[7] International Energy Agency (IEA, June 2022) Value of urgent action on energy efficiency;

[8] PGGM to engage with energy customers (2024); Church of England Pensions Board: There is a limit to what you can achieve with oil & gas engagement

[9] 9.3% of the EU-27 population could afford to keep their home warm; 17% lived in an overcrowded home; 15% of homes have quality issues (Eurostat 2023)

Figure 2: Cross-asset class illustrations of energy efficiency's relevance

Public policy engagement / Macro perspective	Real estate private equity or debt	Publicly listed real estate companies and Active or Passive equity funds	Infrastructure private equity or debt
COP28 climate summit: 120+ countries agreed to double energy efficiency[1] 70 countries, led by France, agreed to strengthen policies, mandatory building codes and incentives to expand carbon neutral, resilient building retrofits[2] Investor evaluation of sovereign bonds includes whether countries have net zero targets and energy efficiency policies.[3] Effectiveness of new legislation can be improved with stakeholder and financial institution dialogue with policymakers. Policies set the *"rules of the game"* for asset classes that can facilitate capital deployment and affect investment returns. Renovations can create economic stimulus[4] and improve energy security. The Net Zero Asset Owners Alliance published principles[5] to assess asset managers' climate public policy engagement activities. NZAOA suggested that asset owners assess asset managers' policy engagement and integrate the assessment into asset manager selection, appointment and monitoring. EUR 225 bn of un-used EU stimulus loans[6] could be used for new renovation partnerships / guarantees with investors & banks.[7] Energy savings supplied 12% of the EU's energy use 2008-21, more than renewables[8]	~34% of Europe's commercial real estate (and a small but growing portion of residential buildings) are owned as an investment: directly by asset owners, private equity real estate funds, or by stock exchange listed real estate companies/trusts that are themselves owned by shareholders such as active and passive public equity funds[9]. 2,084 real estate funds & companies across 75 countries with 170,000 assets (US$ 7.2trn gross asset value) were assessed by GRESB[10] in 2023. Net Zero Asset Owners Alliance (NZAOA) calls[11] for the asset management industry to serve asset owner clients across all asset classes with systematic, transparent climate stewardship including asset manager and investee public policy lobbying aligned with climate commitments. Investments in data centres are growing, including for AI and data security reasons. Energy intensive data centres are owned by tech companies, listed real estate, private real estate funds, and infrastructure funds. Investment by and for data centres in energy efficiency and renewables are an opportunity with EU policies encouraging investment and disclosures. Many private real estate investors have long sustainable building track-records: owning and renovating buildings, lending for renovation and owning or lending to new buildings. Academics[12]: *"GRESB participation and performance are both significant predictors of cross-sectional private real estate fund returns."* Continued growth in tenant demand for sustainable buildings and features.[13] DWS research found that highly energy efficient office buildings have attracted significant rental premiums.[14]	Actively managed listed real estate funds can integrate ESG factors into investment decisions and engage with companies. Passive funds can focus on companies with strong GRESB performance. Academics[15]: *"there is a positive relationship between operating performance of listed European real estate trusts and their greenness."* DWS and Singapore's sovereign wealth fund GIC found that combining listed real estate with private real estate can help improve a portfolio's risk-adjusted returns[16]. Listed real estate companies publicly disclose their sustainability targets and performance, and major companies have set net zero targets[17]. Shareholder & lender engagement with listed real estate companies can help accelerate their sustainability progress[18]. PRI asset owner guidance for evaluating asset manager stewardship activities[19]. PRI is calling for investors to 'right-size' the resources for investor stewardship[20].	Energy transition is one of the top themes for infrastructure investors.[20] Owning or lending to sustainable technology solution providers and infrastructure related assets are an opportunity for significant capital deployment that can help facilitate green and energy efficient investments across the economy. GRESB Infrastructure Fund Assessment grew to cover 172 funds and the asset assessment includes 687 assets across 72 countries: ~USD 393 billion of gross asset value (GAV) at fund level and USD 1.2 trillion of GAV at the asset level (USD 1.6 trn GAV total)[22].

Source: DWS analysis April 2024; 1 – COP28 2023; 2 – Buildings and Climate Global Form (March 2024) Ministerial Declaration; 3 – Transition Pathway Initiative (2023); 4 – Hepburn et al 2020; 5 – NZAOA 2023 Aligning climate policy engagement with net zero commitments; 6 – Bruegel 2022; 7 – Climate Strategy & Partners 2022 EU Renovation Loan; 8 – IEECP (2023) Make energy efficiency a visible part of the energy mix; 9 – INREV and EPRA 2022; 10 – GRESB 2024; 11 – NZAOA 2024; 12 - Devine et al 2022 13 – CBRE 2023 European Office Occupier Sentiment survey; 14 – DWS (June 2023) Performance of green offices at a time of price correction; 15 – Morri et al (2021); 16 – DWS and GIC (March 2023) Role of REITs in Real Estate Allocations; 17 – EPRA 2024 Sustainability Reporting; 18 – Global Real Estate Engagement Network (GREEN) 2024; 19 – PRI 2023 Evaluating managers' stewardship; 20 – PRI (January 2023) Stewardship resourcing; 21 – DWS 2024 Infrastructure Outlook; 22 – GRESB 2024;

Figure 2: Cross-asset class illustrations of energy efficiency's relevance (cont'd)

Banks and structured finance	Direct Lending to SMEs & Private Equity owned companies	Technology commercialisation private equity / venture	Energy efficiency project finance funds
Banks are the most connected financial institutions with Europe's homeowners and many SMEs. 25% of European homeowners have a mortgage[1]. 24 of Europe's 30 largest banks are members of the Net Zero Banking Alliance but only ~30% of major banks already have a voluntary mortgage portfolio target[1]. The Net Zero Banking Alliance published guidance for banks' climate target setting for real estate/mortgages[2] EEFIG report found statistical evidence that energy efficient loan portfolios can have lower credit risk[3], which could be recognised with lower regulatory capital weights The European Banking Authority (EBA) recommended ways that banks and policymakers could work to expand the early-stage green loan and mortgage market[4] Banks' shares and bonds issued by or underwritten by banks, and issuance of asset backed / structured finance securities are important parts of investor portfolios. Investors have published climate expectations for banks[5] and publicly evaluated 26 major international banks' net zero progress[6] The European Central Bank (ECB) stated[7] that securitisation is a key element of Europe's financial system and can contribute to the financing of the green transition by transferring loans/risk to investors and enabling banks to undertake more real economy lending. The European Supervisory Authorities and the ECB jointly stated their support for enhancing climate disclosure for securitised assets[8]	70% of lending to small/medium enterprises (SMEs) in Europe comes from banks but direct lending from investors is an alternative to bank loans, which can help provide SMEs with the capital needed for their transformation[9]. For borrowers, direct lending offers speed, convenience, and flexibility by working with a single or small number of lenders. This gives Direct Lending investment funds some influence with the SME borrower on ESG priorities such as energy efficiency[9]. Direct Lending funds often work with Private Equity firms that may own fast growing SMEs. Growing numbers of PE firms have climate commitments to help their investee companies ~31% of SMEs have been investing in energy efficiency according to EIB's survey[10] Only 10-11% of SMEs have received a sustainability linked loan[11]	35% of the technologies needed for net zero by 2050 are at demonstration or prototype stage. In 2021, the proportion was 50%, demonstrating technology progress. There is thus an important role for more early-stage capital and expertise for technology commercialisation[12]. 30% of capital invested in early-stage European technologies (pre–Initial Public Offering) went to carbon & energy solutions including energy efficiency[13], making it the largest sector for private technology investment with 3x growth from 2021. Insurance companies are recognising their important role in technology commercialisation & deployment[14].	Project finance funds are pioneers in energy efficiency finance, impact investing and reporting[15] Detailed reporting of positive impact from investments[16] Innovation in financing models could be applied by other asset classes.

Source: DWS analysis March 2024; 1 – Climate Strategy & Partners (2023) Engaging retail lenders in home renovation; 2 – NZBA (2024); 3 – EEFIG (2022) Quantitative relationship between energy efficiency and lower probability of default and increased value; 4 – EBA (2023) Response to the Call for Advice from the European Commission on Green Loans and Mortgages; 5 – IIGCC 2023; 6 – TPI 2023; 7 – ECB (2022) Supervisory priorities and securitisation; 8 – ESMA (2023); 9 – DWS (2023) Direct lending and the European transformation; 10 – EIB (2023); 11 – European Commission quoted in DWS 2023; 12 – IEA 2023; 13 – State of European Tech 2024; 14 – Geneva Association 2024; 15 – European Commission established the European Energy Efficiency Fund in 2011; 16 – EEEF.eu

2 / Energy Performance of Buildings Directive

The EU has strengthened the Energy Performance of Buildings Directive (EPBD)[10]. Member States have two years to implement its provisions in domestic legislation[11]. Several follow-up regulations will also be created over the coming years.

The EPBD was revised to deliver the EU Commission's October 2020 Renovation Wave strategy, which set a goal of doubling building renovation rates[12]. The EPBD is part of the REPowerEU strategy to end reliance on Russian fossil fuels before 2030.

The reform is known as a 'recast' which allows the EU to change part of a law while protecting other parts of the law from alteration[13]. Section 2 of our report analyses the following EPBD provisions. We also discuss the politicisation of retrofit and climate policies. Section 3 of our report analyses the strengthened parallel Energy Efficiency Directive[14].

1) Minimum Energy Performance Standards (MEPS) – triggering renovation of the least efficient buildings
2) National Building Renovation Plans (NBRPs) and fossil fuel boiler phase-out – a heat pump investment opportunity
3) Mandatory solar installations on buildings
4) Electric Vehicle (EV) charge points – infra & real estate investors' role in vehicle electrification and grid flexibility
5) Smart Readiness Indicator – a future requirement complementing investor/city digital strategies and grid flexibility
6) Mortgage Portfolio Standards (MPS) – a global first of a kind voluntary regulation for lenders
7) Zero emissions new buildings
8) Embodied carbon – changing demand for building materials and the potential to support industrial decarbonisation
9) Financial incentives – creating new incentives / partnerships to accelerate investment in retrofits

In May 2020, DWS published recommendations for the Renovation Wave strategy, and we led the Steering Committee of the Energy Efficiency Financial Institutions Group (EEFIG) in writing a letter to Energy Commissioner Simson with recommendations[15]. We also gave input to policymakers through the EPBD policy process the Institutional Investors Group on Climate Change (IIGCC). IIGCC stated: "*"DWS plays a leading role as an IIGCC member in the areas of energy efficiency, real estate, and public policy. DWS co-led the drafting of IIGCC's net zero guidance for real estate and actively supported our policy engagement on the current and previous revisions of the Energy Performance in Buildings Directive".*[16]

1) Minimum Energy Performance Standards (MEPS)

MEPS are a regulation to trigger renovation of existing buildings on a large scale. MEPS requires existing buildings to meet an energy performance requirement in a certain time frame, as part of a renovation plan for a building or at a trigger point such as the sale, rent, or change of purpose of a building. MEPS help address the 'split incentive' between a building owner and tenant. "*If the actor who invests in efficiency measures (capex) is not the same as the actor who reaps the subsequent financial benefits (lower op-ex), split incentives can arise*"[17]. The EU will develop a methodology for MEPS cost-optimal levels. Member States must establish MEPS in commercial and residential sectors with the following goals:

- Commercial: the 16% most energy inefficient buildings must be renovated by 2030 and 26% most inefficient by 2033.
  - Certain exemptions can apply, for example, for historical buildings. Member States are expected to achieve equivalent energy performance improvements in other parts of the commercial building stock. (Article 9.1)
- Residential Sector: Member States must establish a national trajectory that leads to reducing the average primary energy use of residential buildings by 16% by 2030 and by 20-22% by 2035. 55% of the decrease of the average primary energy use needs to be achieved through the renovation of the 43% worst-performing buildings. (Article 9.2)

[10] Our analysis is based on: Council and Parliament reach deal on proposal to revise energy performance of buildings directive. EPBD was approved in the European Parliament with a large majority (370 in favour vs 199 against) and approved by Member States in the European Council in April 2024.
[11] The two-year implementation period officially starts once the recast Directive has been published in the EU's Official Journal.
[12] https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/renovation-wave_en
[13] Client Earth 2016 What is the EU recast procedure and why is it used?
[14] European Commission 2023 Energy Efficiency Directive
[15] Portfolio Advisor Europe (May 2020) DWS gives building recommendations for EU recovery plan
[16] IIGCC February 2024
[17] EU Joint Research Centre (2017) Overcoming the split incentive barrier in the building sector.

In the US: Colorado, Maryland, Oregon, and Washington State have building performance standards for existing commercial buildings. An additional four states have benchmarking and transparency policies in place, indicating that they could eventually enact such policies. New York City, Boston, & St. Louis are cities that also have building performance standards[18].

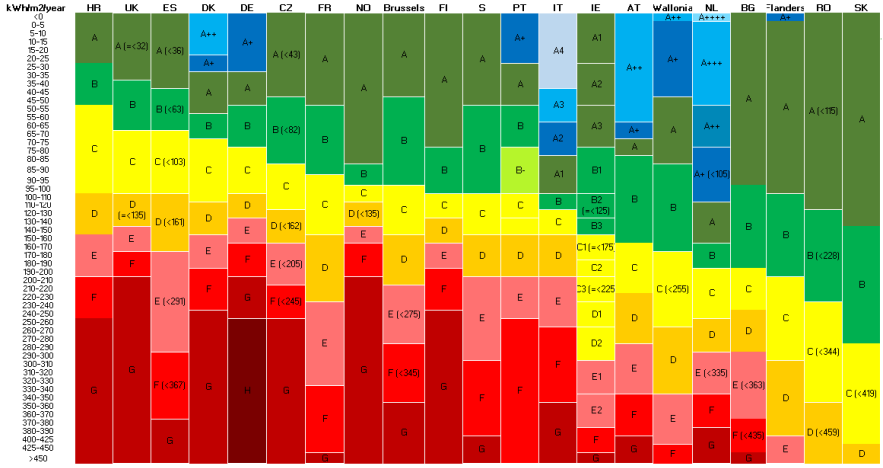
Cross asset class implications – Minimum Energy Performance Standards (MEPS)

Buildings owned by private real estate funds or listed real estate companies, that would qualify as being in the worst-performing % of buildings in a particular country will need to be renovated in the next 6-11 years depending on the sector.

The commercial sector MEPS are more ambitious than residential due to political concerns about the feasibility of residential retrofit targets. As most buildings in Europe are residential (90% by number, 67% by floor space)[19], efficiency targets cannot be met by commercial property alone. Financial and policy solutions for residential retrofits are thus an important priority.

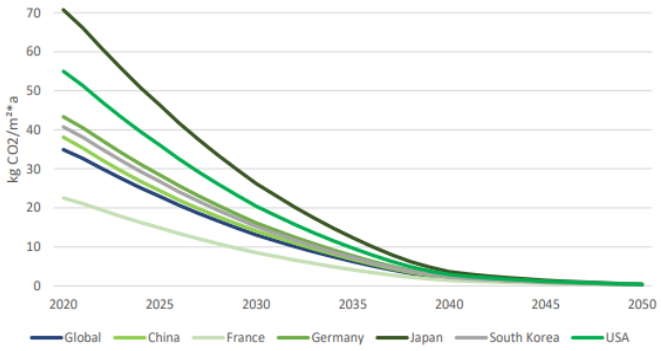
Minimum standards are already in place in the UK and the Netherlands. We can see that for several years preceding the introduction of MEPS, both investor and occupier demand focused on more energy efficient offices. In the UK, the office stock has shrunk since 2018 as non-compliant or obsolete stock is removed (converted to other uses). On a European basis, highly energy efficient offices attract significant rental premiums as detailed in our Office Green Premium report.

Figure 3: Variation in Energy Performance Certificates underlying energy intensity metrics, makes creation of MEPS difficult and not aligned with CRREM: climate science informed real estate net zero pathways.



Source: European Datawarehouse (2020) Babel Tower of Energy Performance Certificates & databases in Europe;

Figure 4: CRREM science based real estate pathways



Source: CRREM 2023

The technical definition of MEPS will be a challenge due to the differences in how Energy Performance Certificates (EPCs) are defined as shown in **Figure 3.** Policy debate on EPBD ruled-out redefining or aligning EPCs across Europe.

Prior DWS research presentations at EEFIG meetings and IIGCC policy papers on EPBD have recommended that MEPS design would be most effective if they are aligned with real estate net zero pathways: Figure 4.

Carbon Risk in Real Estate Monitor (CRREM) is an EU Commission and investor funded tool that is increasingly used by investors to assess different types of real estate buildings in different countries for their alignment with science-based emission reductions.

CRREM is integrated into GRESB and real estate net zero guidance.[20]

CRREM is perhaps one of the most successful EU funded projects in terms of adoption by investors[21].

Many large real estate private equity and debt funds and some listed real estate companies have strengthened their focus on energy efficiency and other ESG priorities. MEPS creates real estate opportunities such as for Next generation offices.

[18] CBRE (Oct 2023) US Building Performance Standards in 2023 and beyond
[19] EU Building Stock Observatory (2020)
[20] GRESB 2023; IIGCC 2023; EPRA 2022; INREV 2022; SBTI 2022
[21] CRREM 2023; DWS presentation (2023)

The EU and Member States will also develop Renovation Passports as a voluntary tool to complement EPCs for building owners: a tailored roadmap for renovation through specific steps that can be taken over time to reduce energy use[22].

Next generation offices

Future proofed sustainable offices do not exist in the quantities needed, in the locations necessary and with sufficient certifications/energy efficiency, which creates an investment opportunity. DWS's report on Sustainable Next Generation Office identifies a grading system for evaluating offices' micro-location, ESG and net-zero alignment, alignment with the occupiers' expectations and asset specifications. A parallel report evaluated the attractiveness of major cities. DWS's European Transformation Scorecard includes a metric on the proportion of ESG labelled offices in major countries. DWS's Real Estate Strategic Outlook concludes that 2024 could be an exceptional year for real estate investment.

With MEPS enhancing the regulatory impetus for building renovation, the investment opportunity is likely to grow for infrastructure investors and companies providing technologies, services, and materials.

Infrastructure investments and energy efficiency[23]

DWS's European Infrastructure Strategic Outlook[24] concludes that owning or lending to sustainable technology or digital solution providers is an opportunity for significant capital deployment and can help facilitate green, energy efficient, and digital investments across the economy. We see opportunities such as:

- an infra loan to a renewable/efficient tech installation company that could help homeowners with low upfront cost.
- an infrastructure investor could acquire and help scale up the energy transition focus of the many small companies that install and maintain green building technologies in hotels, supermarkets, and other buildings.
- an infrastructure investor owning a transport company could support the company's shift to electric vehicles.

DWS's report on Direct Lending finds that the global use of sustainability linked loans (where the interest rate slightly varies on the SME's progress towards an ESG target) declined from a peak of US$200bn in 2021. We also found that only ~10-11% of European SMEs may have obtained a sustainability linked loan. Banks and private debt investors can aim to lend to companies (who themselves may own or use buildings that will be subject to MEPS), including with sustainability linked loans.

For debt investors and lending institutions, MEPS enhances the importance of due diligence. Loans can be provided to help a building meet a MEPS regulation. However, DWS's Real Estate Debt Update report, states that:

- *Continued polarisation within the real estate market and a rising risk of obsolescence for non-energy efficient properties have resulted in an increasing focus on the quality of underlying assets… buildings that meet the highest environmental standards are likely to achieve higher rental growth, maintain their value better, and offer greater liquidity upon selling, all of which may reduce risk from a lender's perspective. Moreover, restrictive monetary policy and a weakening economic environment have led to an increase in risk aversion from lenders…*
- *Lower quality buildings already have greater difficulty in securing financing, and we expect to see rising margins for such assets as well as more restrictive [financing] terms."*

Real estate asset managers working with the Urban Land Institute (ULI) are helping address the risk of real estate stranded assets[25] by developing and promoting a series of sector wide changes. For instance, standardising the secure sharing between buyers and sellers of a building, of data on the cost of renovating buildings to meet MEPS goals, could help the real estate industry integrate transition risk in valuations and reduce stranded asset risk.

Regarding structured finance and asset backed securities: Moody's note[26] highlighted how EPBD may affect credit risk depending on the security's diversity and exposure to inefficient underlying assets (i.e. mortgages, real estate/SME loans).

[22] See EU funded project to connect renovation passports with Energy Performance Certificates
[23] DWS (2024). For illustrative purposes only.
[24] DWS (January 2024) European Infrastructure Strategic Outlook
[25] https://europe-uli-cchange.org/
[26] Moody's (January 2024) Real Estate – Europe: Revised energy directive will divide property markets, with varying credit implications.

2) National Building Renovation Plans (NBRPs) and Fossil fuel boiler phase-out

The new EPBD requires Member States to establish a NBRP, with first drafts due by December 2025. The Commission will review and comment on NBRPs with Member States publishing their final plans by 2026. The plans will be revised every five years. Each NBRP must include a roadmap with 2030, 2040 and 2050 national targets for building renovation rates.

Annex II to the EPBD contains a template for NBRPs with a set of mandatory and optional indicators for Member States. Real estate owners may be asked to share building data with governments for their renovation plans.

The NBRPs should include "a roadmap with a view to phase out of [standalone] fossil fuel boilers by 2040". (Article 3)

Cross asset class implications of renovation plans and fossil fuel boiler phase-out.

The IEA's net zero scenario recommends[27] no new fossil fuel boilers should be installed from 2025. Member States may thus face pressure for more ambitious on fossil fuel boiler phase out, but policy politicisation is a risk that we describe below.

Investors will need to be vigilant as to how NBRPs evolve given the competing political pressures to phase out vs retain fossil fuel boilers. For instance, initial heating policy proposals were very contentious in Germany[28]. After much debate, Germany de-facto banned installation of new gas or oil heating systems in new buildings in new residential areas from January 2024. New fossil heating systems can be installed until a municipality has an approved transition. Large cities have until 2026 to present these plans, while small towns have a 2028 deadline. Subsidies are being provided[29].

The IEA concluded that heat pumps are a critical technology[30] for replacing fossil fuel boilers as shown in the box.

In contrast, a review[31] of 54+ independent studies found that "*The scientific evidence does not support the widespread use of hydrogen for heating buildings. This is because it is less efficient, more costly, and more environmentally harmful than alternatives such as heat pumps and district heating*". Hydrogen is likely better prioritised towards industrial uses, aviation, and long-duration power grid balancing[32].

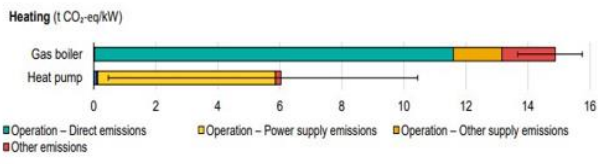
IEA: Heat pumps are a key energy efficient and renewable technology and can be cheaper to operate than fossil boilers depending on energy prices and installation quality…but financing solutions are necessary for upfront cost

"A heat pump extracts heat from the surrounding air, geothermal energy underground, nearby water, or waste heat from a factory. It then amplifies and transfers the heat to where it is needed". Well installed heat pumps can save significant amounts of energy and carbon, even in regions with carbon intensive electricity as shown in Figure 5.

Currently available heat pumps are 3-5x more efficient than fossil gas boilers. Heat pump installation grew 34-39% in 2001-2022 in Europe but the growth rate fell by 5% 2022-23 due to policy delays and uncertainty[33]. There are now ~23 million heat pumps, heating 16% of Europe's buildings. The highest installation rates are in the Nordic countries where it is coldest.

Heat pumps can be on average 30% cheaper to run than fossil gas residential boilers over their lifetime and can help reduce the impact of energy price shocks. However, researchers found that electricity is over-taxed in Europe compared to fossil fuels which affect the cost competitiveness of heat pumps and electric vehicles[34].

Figure 5: Heat pump carbon savings vs gas boilers



Source: IEA 2021

EU Finance Ministers have been unable to agree green reforms to the 2003 Energy Tax Directive[35].

The upfront cost of heat pumps can be a barrier, that can be solved with financing solutions.

The EU Commission decided to delay publishing a Heat Pump Action plan until after European elections in June[36].

[27] IEA (2023) Net Zero
[28] Politico (October 2023) How the far right turned heat pumps into electoral rocket fuel;
[29] Clean Energy Wire (Sept 2023) Germany agrees phaseout of fossil fuel heating systems.
[30] IEA (2022) The future of heat pumps
[31] Rosenow, Jan (January 2024) A meta-review of 54 studies on hydrogen heating
[32] Liebreich, Michael (2023) Hydrogen Ladder 5.0
[33] European Heat Pump Association (EHPA) 2024; Morgan Stanley 2023
[34] Regulatory Assistance Project (2022) Levelling the playing field: aligning heating energy taxes and levies in Europe with climate goals
[35] Euractiv (May 2023) Energy Taxation Directive: Europe's key climate law stuck in a quagmire
[36] European Heat Pump Association (EHPA) January 2024 Twenty organisations urge EU Commission to publish heat pump action plan

Future infrastructure opportunity: heat pumps for district heat networks and large buildings

There are 17,000+ district heating networks in Europe: 190,000km of pipes heating 67m citizens' homes, ~12% of Europe's building and water heating energy supply[37]. However, most of these systems use fossil fuels[38].

Modernising and decarbonising district heating systems requires significant investment (i.e. heat pumps and waste heat such as from data centres). It also requires coordination between the public sector and financiers. Researchers have suggested principles for policymakers and presented examples of district heating modernisation[39]. We see heat pump and/or waste heat supported modernisation or expansion of district heating being a potential future opportunity for infrastructure investors. The maturity and stability of underlying regulatory models will be key to attract capital[40].

Politicisation of energy efficiency, retrofit, heat pump, and climate policies

We have seen debate over energy efficiency and other policies become contentious, and policies delayed or weakened[41]. We have seen some companies using public affairs companies to help get newspaper articles published questioning the benefits of heat pumps[42]. Researchers found that some large companies spend on average US$296,000/year on anti-climate policy lobbying while other companies only spend US$165,000/year on pro-climate policy lobbying[43].

On the flip side, as energy prices spiked following Russia's invasion of Ukraine, the European Commission, and the International Energy Agency (IEA) developed recommendations and communication on the personal actions that individuals can take to reduce their energy use[44]. Many governments also launched communication and education efforts.

Public policies and public sector financing should be designed to help people and the private sector adopt new technologies, accounting for their financial situation and policy/market failures. But regulations to phase out polluting technologies by a certain date also have a role to play. Minimum Energy Performance Standards give time for individuals, companies, and financial institutions to plan and carry out renovations before regulations come into effect.

We believe that there continues to be a need for clear public communication over the value of energy efficiency policies and the benefits and limits of different technologies. Misinformation needs to be halted and quickly corrected. The news media, financial institutions, policymakers, companies, and experts all have roles to play in clearly communicating the costs and benefits of the energy transition to their respective audiences.

3) Mandatory solar installations on buildings

If "*technically suitable and economically and functionally feasible*", new buildings will need solar renewable electricity photovoltaic (PV) installations with different start dates and thresholds for public, commercial, and residential buildings.

Existing public buildings will be required to install solar energy, with a progressive approach that starts in December 2027 for the largest public buildings (2,000 sqm) and progressively reduces the threshold until December 2030 (250 sqm).

As of December 2027, all existing commercial buildings will be required to install solar energy (how much is to be determined) when undergoing a renovation action that requires an administrative permit, major renovation or works on the roof. All new roofed carparks adjacent to buildings must also have solar by December 2029. (Article 9a).

Cross asset class implications for mandatory solar

We can look to France to see the implications of mandatory solar. Since 2015, new buildings in French commercial zones have been required to install solar panels or green roofs, and the "Loi ELAN" requires PVs to be installed on all existing commercial real estate assets from 2028. We have seen that the ability to sell a building (asset-level liquidity) improves when PV panels are installed, or the building is 'PV ready'. Proper due diligence on feasibility of installing PV panels is essential. Insurance costs can be higher with PV panels. Also, solar installations help GRESB sustainability scores.

[37] https://www.euroheat.org/
[38] RAP (June 2023) How clean is Europe's district heating - 32% gas, 26% coal, 22% biomass, 15% incineration, 3% oil, 2% geothermal
[39] RAP (Nov 2023) Principles for clean, efficient & smart district heating and RAP (May 2023) District heating can support Europe's decarbonisation
[40] NERA (Oct 2023) Economic regulation of district heat networks: a survey of European approaches
[41] Carbon Brief (Sept 2023) Analysis: UK government
[42] Resilience (July 2023) Media blitz against heat pumps funded by gas lobby group
[43] ECGI (February 2024) Corporate climate lobbying
[44] IEA and European Commission (2022) Playing my part

The cost competitiveness of solar panels, speed of installation, tenant interest and regulations are supporting the growth of new business models, including a 'capex light' investment scheme where a third-party operator bears the initial investment, operates the PV equipment over a long period and sells the electricity to the network. We expect real estate investors to draw on this type of offering, which is an opportunity for infrastructure equity or debt investors to work with solar installers and operators.

However, buildings that install large numbers of solar panels effectively become power stations and may be subject to regulations that were designed for traditional power generators. Such barriers need to be addressed to unlock investment.

4) Electric Vehicle (EV) charge points

New residential buildings will have to have at least one recharging point. In existing commercial buildings with more than five car parking spaces, a choice will be possible between installing one recharging point for every ten parking spaces or ducting for future EV charging for at least 50% of the parking spaces. (Article 12).

For new office buildings and office buildings undergoing major renovation and that have more than five parking spaces, Member States will require the installation of at least one recharging point for every two parking spaces.

For commercial buildings with more than twenty parking spaces, Member States shall ensure that by January 2027, at least one recharging point for every ten-parking space, and 50% of parking spaces should have conduits for future recharging points. A request from tenants or building co-owners to install recharging points may only be refused if there are serious and legitimate grounds for doings so. Member States are to streamline permitting procedures for charge point installation.

Cross asset class implications for EV recharging

While EVs are a transport technology, their higher efficiency compared to fossil fuelled vehicles, means that EVs contribute to EU efficiency targets (measured on total energy use). DWS's European Transformation Scorecard[45] includes a metric on the growth of battery electric vehicles. From almost zero EVs six years ago, the share of EVs in the total car fleet has increased across all European countries. The biggest gains in BEV market share have occurred in Denmark, Sweden, and Finland.

Infrastructure opportunities: EV charging

A DWS article[46] found that while Europe accounts for a third of the global EV car fleet, it is only home to a fifth of the charging stations globally. With growing EV sales, charging point infrastructure needs to expand. A 2014 EU law recommends that Member States reach one public recharging point per 10 electric light duty vehicles. Only the Netherlands, Italy and Greece have met this metric. For instance, the Netherlands is facilitating recharging point infrastructure in anticipation of EV growth. The country has less than 10% of EVs in the EU-27 but almost 33% of recharging points.

A DWS report[47] concluded that EV charging infrastructure installation rates need to increase 9x by 2030. Failing to invest will put at risk the EU target of increasing EV passenger car numbers to 43 million by the end of the decade.

Infrastructure investors are likely frontrunners to finance the charging infrastructure network, but currently, most investment opportunities do not provide suitable risk/return profiles for infrastructure investors.

Initiatives to crowd-in private sector capital are therefore urgently required. While capital flows into charging infrastructure have begun to ramp up, they are not nearly large or widespread enough to meet required roll-out. Subsidy support should not only address installation, but also operation, given the EV market has yet to fully develop.

Some real estate investors may look to partner with infrastructure investors and/or dedicated companies, to finance the installation of EV chargers for large offices, apartments, and supermarkets.

However, carbon accounting guidance should clarify that electricity (and related emissions) used to charge vehicles that leave a building, should not be attributed to the building but to the vehicle owner.

[45] DWS (April 2024) Europe's transformational scorecard
[46] DWS (April 2023) E-mobility solutions
[47] DWS (March 2023) Transforming transportation

Logistics real estate investments

A DWS real estate report[48] found that European logistics remains a key investment strategy, supported by market fundamentals and healthy rent growth. Logistics can play an important role in net zero through the upgrading of older properties. We see the opportunities in brownfield redevelopment for last hour and urban delivery in Western Europe.

With many warehouses having flat roofs, solar is a clear opportunity. Major sustainable improvements to existing logistics stock would retain embodied carbon. However, upgrading an existing warehouse also comes with risks regarding if the buildings' specifications (internal height, floor loading capacity etc) are sufficient to meet new occupier demand.

DWS's report concluded that the best opportunity for risk-adjusted returns is in the demolition of existing, secondary logistics stock and replacement with new build, highly sustainable buildings that meets modern-day logistics requirements. The recycling of construction materials, if possible, would also allow for a more limited embodied carbon impact.

According to CBRE's 2023 Survey, sustainability is becoming increasingly important for European logistics occupiers.

Beyond rooftop solar, logistics warehouses potentially have an anchor role to play in electrifying delivery fleets.

EV100 is a commitment by major corporates to switch their owned or contracted fleets to EVs and/or to install EV charging for their staff and/or customers. More than 120 companies globally have commitments to transition 5.75m+ vehicles to electric and have already put 400,000 EVs on the road[49].

As well, independent analysis indicates that electric trucks for parcel delivery are starting to be or may already be at operational cost parity with diesel vehicles for last-mile delivery in major European cities[50].

A 2023 update to the European Alternative Fuels Infrastructure Regulation sets a number of mandatory national targets and criteria for the deployment of electric charging/hydrogen infrastructure, for vehicles, vessels and stationary aircraft.

Some major truck manufacturers are making progress developing EV long-haul trucks, though further policy support and technology is needed[51]. Roll-out of EV long-haul trucks will require 'megawatt charging' infrastructure along major freight corridors. Independent analysts have examined the challenges and opportunities of this goal[52].

Germany, Sweden, and the UK are among countries trialling Electric Road Systems with wires embedded in roads or overhead that charge electric heavy good vehicles or buses[53]. Infrastructure investors and logistics owners (depending on their location) may be useful partners for large scale charging / electric road system infrastructure for long-haul trucks.

Parked electric vehicle fleets can also contribute to power grid flexibility as the EPBD requires Member States to ensure that recharging points are 'bidirectional': allowing vehicle batteries to provide electricity back into the power grid when needed. Smart charging means charging a vehicle flexibly to lower costs for the fleet owner and power grids, to manage the integration of renewables and to minimise EVs' collective power system impact. More progress needs to be made by policymakers, grid and fleet operators and companies/investors to expand smart charging[54] and demand side flexibility. Smart charging infrastructure may increasingly be an expectation for building tenants.

5) Smart Readiness Indicator for buildings and European building systems strategy

The 2018 Energy Efficiency Directive created the concept of a Smart Readiness Indicator (SRI) for buildings which will sit alongside Energy Performance Certificates (EPC) to evaluate the presence of different energy system or intelligent building control technologies. The aim is for 'Smart readiness' to help enhance a building's energy efficiency (Article 13). Since then, experts have developed and piloted[55] the indicator system in Austria, Croatia, the Czech Republic, Denmark, Finland, France, Slovenia, and Spain. Figure 6 shows the elements of the SRI. An online assessment tool is available[56].

[48] DWS (January 2024) Pursuing higher returns in European logistics
[49] Climate Group (2023) EV100 Progress and Insights report
[50] https://www.raponline.org/knowledge-center/electrifying-last-mile-delivery/
[51] Bloomberg New Energy Finance (2023) Electric Vehicle Outlook
[52] https://www.raponline.org/knowledge-center/power-moving-loads-cost-analysis-megawatt-charging-europe/
[53] Electrive (2022) Charging project on German Autobahn; IKEM (2020) Models for the development of electric road systems in Europe
[54] https://www.raponline.org/knowledge-center/time-is-now-smart-charging-electric-vehicles/
[55] European Commission (2023) Smart Readiness Indicator Test Phases
[56] https://smartreadinessindicator.com/

While the SRI is voluntary, it will likely become mandatory. By June 2027, the Commission must create a delegated act, requiring the SRI for commercial buildings with a combined heating, air conditioning, and ventilation capacity of 290+ kW.

It is possible to create more comfortable and thus healthier buildings to live/work in, with lower energy use, through technologies such as smart thermostats and lighting, automated sunshades, ventilation with air-quality sensors and intelligent scheduling of energy consumption. These types of technologies can create energy savings and help balance the power grid as renewable energy generation grow. The SRI aims to provide a common language for building stakeholders (owners, designers, solution providers, policy actors, etc.) to discuss how to make buildings smarter, and what benefits this will bring.

Figure 6: Europe's Smart Readiness Indicator (SRI) will complement Energy Performance Certificates (EPCs)

The methodology for calculating the SRI is based on the assessment of smart-ready services that the building has or could use:

- heating
- cooling
- hot water
- ventilation
- lighting
- electricity
- window shading
- electricity
- EV charging
- monitoring and control

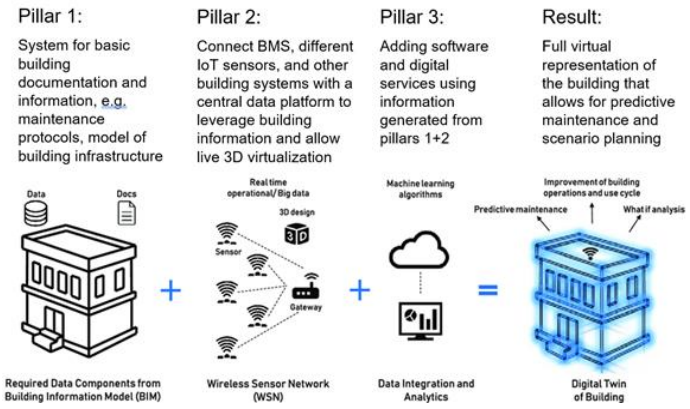
Source: European Commission 2022

A Smart Readiness Indicator may be one element of a digital strategy for real estate investors and building owners. For instance, large real estate asset managers are increasingly strengthening their own digital technology solutions to handle a variety of data and information. Figure 7 shows possible elements of a building digital twin strategy.

The EU/Member States will develop a building systems data strategy (EPBD Article 14) to ensure building owners, tenants, managers and third parties (with consent) have access to all readily available building data through a digital building logbook. Member States shall also set up national databases on energy performance of buildings (Article 19), which may be interconnected databases that collect data from all relevant sources. Drawing on data sources like GRESB will be important. Aggregated and anonymised data shall be made publicly available in compliance with EU and national data protection rules.

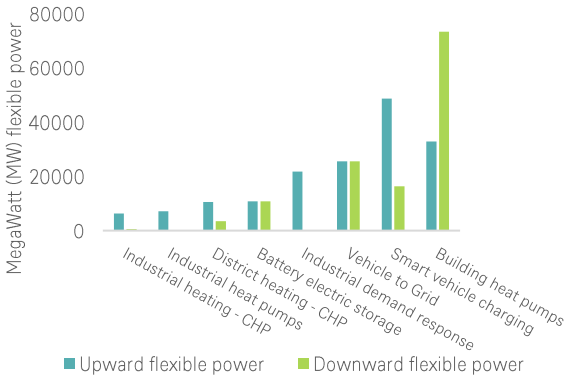
Figure 8 shows the results expert analysis from DNV that the timing of buildings' heat pump use could be the largest source of energy demand flexibility in Europe. Greater demand side flexibility could result in EUR71bn electricity cost reduction for consumers, indirect benefits of EUR300bn due to lower energy system costs such as 61% less 'curtailment' of renewable energy generation due to better matching of energy demand with wind/solar generation and lower grid investment costs, and annual greenhouse gas savings of 37.5 million tonnes. However, countries need to strengthen the energy flexibility market[57].

Figure 7: A digital building twin strategy



Source: DWS 2023. For illustrative purposes.
Note: BMS = Building Management System; IoT = Internet of Things

Figure 8: Heat pumps in buildings could be the largest source of energy demand flexibility to balance the grid



Source: smartEn (2022) Demand Side Flexibility: quantification of benefits
Note: CHP = Combined heat and power

[57] smartEn (2024) Report reveals limited demand side flexibility growth in 30 European countries

6) Zero Emissions new buildings

All new buildings built and owned by public bodies need to be zero-emission buildings by 2028, and by 2030 for the whole economy. (Article 7). 'Zero-emission building' means a building with a very high energy performance requiring zero or a very low amount of energy, producing zero on-site carbon emissions from fossil fuels and producing zero or a very low amount of operational greenhouse gas emissions. This does not preclude the building receiving energy generated from fossil fuels as part of a district heating system.

Real estate fund acquisitions of new buildings with a completion date post-2028 should comply with the EPBD's 'zero emissions' standard. Real estate developers and lenders will need to ensure future building designs can achieve this standard.

7) Embodied Carbon

Until recently, embodied carbon has not been a focus of EU legislation. As anticipated in our 2023 report "Decoding Carbon", the EPBD reform marks a shift towards recognizing the importance of embodied carbon emissions.

By 1 January 2027, Member States shall publish and notify to the Commission a roadmap detailing the introduction of limit values on the total cumulative life-cycle Global Warming Potential (GWP) of all new buildings and set targets for new buildings from 2030, considering a progressive downward trend, as well as maximum limit values, detailed for different climatic zones and building typologies. (Article 7)

Cross asset class implications

As Member States' roadmaps limiting building lifecycle GWP are published, real estate investors will need to ensure that new acquisitions comply with these lifecycle limits. The future regulation of embodied carbon limits currently does not include carbon embodied in refurbishment materials, but it is conceivable that thinking on this matter will develop in the future to include limits as well, especially for major refurbishments.

GRESB created a new indicator on embodied carbon for the 2023 Real Estate disclosure[58]. This change will encourage the collection of embodied carbon data as part of carbon accounting and commitments. Embodied carbon emissions data will be collected from New Construction assets and Major Renovation projects separately, alongside the life cycle stages and building layers included in the entity's embodied carbon analysis for assets/projects completed during the reporting year.

Developing and commercialising sustainable building materials could be part of a focus for a private equity/venture transition platform strategy.

Major European industrial companies published the 'Antwerp Declaration for a European Industrial Deal' with policy recommendations for strengthening Europe's green industrial competitiveness[59]. One of their priorities is to "*Boost demand for net zero, low carbon and circular products*" such as through private business procurement initiatives. A model for this is the World Economic Forum and US State Department's First Movers Coalition.

The EPBD could be a trigger for real estate owners and developers to create low carbon demand procurement signals to manufacturers of steel, cement, and aluminium which represent most embodied carbon in building materials.

8) Mortgage Portfolio Standards (MPS)

A voluntary regulation will be developed within 12 months to encourage lenders to provide more loans for renovation and to establish a path to increase the median energy performance of the portfolio of buildings covered by their mortgages towards 2030 and 2050, and to encourage potential clients to make their property more energy efficient. (Article 15).

Cross asset class implications

This is the first time globally that such a regulation will be developed. Lenders are likely to scrutinize and support energy performance with a view to promoting the median of a portfolio of loans they manage. Net zero goals of banks and

[58] GRESB May 2023
[59] https://antwerp-declaration.eu/

investors imply targets for all major portfolios, including mortgages. A Deutsche Bank mortgage expert spoke in favour of this concept when it was first proposed in 2021.

While the regulation will be voluntary, a report on retail lending and home renovation found that 24 of Europe's 30 largest banks are members of the Net Zero Banking Alliance (NZBA) and 30% of major banks already have a voluntary mortgage portfolio target. The NZBA has published best practice guidance for net zero target setting by banks for commercial and residential real estate, which could be useful for the design of Mortgage Portfolio Standards. We suggest that regulations will be most successful when they align with metrics used by financial institutions.

During EPBD debate, banking associations called for Mortgage Portfolio Standards to focus on incentivizing rather than requiring portfolio targets[60]. The application of MPS to private debt funds/structured finance needs to be clarified.

Energy efficient loan portfolios can have lower credit risk according to statistical analysis by major banks and EEFIG. The European Banking Authority cited this EEFIG research in a discussion paper and is now consulting on ESG risk management guidance under the Capital Requirement Directive. More financial institutions could assess how energy efficiency can reduce credit risk in loan portfolios, which could be used by regulators to create green capital weights.

9) Financial Incentives

To channel private capital into building renovations, Member States shall promote the effective development and use of enabling funding and financial tools, such as energy efficiency loans and mortgages for building renovation, energy performance contracting, pay-as-you save financial schemes, fiscal incentives.

For example, this might be reduced tax rates on renovation works and materials, on-tax schemes, on-bill schemes, guarantee funds, funds targeting deep renovations, and mortgage portfolio standards (Article 15). Public financing for renovations may help private capital but there needs to be more clarity on individual country policies to comment further.

Banking associations stated[57] that Minimum Energy Performance Standards (MEPS) should be combined with EU grants and subsidies for vulnerable households, financial institutions guarantees and training for a qualified renovation workforce.

Currently un-used EU stimulus loans of EUR 225 bn could be used for new renovation loan[61] partnerships / guarantees with investors and banks for mortgages, SME loans and commercial real estate. Deutsche Bank's residential real estate sustainability strategy[62] have called for a new publicly supported/guaranteed Renovation Loan to support renovation.
Incentive design and implementation would benefit from financial institution input to be most effective.

3 / Reform of the Energy Efficiency Directive

The revised Energy Efficiency Directive (EED) became law on 10 October 2023 after it was published in the EU's Official Journal[63]. Member States have two years to implement it into national law. We summarise the key elements of the EED:

1) Stronger energy efficiency targets

2) Public sector leadership: renovation targets

3) Data centres: mandatory disclosures

4) Utility obligations to save energy

5) Mandatory energy audits and energy management systems for companies

[60] European Banking Federation, European Mortgage Federation, Association of Financial Markets in Europe (2023) Joint position on EPBD
[61] Climate Strategy and Partners (2022) EU Renovation Loan: a new instrument to fund the EU renovation wave
[62] Deutsche Bank (2023) Residential real estate sustainability strategy
[63] EU Commission (2023) Energy Efficiency Directive

1) Stronger energy efficiency targets

The EED's main objective is to strengthen the EU energy efficiency target. It is now legally binding for EU countries to collectively ensure an additional 11.7% reduction in energy consumption by 2030, compared to the projections of the EU reference scenario 2020. EU countries have agreed their contributions to this target based on their national circumstances.

Member State are required to achieve cumulative end-use energy savings at least 1.3%/year in 2024-2025, 1.5%/year in 2026-2027 and 1.9%/year in 2028-2030. Governments are mandated to report on energy efficiency investments, including energy performance contracts, as part of the Governance Regulation, ensuring transparency and accountability.

The EED also gives legal standing to 'Energy Efficiency First' as a fundamental principle of EU energy policy: all countries must consider energy efficiency in all relevant policy and major investment decisions in the energy and non-energy sectors.

The 2013 first report of the Energy Efficiency Financial Institutions Group (EEFIG) played a key role in the EU adopting this principle. EEFIG published a report on applying this principle to financial institutions and sustainable finance policies[64].

2) Public sector leadership: renovation targets

Member States shall ensure that energy use by all public sector organisations is reduced by at least 1.9% each year, compared with 2021. Public transport, the armed forces and small towns/villages may be exempted from the goal (Article 5).

At least 3% of the total floor area of public sector buildings should by renovated each year to play an 'exemplary role'. Less stringent requirements may be applied by historical or religious buildings and buildings used by the military. An inventory of public buildings' characteristics and national renovation plans should be established by October 2025 (Article 6).

Procurement shall purchase only energy efficient products/services and can use energy performance contracts (Article 7).

Many governments and cities have carried out renovations of schools, museums, hospitals[65] etc which has helped expand Europe's renovation market and create financing opportunities. However, properly following public procurement rules takes time. More capacity building funding is being provided to help public bodies gain the technical skills to meet these goals, but challenges with overall public sector budgets can delay progress towards these goals.

Public sector targets create opportunities for dedicated project finance funds that we explored in a separate DWS report[66].

3) Data centres: mandatory energy, carbon, and water public disclosures

The EED creates an obligation on data centres to monitor and disclose their energy performance and water footprint in an EU database if their power demand is more than 500kW (Article 12). The EU is already preparing the technical work on the metrics and data repository[67]. Data centres with power demand greater than 1 MW shall take account of best practices in the European Code of Conduct on Data Centre Energy Efficiency. Since its launch in 2008, more than 500 data centres have joined this Code of Conduct.

Morgan Stanley[68] estimates that European data centres may grow +18%/y over the next 5 years and 5x by 2035, driven by Cloud, GenAI, and Data Sovereignty (~66% of consumers want their data stored and processed locally). Data centres are owned by technology companies but also private equity, infrastructure, and real estate funds. All types of companies and financial institutions increasingly purchase data services/capabilities and could aim to green their data contracts.

Data centres' electricity use may grow from 1% to 4% of Europe's power demand, concentrated in major cities and countries like Ireland. Energy price volatility is a major factor in data centre profitability, making energy efficiency and renewable energy important factors.

Leading tech companies have pioneered 24x7 carbon intensity analysis, shifting business activity to lower carbon intensity locations/times of day, and 'always on' renewable power purchase agreements that encourage investment in energy

[64] https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficiency-targets-directive-and-rules/energy-efficiency-first-principle_en
[65] For instance, see: www.eeef.lu/impact-reports.html
[66] DWS (2023) Energy efficiency project focused funds
[67] European Commission 2023 Heating and cooling and data centres
[68] Morgan Stanley (27 Feb 2024) European Data Centres to Grow 5x by 2035

storage[69]. Data centres may require an additional EUR35bn investment in renewables by 2035 (5% or 440 GW of Europe's renewable capacity additions over this period).

Recently published granular electricity carbon accounting guidance ("24x7" = 24hours per day x 7 days per week) could be used by more financial institutions and companies and be integrated into public policies to encourage shifting of building/facility operating practices (carbon/energy demand response) and renewable contracting practices[70].

A major opportunity is re-using waste heat as fewer than 5% of data centres are recycling their heat. Waste heat could be used for 2-3% of European households and/or industry with infrastructure investors playing a role in financing systems.

4) Energy utilities' obligation to save energy: creating revenue for retrofits

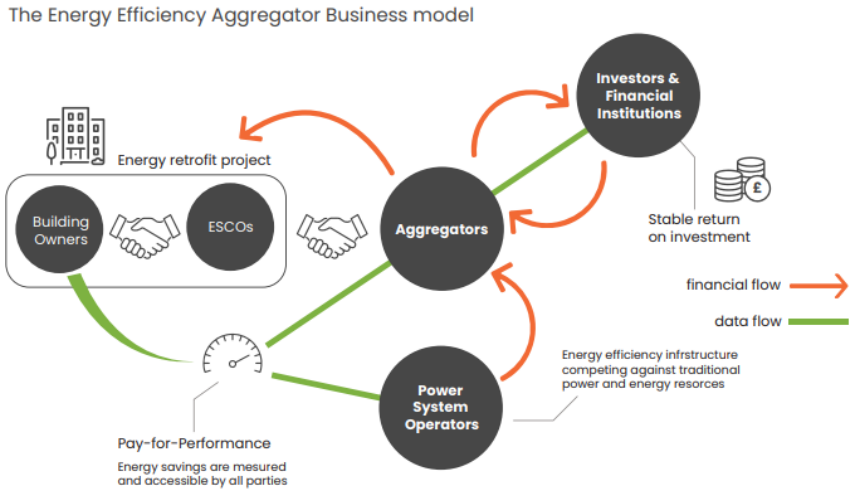
Member States shall strengthen the obligation on utilities to save energy including transmission and distribution system operators, retail energy companies and transport fuel distributors and retailers (Articles 8-10 and Annex V). The obligation is for utilities to save energy at increasing rates (1.3% for 2024-25 going to 1.9% for 2028-2030) compared with 2016-19 average energy sales to customers or final energy consumption. This is a doubling of the previous targets. Obligated parties are required to achieve a share of their energy savings obligation from disadvantaged / energy poor communities.

This policy has in the past been implemented by utilities such as through rebates/grants for retail customers, accounting for additionality to other EU laws and market trends. The savings were measured through statistical analysis of a sample of the technologies that were encouraged but savings are often 'deemed' or estimated which may have low accuracy.

We believe the current approach should be evolved towards a more sophisticated measurement and verification system, drawing on smart meter data. This could enable to creation of a Pay for Performance market, Figure 9. Such an effort would complement the focus on demand side flexibility and Smart Readiness Indicators.

The Save Energy Communication committed the EU Commission to examine the potential for Pay for Performance schemes[71]. The EU funded research project SENSEI found that this type of new market is feasible. DWS's Murray Birt was an informal advisor to the SENSEI project and recommend Pay for Performance be examined at previous EEFIG events.

Figure 9: Revenue for retrofits: Connecting energy markets to create a Pay for Performance market



Source: GFI 2021 based on SENSEI April 2021. For illustrative purposes only.
No assurance can be given that any forecast, target, or opinion will materialise.

- **Imagine if** a power system operator could contract for energy efficiency savings in buildings that could help accelerate retirement of fossil fuel power generation and avoid or delay power grid upgrades.
- **Imagine if** a heating supply company could write a contract for deep retrofits of buildings/heat pumps as an alternative to fossil gas.
- **Imagine if** the paradigm could be flipped from retrofits only being about energy cost savings to include new sources of revenue from contracts with energy companies, helping create compelling propositions for consumers, energy service companies (ESCOs) and investors.
- **Imagine if** the energy reduction from building retrofit programs could be more accurately measured instead of estimated or 'deemed'.
- **You don't have to imagine this future - it is here today**: multiple jurisdictions in the United States are implementing these ideas.

[69] https://sustainability.google/operating-sustainably/stories/24x7/
[70] https://energytag.org/blog/ and https://energytag.org/standards/ and
[71] EU Commission (2022) EU Save Energy

5) Mandatory energy audits and energy management systems for companies

Member States should develop programmes to encourage and support SMEs to undergo energy audits and to implement the recommendations arising from those energy audit.

All companies using more than 85 terra joules (TJ) of energy over the previous 3 years (adding all energy sources together) should implement a certified energy management system by October 2027. Companies with certified environmental management systems will be exempt from this requirement.

Companies with energy use higher than 10 TJ over the past 3 years and that do not implement an energy management system should undertake an energy audit at least every four years. A plan for implementing technically or economically feasible energy efficiency investments should be submitted to the management of the company with summary information published in the company's annual report (subject to EU and national laws regarding trade/business secrets and confidentiality).

Member States shall provide technical support to SMEs that are not subject to the above energy audit requirement such as through support schemes to partially cover the cost of energy audits and investment.

These provisions are particularly relevant for private debt funds and banks providing loans to SMEs.

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