Low carbon buildings create economic value

Key Highlights

The next few years present a unique opportunity for building owners and occupiers to leverage the net zero transition to drive economic value.

- **The opportunity is now.** With occupiers increasingly looking to lease space aligned with their own corporate emissions targets, there is a ripe opportunity for owners and investors to act now to close the supply gap for low-carbon space.
- **Three action areas to focus on.** Successfully decarbonizing buildings depends on targeting three key elements: energy efficiency, electrification and clean energy sources.
- **Creating economic value.** The capex invested in addressing these three action areas results in lower operational costs, secure energy, regulatory resilience and improved employee attraction.

The real estate industry finds itself at a crossroad. Market conditions are compelling owners and occupiers to prioritize cost-cutting opportunities wherever they may arise. At the same time, corporate commitments and regulatory pressures leave little to no room for building owners to look past the global call for reducing emissions. However, by undertaking comprehensive planning and taking decisive action, investing in decarbonization becomes a strategic economic opportunity.

JLL has undertaken a unique analysis of energy and emissions performance data from **46,600 buildings in 14 global cities and across 11 sectors** to uncover the dynamic landscape of operational emissions in the built environment – and highlight the economic opportunity that exists in improving building performance today. The data has been compiled and aggregated from local energy benchmarking and reporting requirements. Together, these buildings represent **5.9 billion square feet of commercial space (or 550 million square meters) and a total of 120,700 GWh of annual energy consumption, enough to power 11.5 million homes for a year**.

The opportunity is now

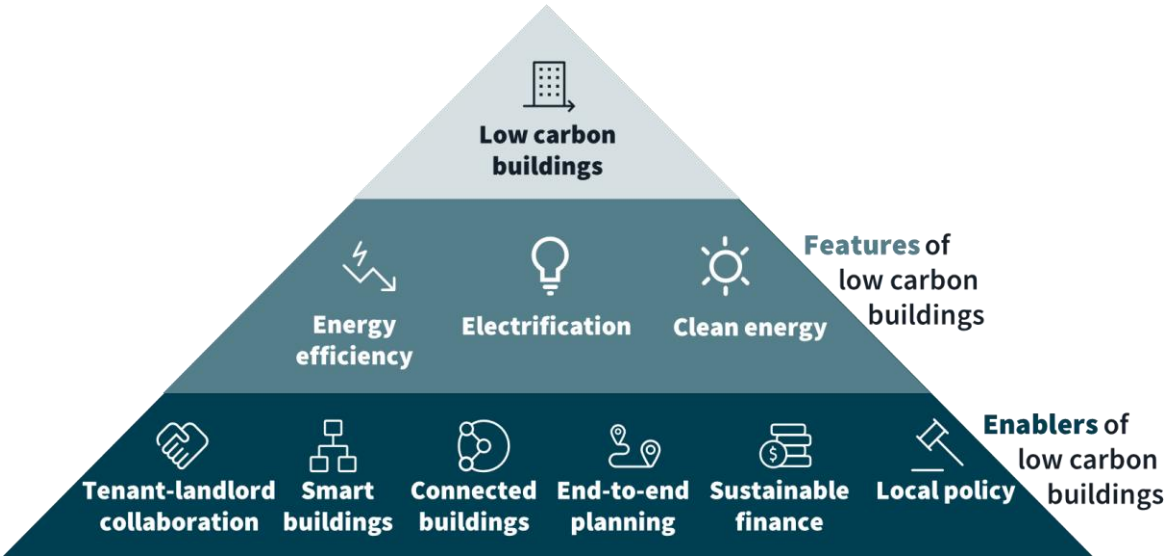
Most corporate occupiers have targets to reduce their operational emissions – which involves their leased spaces. These commitments typically include a 50% interim reduction target by 2030, yet our recent research reveals an already widening supply gap of low carbon space.

With occupiers increasingly looking to lease space aligned with their own corporate goals, opportunity is ripe for owners and investors to take action to close this supply gap. But this opportunity will quickly turn to risk in the face of inaction.

This study reveals that **65% of office and 75% of multifamily buildings face stranding risk[1] by 2030 if action isn't taken to improve building performance**.

Three action areas

Successful decarbonization of building operations means the prioritization of three key action areas: optimizing operations through **energy efficiency** measures, **electrifying** operations and employing dynamic **clean energy strategies**. These elements are inherently intertwined and effective building decarbonization will rely on the combined success of all three.



Emissions in the built environment – *Jargon Buster*

Buildings are responsible for two types of emissions: operational and embodied. This study focuses on operational carbon, emissions generated during the building's lifetime use, which account for 27% of annual global emissions.

Being able to first identify underperforming buildings is key. **Energy Use Intensity (EUI)** has become the 'miles per gallon' metric of the built environment. It is calculated by dividing the total annual energy consumed in a building by its total gross floor area. The lower the figure, the better.

EUI is a key metric to understanding the energy efficiency of a building but to fully understand a building's operational carbon footprint, **Carbon Intensity (CI)** is the industry's go-to measure. It calculates the annual amount of CO_2e emitted per gross floor area by essentially attaching an emissions factor to the energy inputs consumed by a building. With CI as the mark for building decarbonization, the interplay between energy efficiency, electrification and clean energy sources becomes clear.

[1] Under CRREM, the term 'stranding risk' refers to potential write-downs and devaluations due to direct climate change impacts and the transition to a 'low-carbon economy'. Estimates of stranding risk were reached using CRREM market- and sector-specific decarbonization pathways.

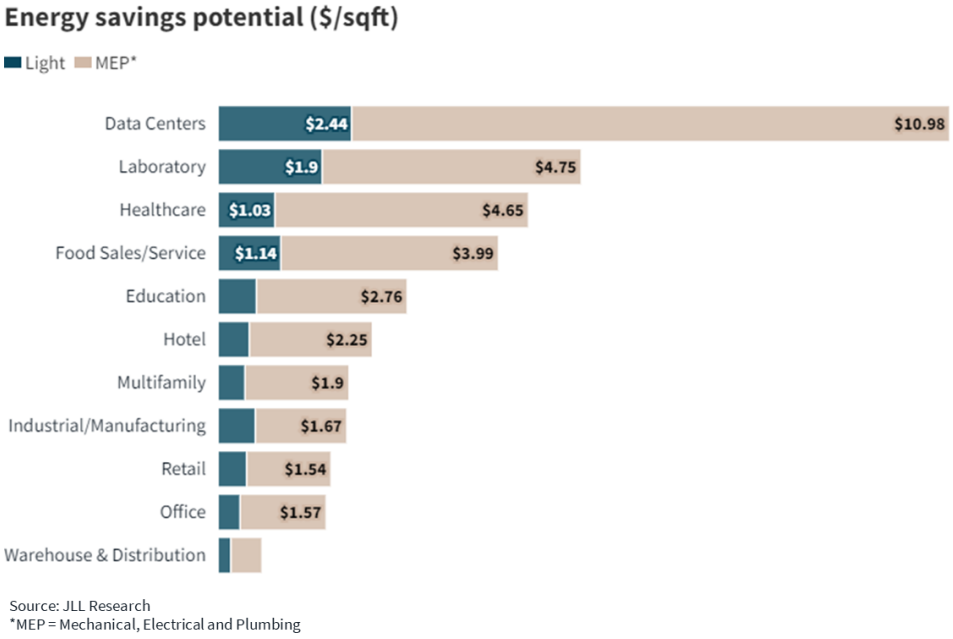
Creating economic value

In current market conditions, the economic benefit makes an even stronger case for action from investors and corporate tenants than emissions reductions alone.

1. The economic case for energy efficiency

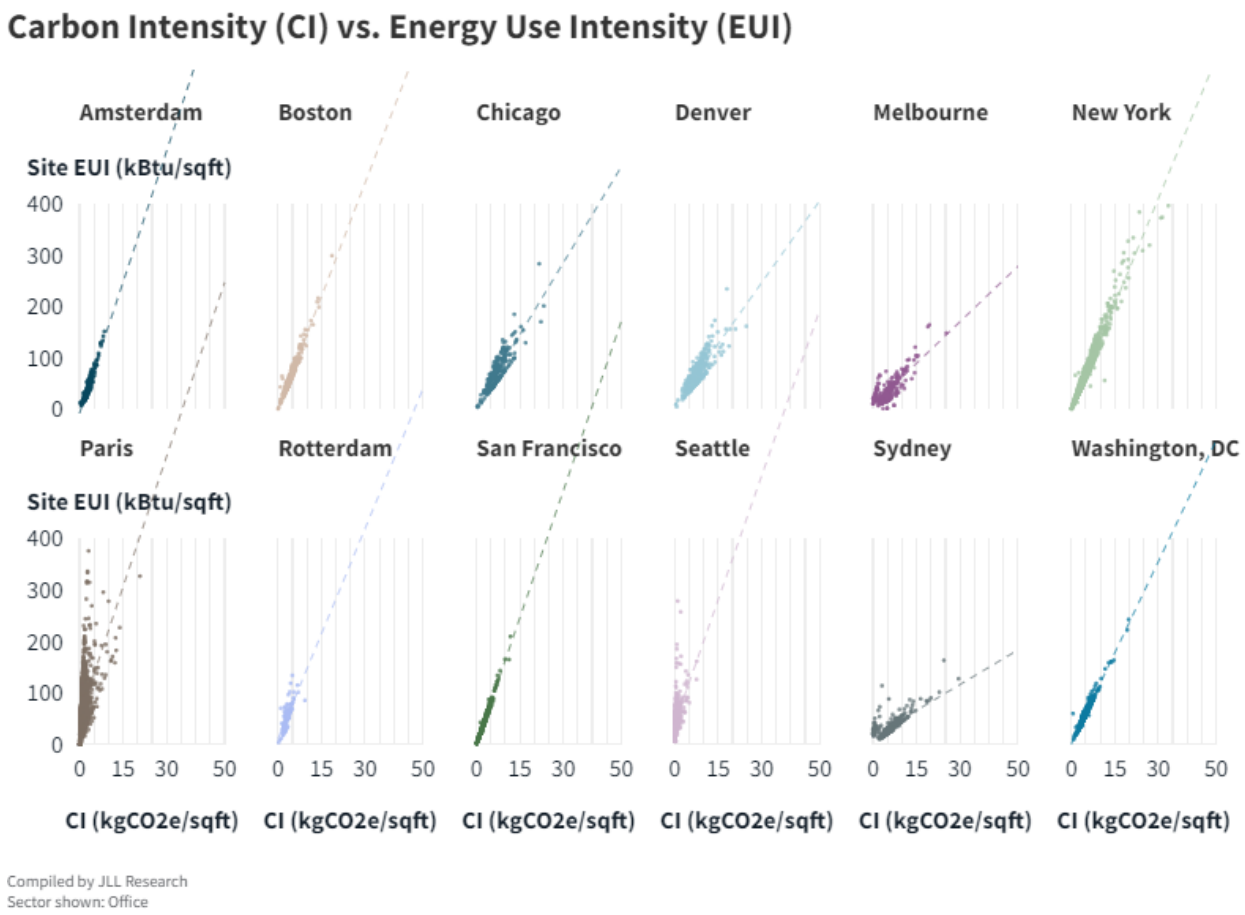
The energy transition necessitates a shift in mindset – from one that sees energy efficiency as a 'nice-to-have' to one that sees it as a fundamental clean energy source and cost-savings strategy. Improving a building's energy efficiency is the quickest way to reduce opex and cut emissions – and a critical first step in the wider energy transition. In fact, a study by Berkeley Lab found that such demand-side solutions across buildings in the U.S. would avoid over US$100 billion in power sector costs by reducing the investments needed to scale carbon-free energy capacity.

Light to medium energy retrofits can unlock between 10% and 40% in energy savings, depending on property type. Across the buildings in our study, this means **US$2.9 billion in annual energy savings under a light retrofit scenario and up to US$11.4 billion in savings under a MEP scenario – equating to US$0.49 to $1.94 per square foot savings on average**.

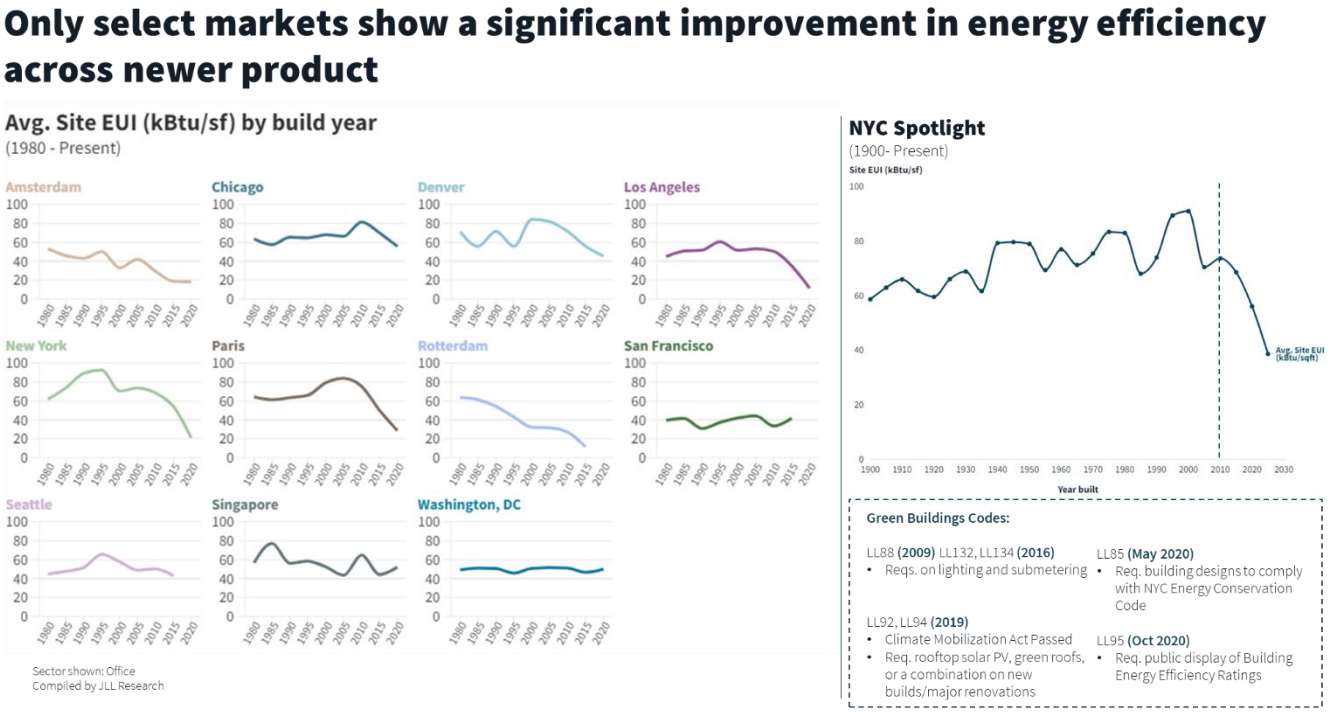


Improving energy efficiency is also a crucial element of a successful energy strategy as it allows consumers to mitigate challenges from energy price volatility and reduce the risk of overwhelming aging grids.

According to the IEA, energy efficiency has the potential to deliver the second largest contribution to cutting down CO_2 emissions globally. At a building level, lower EUI has a direct linear relation with lower emissions in all cities in our study. However, the marginal improvement in emissions from a unit improvement in energy efficiency becomes lower as the grid gets cleaner. This is why the trendline is steeper in markets with cleaner grids, like Paris and Seattle, and flatter in markets like Melbourne and Denver where energy grids are much dirtier.



A common misconception is that newer buildings are significantly more energy efficient than older ones. While mandatory standards, building codes and labels have helped ensure some minimum level of efficiency across newly constructed product, few markets such as New York City and Amsterdam show significant improvements in EUI across newer buildings.



Constructing an energy-efficient, low carbon *new* building is a comparatively much easier feat than achieving significant energy and emissions reductions in an existing building. Both must be done to decarbonize buildings but ensuring that new product is low carbon from the get-go should be standard across all markets. As specified in SBTi's newly announced Buildings Guidance, all new developments and major renovations must be designed so that energy performance shows a 70% improvement from the regional/country median for that building type.

Heating and cooling systems typically make up the bulk of a building's energy use, so addressing them will have a significant energy and emissions - as well as cost reduction - impact. In a standard office building, about 40% of total energy use is from its HVAC system. Consequently, EUI significantly increases during the winter months. In Washington, D.C. for example, average EUI across its office stock increases by as much as 60% in January compared to June while natural gas makes up a much greater share of its energy use (46% on average in January, compared to 16% in June), meaning onsite emissions also spike.

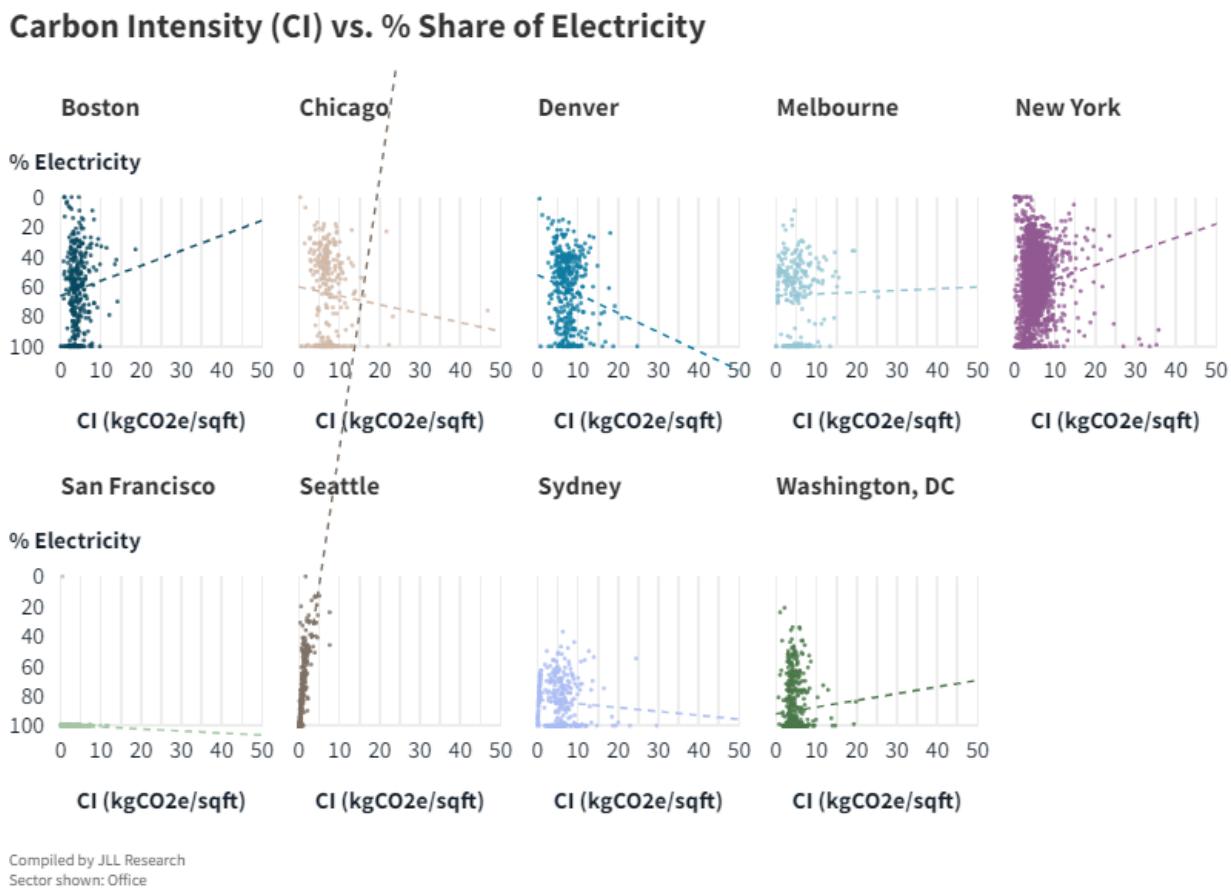
The good news is that, for buildings, there are already highly energy efficient measures and technology solutions available for deployment today. Furthermore, these improvements often also serve to enhance comfort levels for building occupants. JLL's Hank uses machine learning, energy modelling and outside data sources to continuously optimize all HVAC equipment, reducing energy consumption and costs by 20% while also improving indoor air quality and tenant comfort. This combination of lower costs, reduced emissions and better user experience makes assets more attractive to today's occupiers.

2. The economic case for electrification

When it comes to buildings – as well as transport – the net zero transition means a transition towards electrification - and when done right, efficiency gains and electrification go hand-in-hand. Electric heat pumps have become an effective solution to efficient electrification thanks to operating, equipment and installation costs reaching cost-competitiveness in many markets. Today's models are 1.5 to 3 times more efficient than electric resistance heat and up to 4.5 times more efficient than conventional gas boilers. While heat pumps have different space needs than their less efficient counterparts, they are a promising solution for existing buildings and a vital solution for new buildings, especially those in colder climates.

Across the nine markets with energy input data available, Washington, D.C. and Seattle have the greatest share of fully electrified buildings[2] with 51% and 44% respectively. All other markets have less than 30%. However, not all electrification is equal and to date, electrification has typically been done through electric resistance heating, without efficiency in mind. What's more, most utility grids are still heavily dependent on fossil fuels. Consequently, the link between lower emissions and electrification today is much less evident (as compared to lower emissions and energy efficiency). It is only in Seattle where buildings show a linear trend – the more energy that comes from electricity, the lower the emissions and all-electric buildings have the lowest emissions in the city.

[2] Across office stock.



Many jurisdictions are now ensuring new construction is all-electric. In 2019, Berkeley, California in the U.S. became the first municipality to require all new construction to be all-electric, and since then about 100 other cities have followed suit, including New York, San Francisco and Los Angeles.

Utilizing electricity in lieu of onsite fossil fuels means Scope 1 building emissions have been dramatically reduced or eliminated which, as a building owner, is a clear lever to pull. To meet climate targets, corporate occupiers have increasingly sought Net Zero Carbon buildings but have discovered that in reality, there are few to none available. As an interim solution, they have sought buildings that are 100% electrified and taken it upon themselves to secure clean energy supplies through onsite and/or offsite procurement strategies. As a result, because of market demands and its ability to reduce utility bills, efficient electrification has the potential to significantly increase building value.

3. The economic case for clean energy strategies

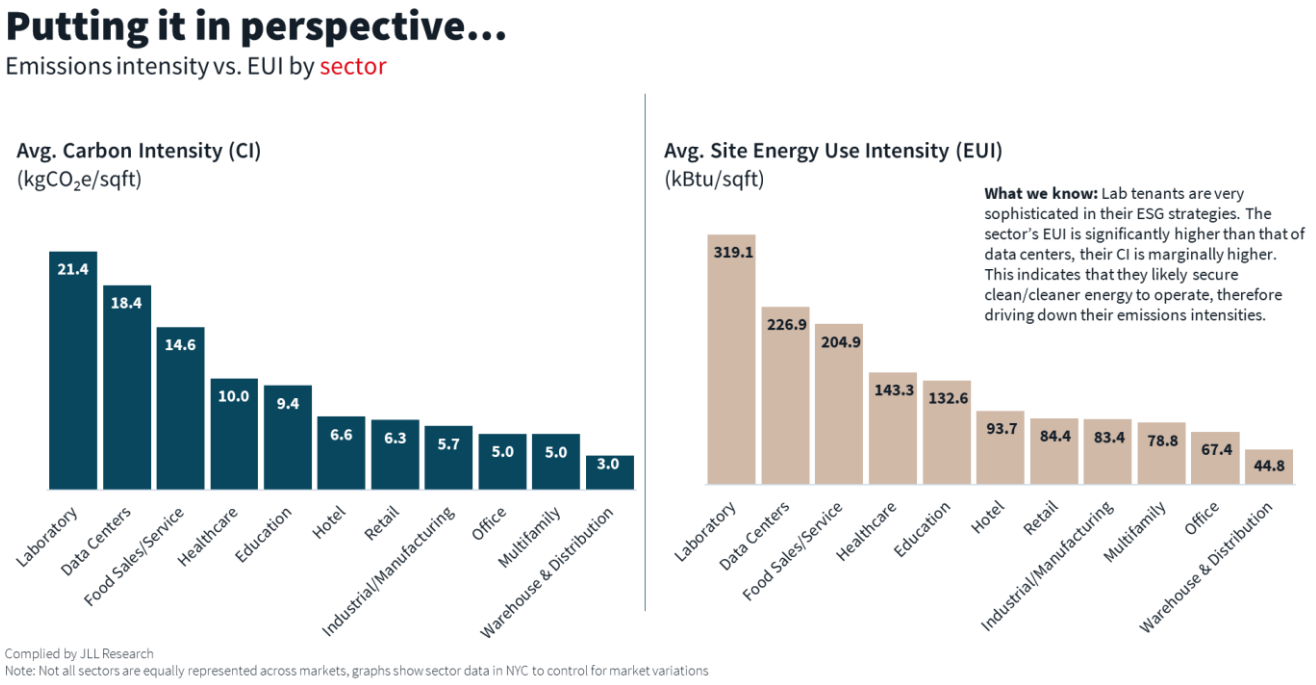
As more regions deploy clean energy, it is becoming the most cost-effective choice of fuel. In fact, the latest solar panels generate the cheapest form of electricity in human history, according to the IEA.

In Europe, renewables have become the cheapest source of electricity generation. Producing a kilowatt-hour of power from solar is now 10 times cheaper than by fossil fuel gas. Within the EU, electricity consumers are estimated to have saved EUR 100 billion during 2021-2023 as a direct result of newly installed solar PV and wind capacity, after fossil fuel prices spiked following Russia's invasion of Ukraine.

In 2023, the average wholesale price of electricity would have been 15% higher without these capacity additions.

Many markets in the U.S. are also benefiting from similar trends. In Texas, the scale of renewables from 2010 to 2022 decreased wholesale electricity costs in the state by US$31.5 billion. Seattle benefits from the state of Washington being a leader in clean energy generation for decades. Over 80% of its power is generated from carbon-free hydroelectricity – and Seattle energy consumers benefit from 45% cheaper electricity bills than those in New York City, where the state grid is 62% dirtier in terms of grid emissions. On average, the lowest emitting buildings in the study can be found in Los Angeles and Seattle – these are markets with more temperate climates and cleaner energy grids. Among fully electrified buildings, it is only in Seattle where their emissions concentrate on the low end.

The global transition of utility grids towards carbon-free energy is critical but cannot be the only solution in securing clean energy sources. Large-scale and energy-intensive users in particular may not have local grids capable of supporting a fully electric utility option. They will require more comprehensive energy strategies that include onsite renewables, if feasible, and smart procurement strategies through mechanisms like Virtual Power Purchase Agreements (VPPAs).



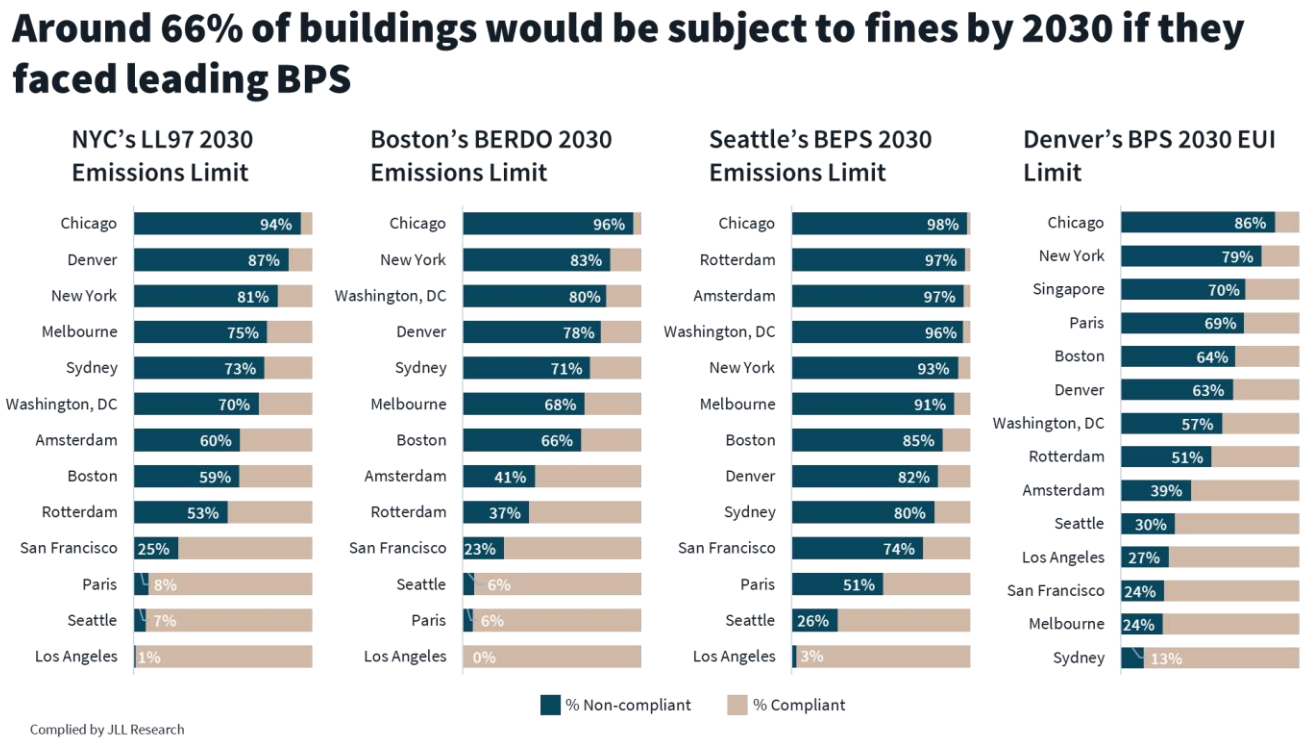
Energy intensive property types like data centers and labs but also sectors with ample roof space like warehouse and logistics and retail sites are especially primed for onsite power. In the U.S., putting solar on 450,000 medium and large warehouse and logistics sites could provide enough electricity to power more than 19.4 million households per year.

Notably, onsite renewables will not be feasible for all property types, especially for those in dense urban areas. Comprehensive energy strategies that include VPPAs will be crucial to securing renewable energy at scale. However, the demand for VPPA's is already spiking, bringing expensive upticks in associated costs. Adding to that, utility grids are increasingly implementing Time of Use (ToU) rates for electricity to

mitigate peak demand hours. ToU rates can bring immense savings for energy consumers who implement comprehensive energy strategies that allow them to integrate and respond to peak demand pricing models – and expensive utility bills for those who don't. Building owners and users must leverage smart building technology to digitize and connect assets with real-time metering and energy management so that demand can interact with supply, rather than the one-way relationship that typically exists today.

Creating regulation-resilient assets

As cities look to advance on their net zero goals, many have turned to Building Performance Standards (BPS). BPS place limits on energy use or emissions from buildings that gradually decline in line with Net Zero by 2050. These policies include hefty penalties for noncompliance. Take the BPS passed by New York City, Boston and Seattle; 2030 limits entail a median annual per square foot penalty of US$0.29 – US$2.00 for office properties and US$0.29 and $1.50 for multifamily.[3]



BPS vary across jurisdictions in terms of the targeted measure (usually Carbon Intensity (CI) or EUI), the limits set and the penalty amount as they take local nuances like energy grid mix, climate and city-wide targets into account. Yet, because they all share net zero goals by 2050 or earlier, their limits provide a solid benchmark to understanding the performance gap of real estate today. Denver's BPS for example targets EUI while New York City's, Boston's and Seattle's sets limits on CI. If faced with these leading BPS,

[3] Given current building performance levels.

around **66% of buildings in our study would face fines by 2030**, given current energy or emissions performance levels.

Observations: Taking action and creating value

If done well, the net zero transition presents a market opportunity for building occupiers, owners, developers and investors to create economic advantage. Those who accelerate the deployment of energy efficiency and electrification measures alongside demand flexibility and aggressive clean energy procurement stand to gain most.

Energy Efficiency

Improvements in energy efficiency have the potential to:

- ✓ Reduce opex by US$0.49 to $1.94 per square foot, on average
- ✓ Improve indoor air quality
- ✓ Enhance tenant comfort

Electrification

Efficient building electrification *is* building decarbonization:

- ✓ Ensure assets are zero-carbon ready
- ✓ Minimize operational costs
- ✓ Increase building value

Clean Energy

Comprehensive clean energy procurement strategies include demand flexibility and decentralized energy strategies:

- ✓ Increase operational security
- ✓ Mitigate peak-demand pricing
- ✓ Reduce utility bills

Owners, investors and developers:

Reducing emissions in a building – and much more so across a portfolio – is a complex task. Success is not a copy-and-paste approach but a relative mixture of energy efficiency, electrification and clean energy strategies that are best-fit to the building in question. Yet, the tools for success *are* consistent, and more importantly, most are ready to deploy today. When done well, asset decarbonization becomes a market opportunity for those who act first – and an economic risk for those who wait.

Occupiers:

We are reaching a point where even the most advanced corporates with the most ambitious targets (and budgets) will be unable to find available, low-carbon space that meets their needs. Occupiers must become active players in decarbonizing the built environment, partnering with their landlords and co-investing in strategies that make low-carbon buildings a reality.

City governments:

The phrase “you can’t manage what you don’t measure” comes to mind when considering the important role cities play in driving decarbonization in the built environment. Coverage of U.S. cities in this study is

greater exactly because of local reporting mandates that make building-level energy-use data publicly available. Access to this data allows local jurisdictions to follow-through with policy that is more effective in driving down emissions, like Local Law 97 in New York and Boston's BERDO. While BPS that force improvements in energy efficiency or emissions, or incentive frameworks that promote building improvements are necessary, it is the ability of local governments to create a standardized level of transparency around building performance that is key to enable informed action.

Note on data coverage: Our research compares building-level energy use and emissions data across 14 global markets: ***Amsterdam, Paris, Rotterdam, Sydney, Melbourne, Singapore, Boston, Chicago, Denver, New York, Los Angeles, San Francisco, Seattle and Washington, D.C.***

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