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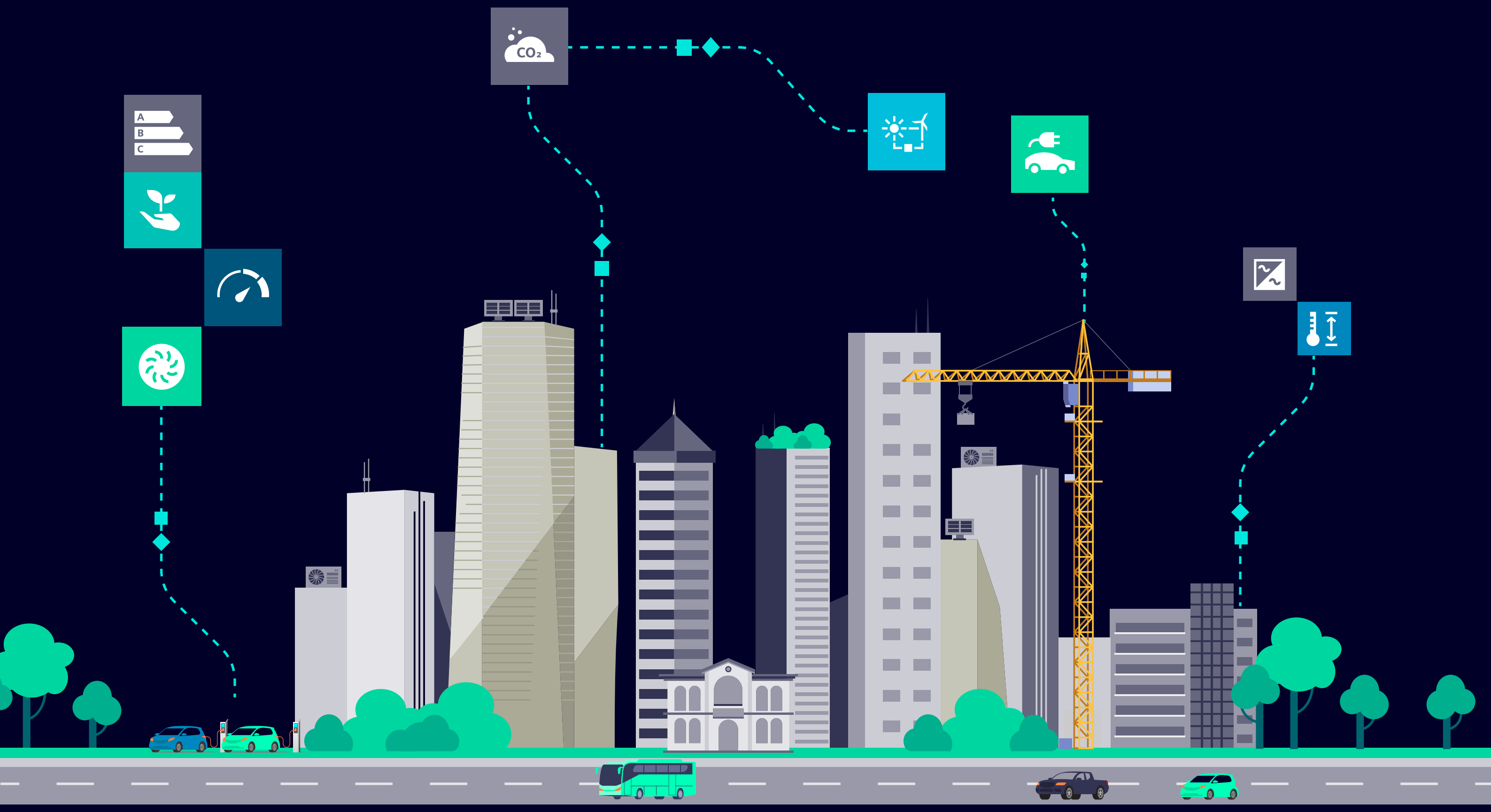

AN INSIGHT PAPER FROM SIEMENS FINANCIAL SERVICES

Retrofit for purpose

The role of finance in enabling decarbonization through non-residential building retrofit

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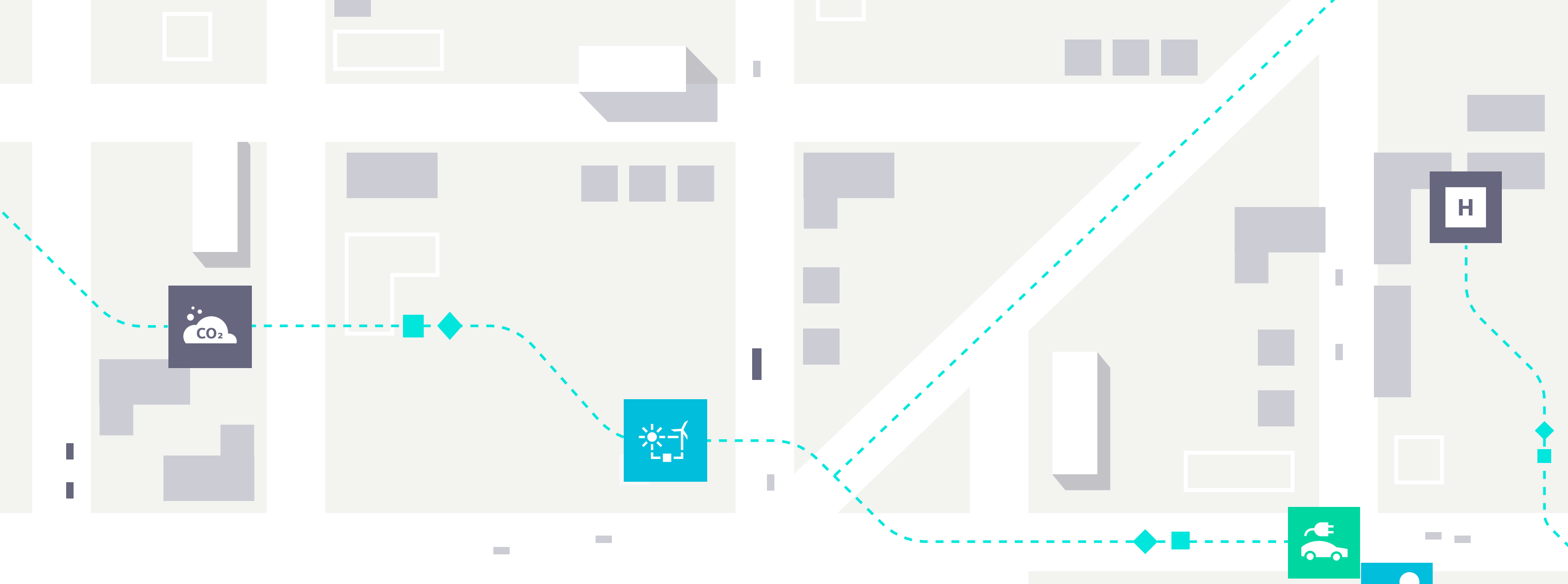

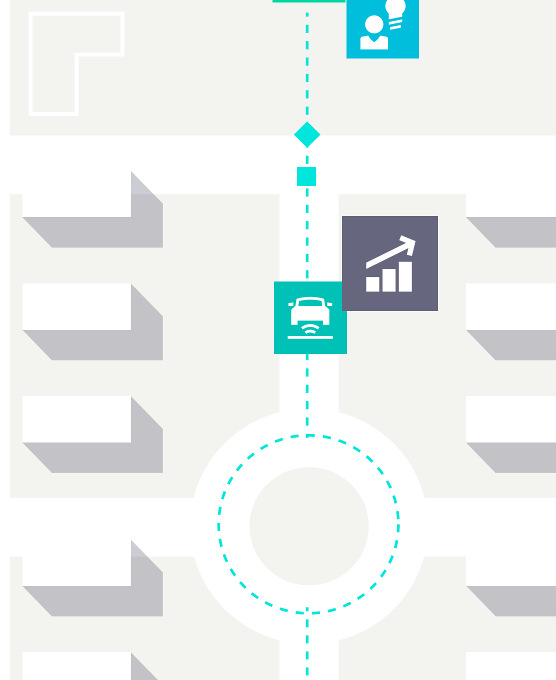

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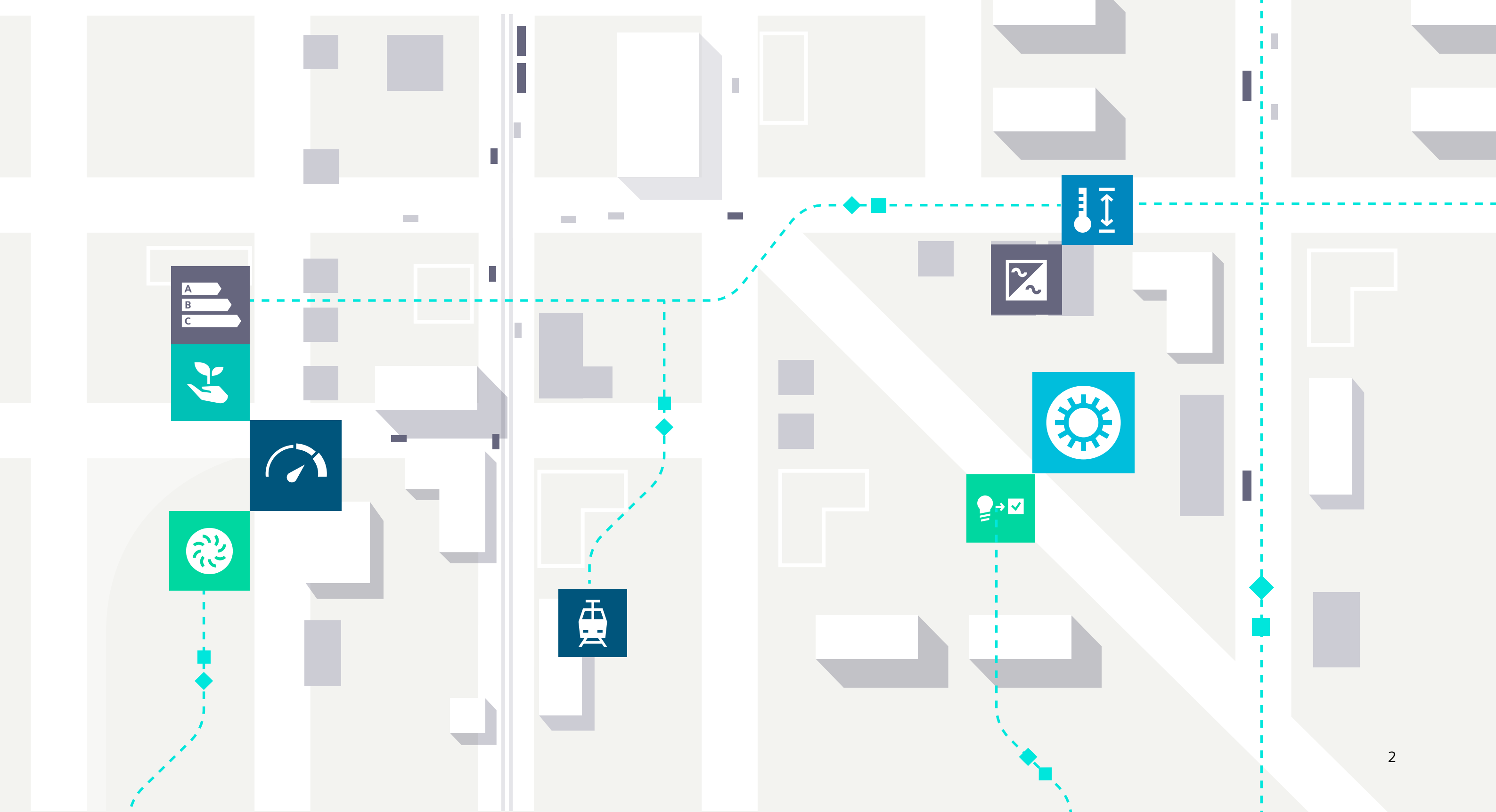


Summary

The challenge
Decarbonizing the existing non-residential buildings stock worldwide will play an important part in meeting 2030 and 2050 climate targets.

1

The scale of the challenge
Existing stock covers offices, hospitals, factories, warehouses, educational establishments, and more commercial buildings.

2

Slowing down
Investment in energy-efficiency technology for existing building stock has slowed recently, according to the International Energy Agency.

3

Private sector financing
Nevertheless, flexible private sector financing can play a crucial role in enabling energy-efficiency retrofits for existing buildings – often without the need for capital expenditure (CAPEX).

4

Creating partnerships
These arrangements – often termed energy-efficiency-as-a-service solutions - involve a partnership between technology provider and specialist financier.

5

Smart tools
Financing tools also help smaller energy-efficiency projects to be completed without the need for up-front capital.

6

Reducing emissions
This insight paper estimates that such financing arrangements could help the existing non-residential buildings stock in the USA, Europe, China and India reduce emissions by over 210 $MtCO_2e$ annually, between now and 2030.

7

Representation
This represents just under 7.3% of annual global non-residential building stock emissions.[1]

8

Meeting targets
It also equates to over 8% of global annual CO_2 emissions reduction targets, as defined by the International Panel on Climate Change (IPCC).[2]

9

"The importance of digitalizing our current global building stock has been recognized - sustaining progress in the transition requires treating infrastructure as a service instead of an asset; and financing will be one of the important levers of the transition."

Dave Hopping, CEO Regional Solutions & Services, Siemens Smart Infrastructure

Introduction – standards and finance combined for **energy-efficiency**

According to the International Energy Agency (IEA), the operations of buildings account for 30% of global final energy consumption and 26% of global energy related emissions (8% being direct emissions in buildings and 18% indirect emissions from the production of electricity and heat used in buildings).[3]

Yet progress in reducing those emissions to date is not enough. In the IEA's own words, "Minimum performance standards and building energy codes are increasing in scope and stringency across countries, and the use of efficient and renewable buildings technologies is accelerating. **Yet the sector needs more rapid changes** to get on track with the Net Zero Emissions by 2050 (NZE) Scenario. This decade is crucial for implementing the measures required to achieve the targets of all new buildings and 20% of the existing building stock being zero-carbon-ready by 2030."[5]

Comprehensive retrofits of commercial are **not happening anywhere near the scale needed** to meet climate goals.
American Council for an Energy-Efficient Economy (ACEEE)[4]

The operations of buildings account for

30% of global final energy consumption **+** **26%** of global energy related emissions

The target is for all new buildings and 20% of the existing building stock to be zero-carbon-ready by 2030

This short paper reviews the emerging range of mandatory standards in four key areas of the world – North America, Europe, India and China - which will help to accelerate necessary energy-efficiency in the building stock.

The paper then looks at innovative financing arrangements – known as efficiency-as-a-service (EaaS) – that help private and public sector organizations to retrofit the existing non-residential building stock in an affordable and cash-flow friendly way. This is a critical success factor for buildings decarbonization targets in a world of rising inflation, hardening interest rates, increased fuel costs, and supply chain disruption.

Finally, the paper assesses the volume of carbon emissions that could be reduced through the wider deployment of energy-efficiency-as-a-service schemes, between now and the near-term climate target deadline of 2030. These volumes are estimated for each of our four highest-volume emitter regions of the world.

On average, 30% of the energy used in commercial buildings is wasted, according to the U.S. Environmental Protection Agency.[6]

The importance of **decarbonizing buildings**

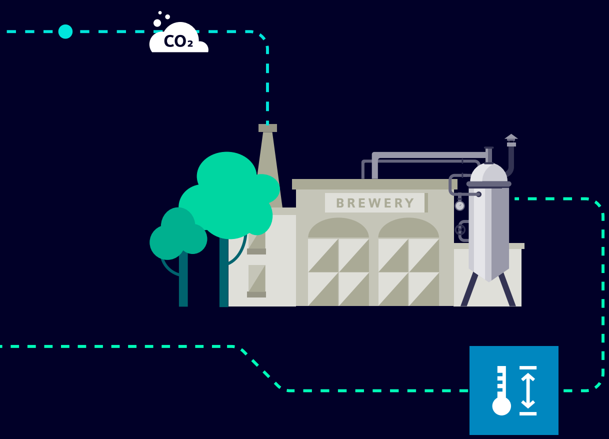
The IEA tells us that renovating the **existing** building stock to a zero-carbon-ready level is a key priority for achieving the sector's decarbonization targets for 2030 and 2050.

However, the retrofitting of buildings is a significant challenge since at least 40% of buildings floor area in developed economies was built before 1980, when the first thermal regulations came into force. And over 80% of buildings were constructed before 2009, after which the majority of energy performance certification regimes began to be more strictly enforced.

For instance, since January 2009, EU Member States have been required to effectively comply with the 2002 Energy Performance of Buildings Directive (EPBD). One of the requirements set by the EPBD is to introduce Energy Performance Certificates (EPCs) which are required to be issued when a building is constructed, sold or let.[7]

CASE STUDY

Winning strategically important business with **a standout finance offering**



Premium beer producer Darguner Brauerei was searching for a way to gain greater independence from its energy suppliers, due to rising energy costs on the German market.

Despite a number of offers from several manufacturers (all with their own finance solutions), the joint offer from Schoenergie GmbH and SFS with a specially tailored finance proposal swung the deal for the vendor. SFS supported the deal with a long-term financing solution unmatched by competitors.

Thanks to the new photovoltaic system installed by Schoenergie GmbH, the customer can cover 10% of its energy consumption itself.

Ethical and commercial benefits of decarbonization

Besides the ethical imperative to decarbonize, initiatives to reduce carbon emissions through lower energy- consumption are commercially compelling on two fronts.

First, companies are increasingly raising funds on the capital markets through the issuance of green and sustainable bonds. To do so, they need to present underlying initiatives that materially reduce their carbon footprint. Alongside this, businesses and consumers are increasingly looking to buy from more environmentally-friendly companies, so green credentials are becoming a competitive differentiator, whether in the US,[11] Europe,[12] India[13] or China.[14]

Secondly, in a world that has recently experienced a major fuel crisis, and where fuel costs are still significantly inflated above their pre-crisis levels,[15] reductions in energy usage save money. Moreover, they save much more money than was the case four years ago. The IEA considers energy efficiency essential to achieving Net Zero. It describes efficiency as "the first fuel – the one you do not have to use, yet it gives you the services you need."[16]

Reducing energy consumption, through the enabling digital technology, has become a major driver of investment in 'smart' commercial buildings, 'smart' hospitals, 'smart' campuses and 'smart' public buildings.

CASE STUDY

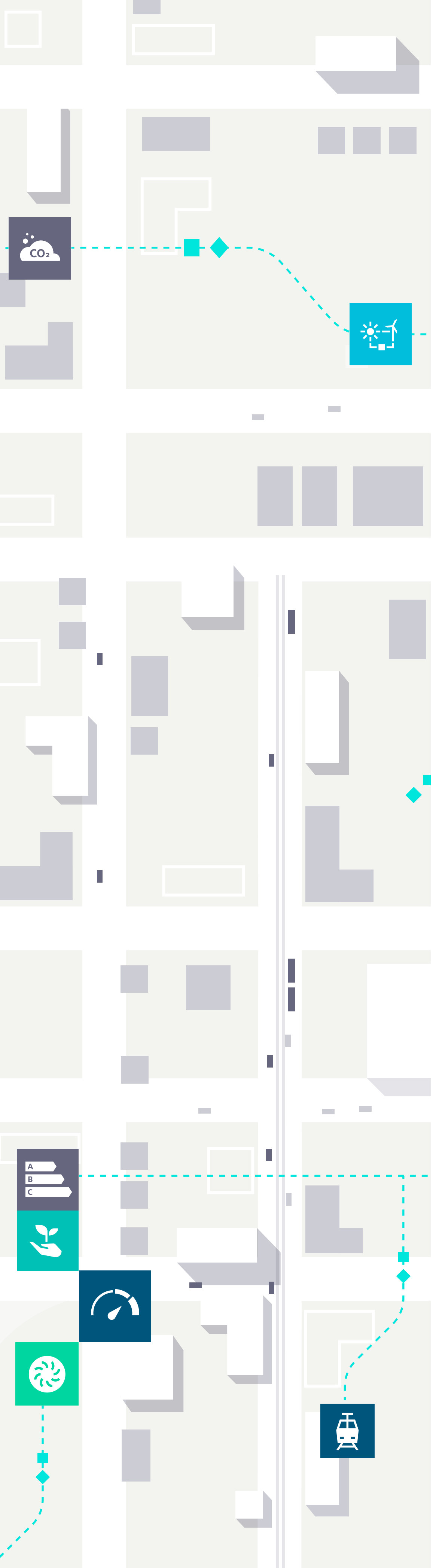
Construction loan for a **data center campus** in the U.S.

Financing was needed for a 184 MW, four-building data center campus in Virginia to be leased to subsidiaries of one of the largest hyperscale cloud providers.

The newly constructed data centers were to include multiple energy efficiency attributes such as low power-usage-efficiency (PUE) levels, 100% LED lights for house power and campus site lighting, energy-saving cooling, and airflow management systems.

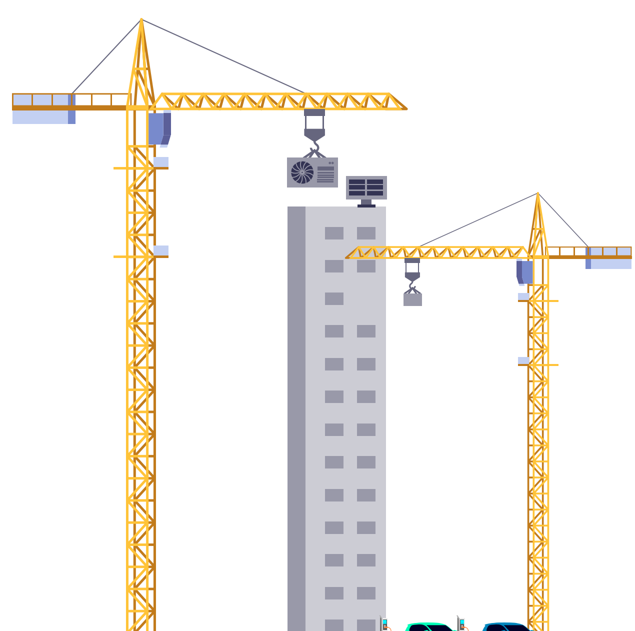
One of the project's primary objectives was to incorporate energy efficiency into its design considerations, a benefit for both itself and its customers.

SFS teamed up with the customer to participate in a Construction Term Loan with a $70 million commitment to help finance the construction of the data center campus.



Retrofitting 20% of the existing building stock to a zero-carbon-ready level by 2030 is an ambitious but necessary milestone toward the Net Zero Emissions by 2050 Scenario (NZE Scenario). To achieve this goal, an annual deep renovation rate of over 2% is needed from now to 2030 (and indeed beyond).

Deep retrofit of existing building stock typically delivers energy consumption savings in the region of 20-40%. Various authorities endorse this range of savings. Comprehensive retrofits of commercial buildings can reduce their energy use by up to 40 percent but are not happening anywhere near the scale needed to meet climate goals, according to a report released by the American Council for an Energy-Efficient Economy (ACEEE).[17] Similarly, the U.S. Department of Energy has estimated that a non-residential retrofit can equate to an energy savings of up to 35 percent.[18] Examples from Europe, India and China also corroborate the real-life experience of energy savings in non-residential buildings, some of which will be highlighted later in this paper.[19]



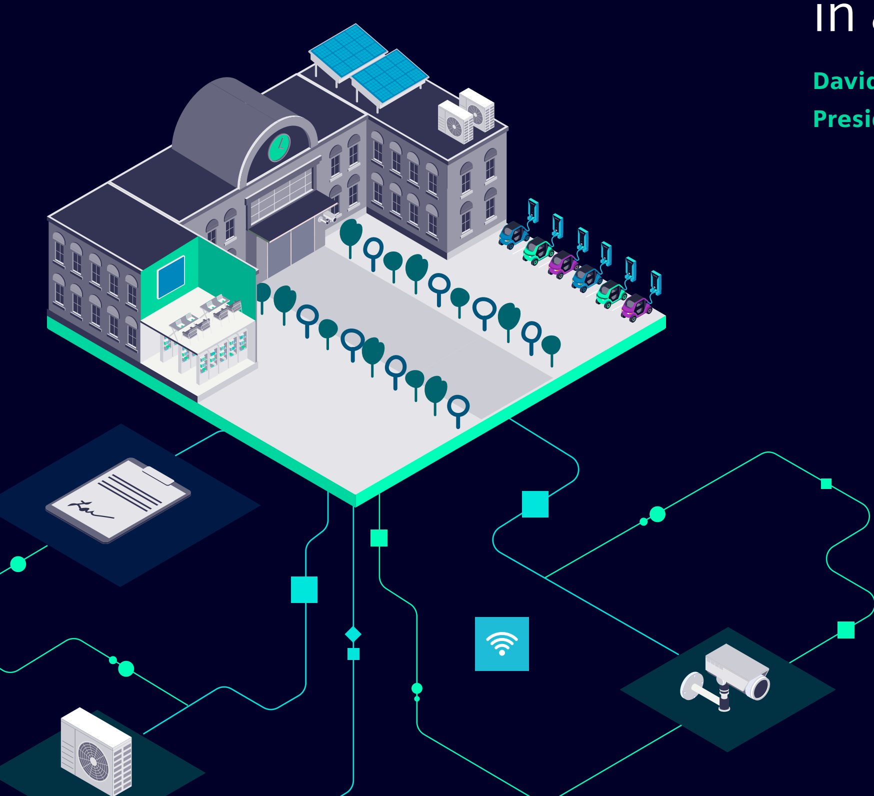
CASE STUDY

A smart campus at **Morgan State University** in the U.S.

As part of its 10-year strategic plan, "Transformation Morgan 2030: Leading the Future", Baltimore-based Morgan State University (MSU) is well on the path to becoming a smart and connected campus of the future. Improvements currently underway include implementing a series of modernization upgrades to the university's HVAC, security, and fire and life safety systems with a focus on energy efficiency, resiliency and sustainability. All work is umbrellaed under a master service agreement between Maryland Clean Energy Center, Siemens and MSU to support the university's campus transformation.

As Dr. Wilson notes, sustainability is important – not just for the campus and buildings but also, for the students and faculty. With a focus on helping institutions achieve their sustainability targets, Siemens Financial Services (SFS) – the financing arm of Siemens – is providing capital for this project.

> Working in partnership with Siemens in developing a more sustainable learning environment for our community moves us in a positive direction."
>
> **David Wilson, Ed.D.,**
> **President of Morgan State University.**



Mandatory standards grow **globally**

Despite these encouraging proof points, there is a widely recognized need for more momentum and effort behind policy drivers and their enforcement.

There has been progress in driving transition to smarter, more energy-efficient buildings. The global buildings sector investment in energy efficiency increased by around 16% from 2020 to a total of approximately USD 237 billion (IEA 2022).[20] The increase occurred primarily among European countries with existing programs of public investment in efficiency, despite economic pressures. In the words of the UN Environment Programme,[21]

“This growth in investment is welcome news but also highlights the challenge of needing to continue to increase investments in efficiency during a period of inflation that will cause increasing pressure on borrowing costs.”

Nevertheless, even greater official pressure is widely seen the key to accelerating progress. The UN’s Global Status Report for Buildings and Construction[22] emphasizes that, “National and sub-national governments must put in place mandatory building energy codes and set out a pathway for their new building codes and standards to be performance based and to achieve zero carbon across a building’s life cycle as quickly as possible.”

Mandatory standards for energy-efficiency in buildings already exist in the Europe, the UK, and China, with strong enforcement regimes and non-compliance penalties. Regulatory regimes are also being tightened in the U.S. and India in the bid to meet rapidly approaching climate goals.

China

In China, the first mandatory standard for energy efficiency has recently been issued.

The Ministry of Housing and Urban-Rural Development implemented the General Code for Building Energy Efficiency and Renewable Energy Utilization[23] in April 2022, requiring all buildings to be designed for energy efficiency. The scope of application of this code is "design, construction, acceptance and operation management of building energy-saving and renewable energy building application systems for new, expanded and renovated buildings and existing building energy-saving renovation projects."

The code makes a number of new requirements.[24] For instance, calculation of building carbon emissions is mandatory, with a new layer of planning and forecasting energy consumption in line with international standards.[25] Industrial energy savings targets have been increased by 20%. Requirements for thermal performance limits of public buildings are raised; and energy-saving design indicators for industrial buildings in the mild A zone added.

India

In India, a national mandatory regime does not yet exist, but incentives have been introduced by individual states for sustainability goals within the National Building Code, and enforcement of existing sustainability standards (such as the BRSR) is being tightened.

In 2022, India introduced an energy conservation code[26] for commercial and residential buildings. The code's text authorizes India's central government to set up energy consumption standards. It also empowers the government to require the designated consumers (in the industry, transport and building sectors) to meet a minimum share of energy consumption from non-fossil sources, including green hydrogen, green ammonia, biomass and ethanol. The legislation also introduces an energy conservation code for buildings (commercial and residential). It provides norms for energy efficiency and conservation, use of renewable energy, and other requirements.[27]

Europe

The European Parliament has agreed on a joint position on the reform of the EU's buildings directive.[28] Article 9 of the Directive stipulates that Member States must ensure that public and non-residential buildings achieve class F after 1 January 2027 and class E after 1 January 2030.

The amended Energy Efficiency Directive, agreed in 2023,[29] significantly raises the EU's ambition and places a strong emphasis on energy efficiency.[30] It more than doubles the annual energy savings obligation (in Article 8) by 2028. EU countries must achieve an annual saving of 1.3% of final energy consumption by 2024, rising to 1.9% by 2028. This is an important instrument to drive energy savings in end-use sectors such as buildings, industry, and transport. An EU regulatory decree also requires Building Automation Control Systems (BACS) in tertiary (service sector) buildings by January 2025 to improve energy efficiency and reduce CO_2 emissions.[31]

U.S.

The U.S. does not have a national commercial building energy code.[32] Instead, the country leaves code adoption to individual states. State governments are taking steps to implement standards.[33]

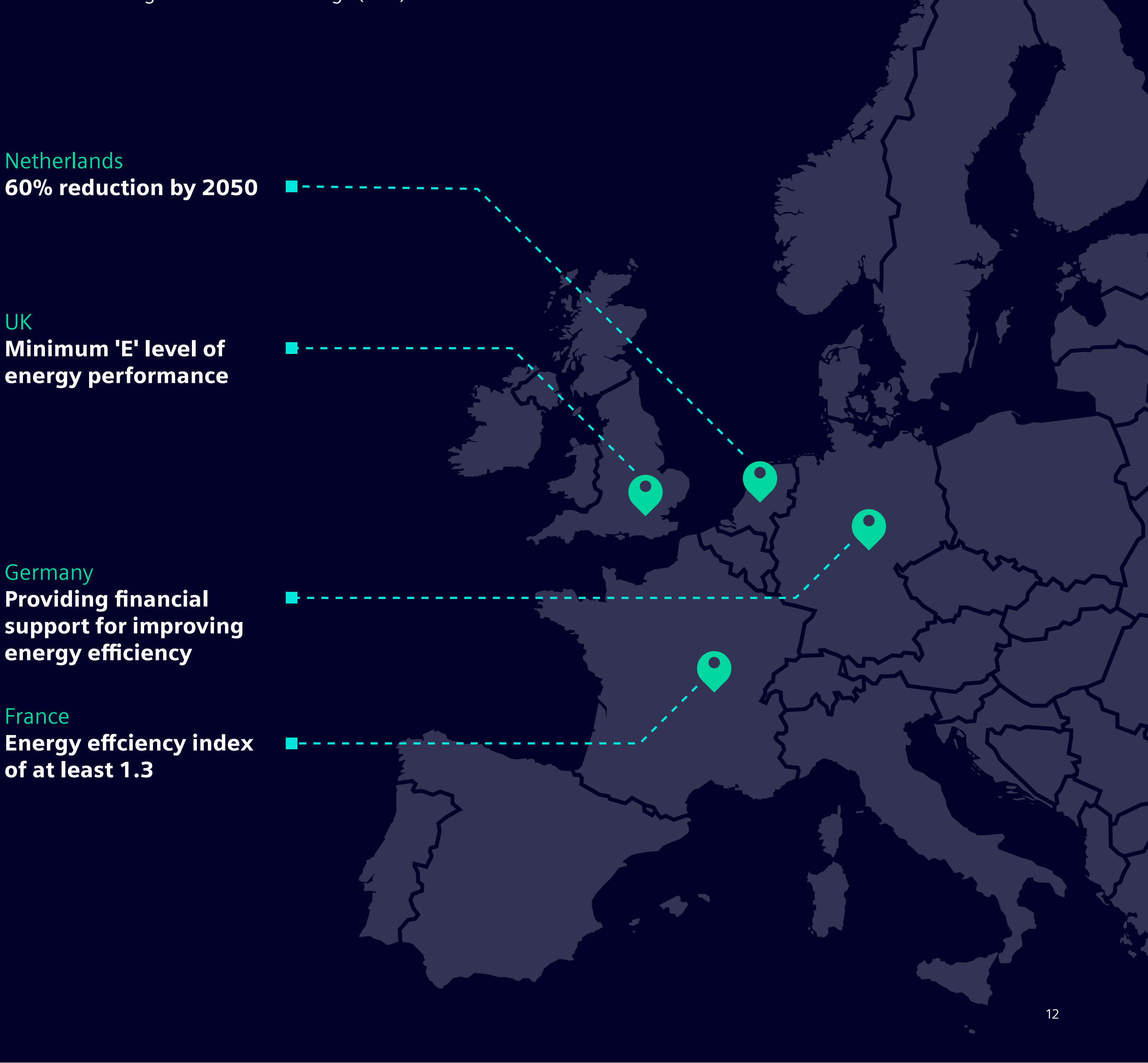
However, there is also a national energy reference standard that is influential in code adoption - ANSI/ASHRAE/IES 90.1,[34] Energy Standard for Buildings Except Low-Rise Residential Buildings. States adopting this standard or an equivalent are eligible for funding to assist in code implementation.

The United States' Inflation Reduction Act[35] of 2022 also provides historic tax incentives, rebates, grants, loans and other investments to improve the energy efficiency and sustainability of existing buildings.[36] One example is the Energy Efficiency Building Tax Deduction, which offers a sliding scale deduction per square foot for existing buildings (five years or older demonstrating improvement over existing energy use intensity by 25% to 50%.

Local standards in Europe

At the local level, European countries are taking individual initiatives.

For instance, minimum building energy performance standards in the UK mean that it is now unlawful to let (lease) properties in England and Wales that do not meet an 'E' level of energy performance. Similarly, in the Netherlands, the government's Building Decree requires that office buildings have an Energy Efficiency Index of at least 1.3 (equivalent to a "C" Energy Performance Certificate rating), with noncomplying buildings longer permitted to be used as offices. In France, the Energy Transition toward Green Growth Act (2016) demands a 60% reduction in final energy consumption in 2050 compared with 2010 level for commercial-sector buildings. Germany provides financial support for improving energy efficiency in buildings and using renewable energy through the "Federal Funding for Efficient Buildings (BEG).[37]



Flexible finance is the key enabler

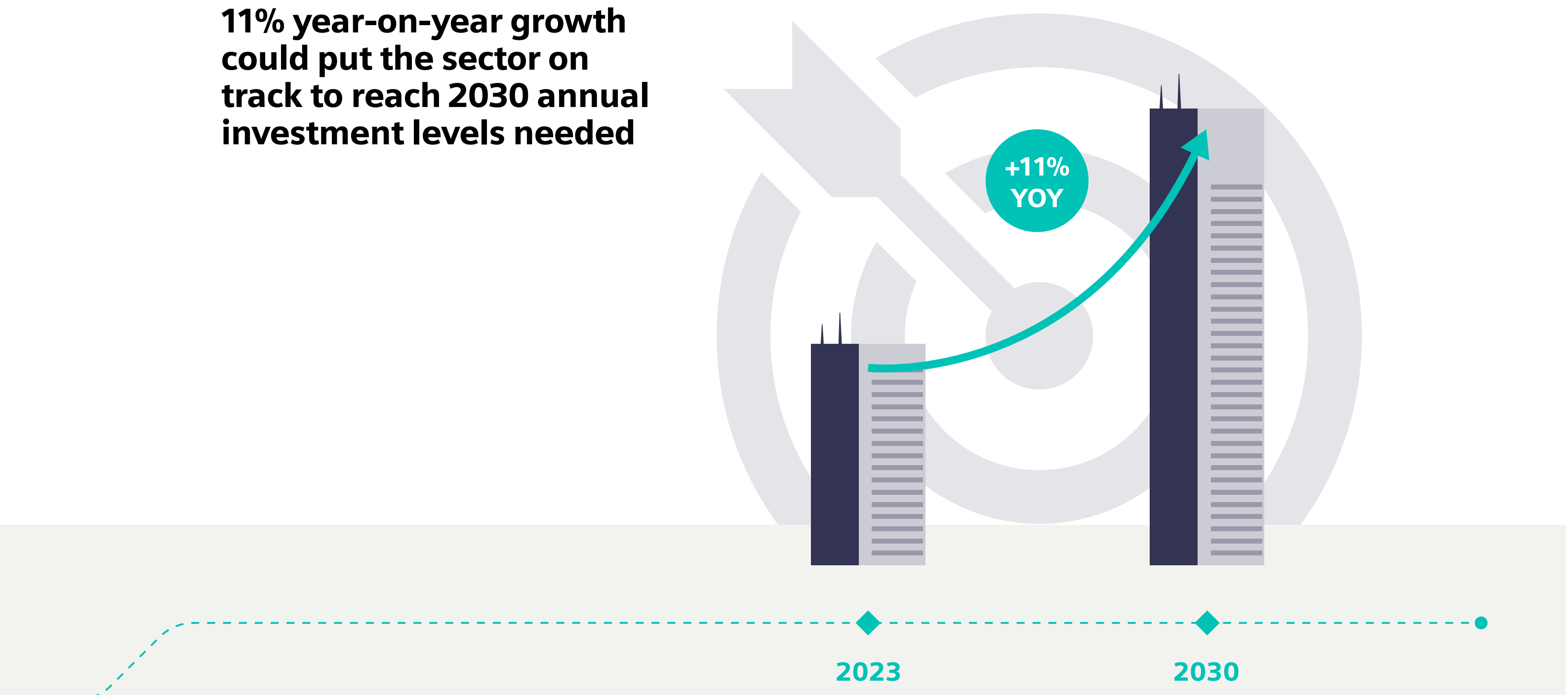
According to the IEA's latest status report, investment in energy efficiency in buildings grew through 2022, continuing the rapid growth of the past few years. The Authority believes that

"Maintaining similar progress of at least 11% year-on-year growth could put the sector on track to reach 2030 annual investment levels needed in the NZE Scenario."

However, it also believes the growth to end 2022 is now seeing a loss of momentum. The Authority says,

"Early signals suggest that a major slowdown can be expected... adverse global economic trends, including high inflation and stringent monetary policies, are expected to slow construction and energy efficiency spending... [and] prevent the sector from reaching its end-of-the-decade target in the NZE Scenario, which calls for investment to more than double.."

11% year-on-year growth could put the sector on track to reach 2030 annual investment levels needed



Decarbonizing the non-residential buildings sector – the main subject of this paper – does indeed require considerable investment. Clearly, public sector initiatives need to be matched by private sector support, in particular private sector finance. Arrangements known as energy-efficiency-as-a-service have already enabled the energy-efficiency transition for many organizations, even in challenging economic conditions.

First buildings owners have to address the issue of what needs to be financed – the precise combination of 'smart' digital technologies to enable decarbonization. Smarter buildings allow flexible/hybrid working to operate. Therefore, aside from carbon emission concerns, smarter buildings are rapidly becoming the norm – simply to attract tenants and/or to ensure buildings optimally perform in financially pressurized circumstances so tenants (a) reduce running costs and (b) contain their carbon footprint.

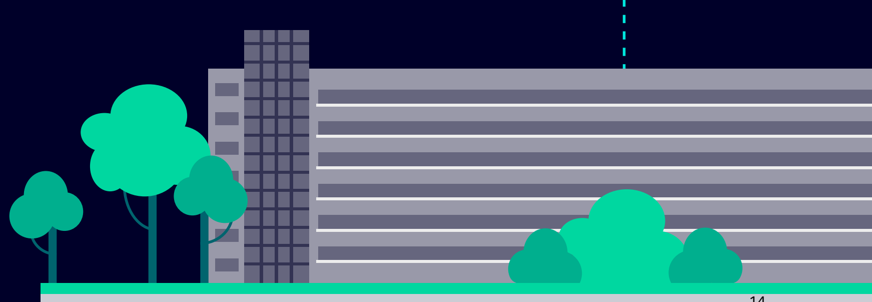
CASE STUDY

Managed services contract for a **shopping mall in Finland**

Sello, Finland's most-visited and most-sustainable shopping center, wanted to modernize and make its building systems more efficient. Not only were the changes key to its ongoing environmental certification, but they would also benefit commercial tenants (by keeping costs low) and visitors (by ensuring air quality).

Siemens and SFS worked together to supply the ideal solution. A comprehensive optimization program to reduce energy consumption and improve air quality and a Managed Services Agreement (MSA) with guaranteed energy savings to finance the system upgrade and related services and protect cash flow.

The project resulted in energy savings of over €100,000 per year and a 20% reduction in CO_2 emissions, all while enhancing the visitor experience.



Examples of the new normal in smarter buildings include – touchless controls (lifts, doors, lights, hot water, etc), 'no touch security', remote/automated occupancy management for hygiene, body temperature readings, real-time scheduling of optimum cleaning routines, sensor data-driven incident management, and smart HVAC for healthier airflows. Many elements of the smart building are also the foundation for reduced energy consumption. The main contributors to energy use reduction and decarbonization focus on energy-efficient insulation and door controls, smart HVAC (heating, ventilation and air-conditioning controls), and sensor-driven LED lighting.[38] Smart buildings controls that activate usage only when needed also clearly play a crucial part.[39]

Even after a technology partner has analyzed a building's energy-efficiency conversion needs and recommended a solution, the project can often face CAPEX and OPEX restraints, or a hesitation to risk capital on a non-core part of their business. A lack of free capital or risk concerns about energy investments can mean a substantial number of buildings owners are missing out on the deliverable operational cost reductions, carbon emission reductions and supply security that can be gained.

However, flexible financing arrangements can secure these operational cost reductions without putting pressure on capital resources, avoid putting capital at risk, and ensure expected savings are realized.

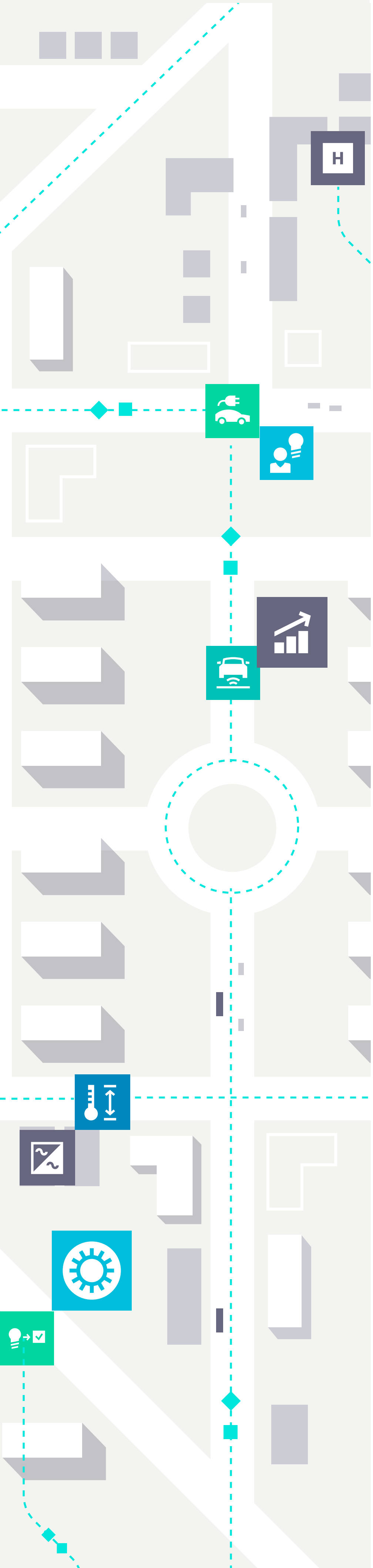
CASE STUDY

Energy Efficiency for a Premium **Hotel Brand in India**

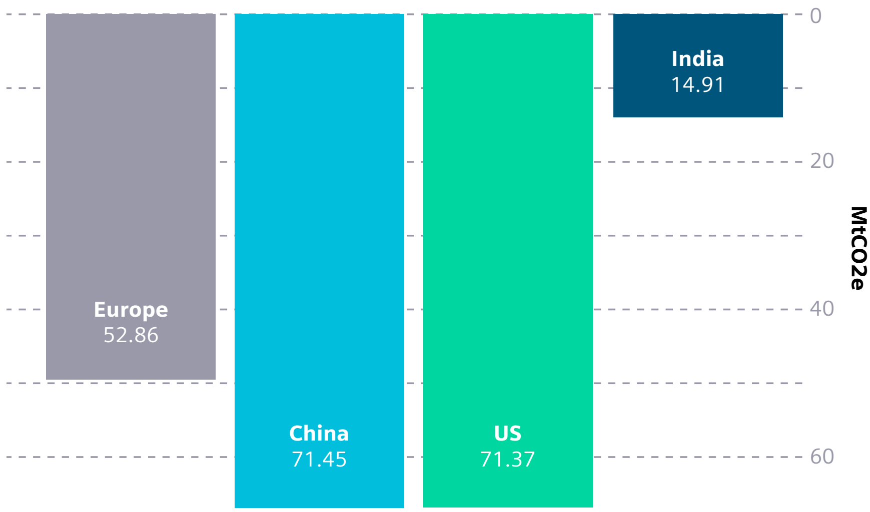
This premium hotel chain was incurring high operational costs for four of its properties in India caused mainly by – a dated HVAC system and high fuel costs due to frequent power cuts.

On the technology side Siemens proposed a data-driven smart heating and cooling system, that could efficiently respond to changing energy loads. And to make the investment affordable SFS proposed a 'Pay-as-you-Save' model – structured to ensure monthly payments are lower than the energy savings generated.

With its energy challenges resolved and its cash-flow preserved, the business can now focus on providing guests the best possible stay and service.



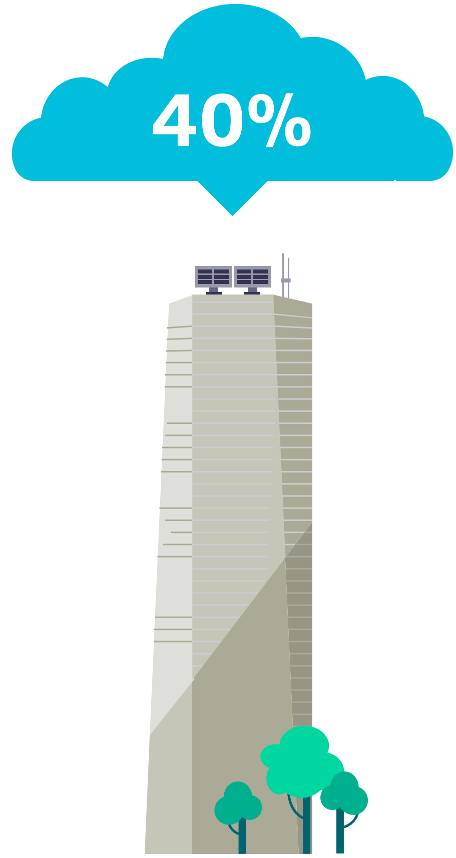
Estimated annual carbon emission reduction 2023-2030 financeable through EaaS for existing commercial buildings



Financing for 'smart' buildings takes a variety of forms, depending on the business processes that need to be enabled. At the technology component level, financing tools are available to help vendors and distributors add value with cash flow capabilities for their buyers. For larger installations or systems, smart financing arrangements can be flexed and tailored to align costs with the rate of benefit gained from the energy-efficient technology. At the most complex level, as-a-service financing arrangements provide the solution, with future expected savings from energy-efficiency being harnessed and used to pay for the capital investment and more. The smart buildings solution provider has to have a deep understanding of the technology and its practical applications, and assumes the risk of achieving the projected energy savings. Often, these arrangements can be made budget-neutral for the building owner, avoiding the need for any capital spending at all.

For CFOs looking at managing their property portfolio, it is helpful to assess just how much decarbonization of existing buildings is susceptible to energy-efficiency-as-a-service techniques. In terms of scope, this paper has put together highly conservative estimates[40] of the baseline annual emissions reduction that energy-efficiency-as-a-service arrangements could enable between now and the end of the decade – the first phase target date for most climate planning around the world. Our model is based on official emissions data and calculates just 50% of the available emissions reduction potential.

Conclusions and **next steps**

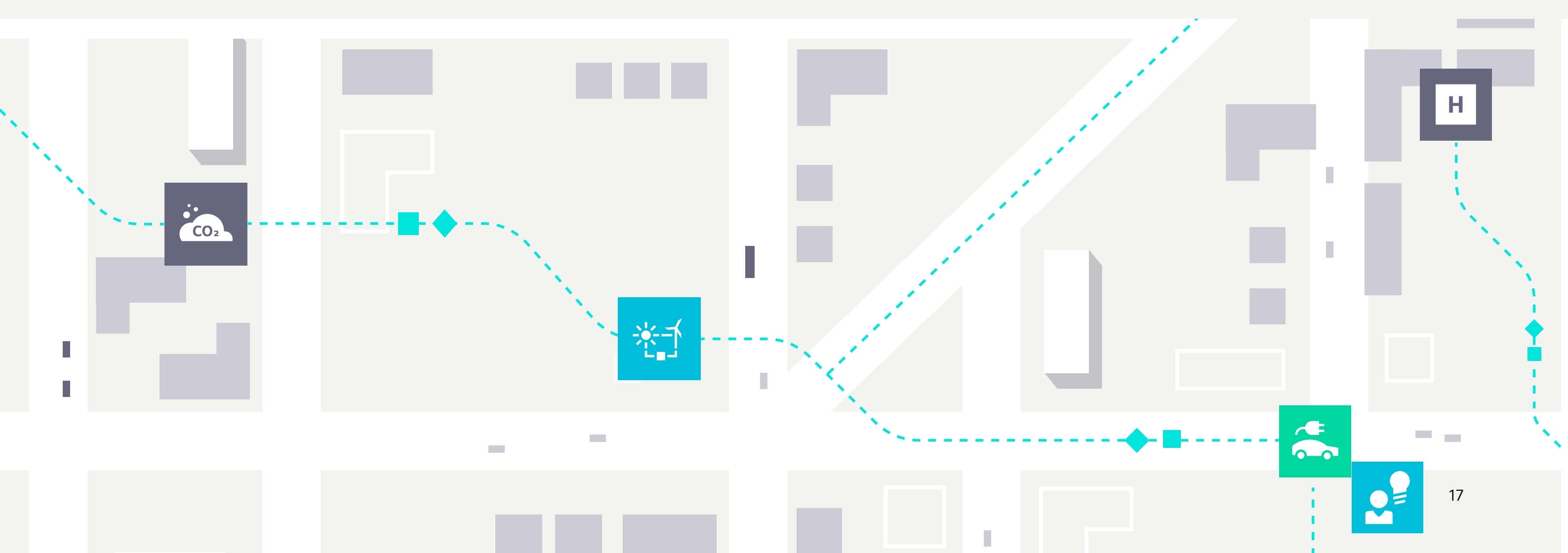


40% of global greenhouse gas (GHG) emissions come from buildings and, if left unchecked, they're set to double by 2050.[41] This means that energy efficiency in the built environment is critical to achieving 2030 and 2050 climate targets.

Commercial and public buildings are more energy intensive per m^2 than residential property, making energy-efficiency initiatives for non-residential buildings a high priority for meeting decarbonization targets.

In challenging economic times, however, with inflation and interest rates rising, flexible, specialist financing techniques (such as EaaS) are important enablers to help the investment in energy-efficiency maintain its required momentum.

If you would like to talk to Siemens Financial Services about accelerating your investment in energy efficiency without the need to find large amounts of capital, please visit https://www.siemens.com/infrastructure-finance



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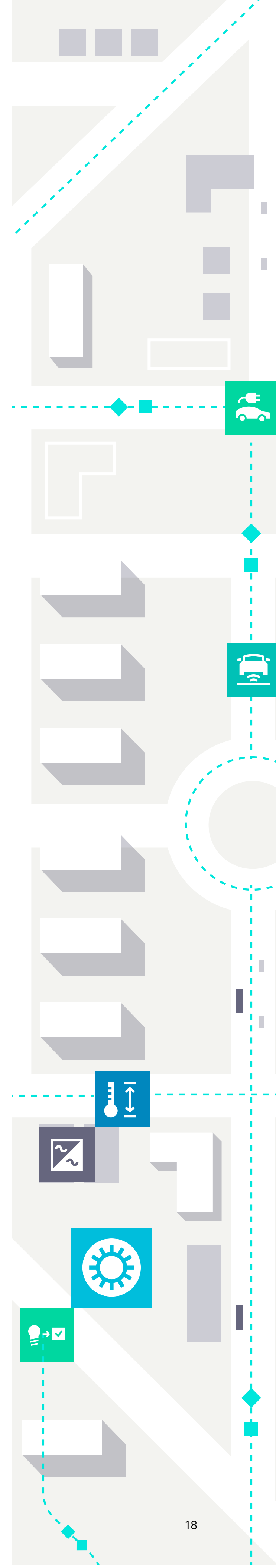

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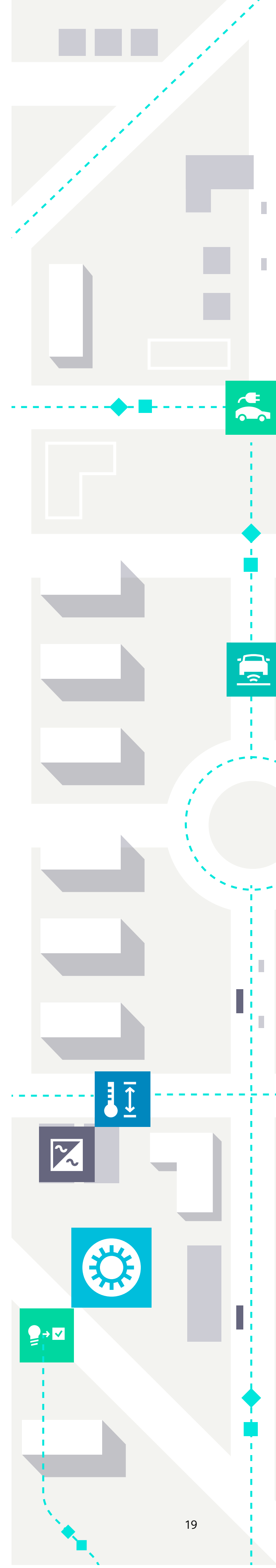

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