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Ingenuity for life



Financing smart buildings: driving value in the “new normal”

Investing in smart buildings using energy efficiency as a key enabler

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Management summary



The pandemic crisis and its aftermath is making building owners and managers look afresh at the value their buildings deliver and the underlying operational cost base of their assets.



Several drivers of change are simultaneously in play to make buildings smart: the economic pressure to seek cost efficiencies, especially through energy efficiency; new ways of working to ensure hygiene, infection control and safety; existing and emerging regulatory requirements making fire and security upgrades mandatory; and the drive across the world to reach higher environmental standards.



There is now wide recognition that smart buildings add value by delivering agility and flexibility in the “new normal” – whether from the perspective of hot-desking, agile changes of use, security and safety, hygiene and infection control, or greater efficiency and flexibility to morph to volatile circumstances.



At a time when building owners and managers are having to invest in measures to make their buildings safe and occupiable, and are also being restricted on the density of occupation, it is arguable that, only smart buildings will present a sufficiently attractive proposition to potential tenants and occupants.



In a budget constrained environment, energy efficiency savings are increasingly seen as the ideal starting point for smart buildings transformation (either as a single investment or as a series of incremental projects), with smart financing techniques playing a major role in enabling those future savings to finance the cost of conversion.



Energy-efficiency initiatives also have greater impetus as official bodies around the world are setting mandatory targets for the reduction of energy consumption in buildings, in the bid to meet climate change goals.



This insight study from Siemens Financial Services has modeled the cost of official buildings energy conversion targets by 2040. These estimates illustrate the sheer size of the investment challenge, and underline the importance of smart finance to make smart buildings transformation happen in a financially sustainable way.



This insight study covers five sectors in fourteen countries: offices, hospitals, manufacturing, public buildings and education.

Introduction – the growing need to make buildings smart

COVID-19 has caused a crisis for building owners and landlords – both in the public and private sectors. Commercial rent collection rates have plummeted across the world¹ and commentators are raising questions over which types of commercial property will remain desirable for tenants to lease and for owners to retain.

As a result, new financial models are emerging that fix rental payments to occupant turnover.² This whole new perspective is making building owners and managers look afresh at the underlying operational cost base of their assets.

Indeed, there is a “perfect storm” of factors which are coming together to simultaneously drive change and make buildings smart. Firstly, the economic pressures resulting from the pandemic are focusing minds on ways of achieving building management cost efficiencies (especially through energy efficiency).³ At the same time, COVID-19 has introduced new rules and ways of working to ensure hygiene, infection control and safety in buildings.⁴ Alongside these topical pressures are existing and emerging regulatory requirements that make fire and security upgrades mandatory.⁵ And various policies around the world are setting targets to reach higher environmental standards in buildings (covered in detail later in this paper).

At the same time, patterns of work and public service are clearly changing as a result of the crisis and its aftermath. There is much emerging evidence major corporations are considering making flexible working the norm for their workforces, a trend that was already under way, but has now been much accelerated by the positive realities of remote working revealed by the pandemic crisis.⁶ Making buildings smart allows flexibility – whether from the perspective of hot-desking, agile changes of use, security and safety, or enhanced ability to morph to volatile circumstances.

Smart buildings allow adaptability – whether from the perspective of hot-desking, agile changes of use, security and safety, or enhanced ability to morph to volatile circumstances.



Smart buildings – coping with the crisis

Smart buildings deploy automated and digitalized technology to enable more efficient, more effective building capabilities and management. The data generated by IoT sensors provide real-time information for quick reactions. Smart technology helps transform the building from a cost burden to an active contributing partner – a new team member – in running a business or a public sector organization and coping with the “new normal”.



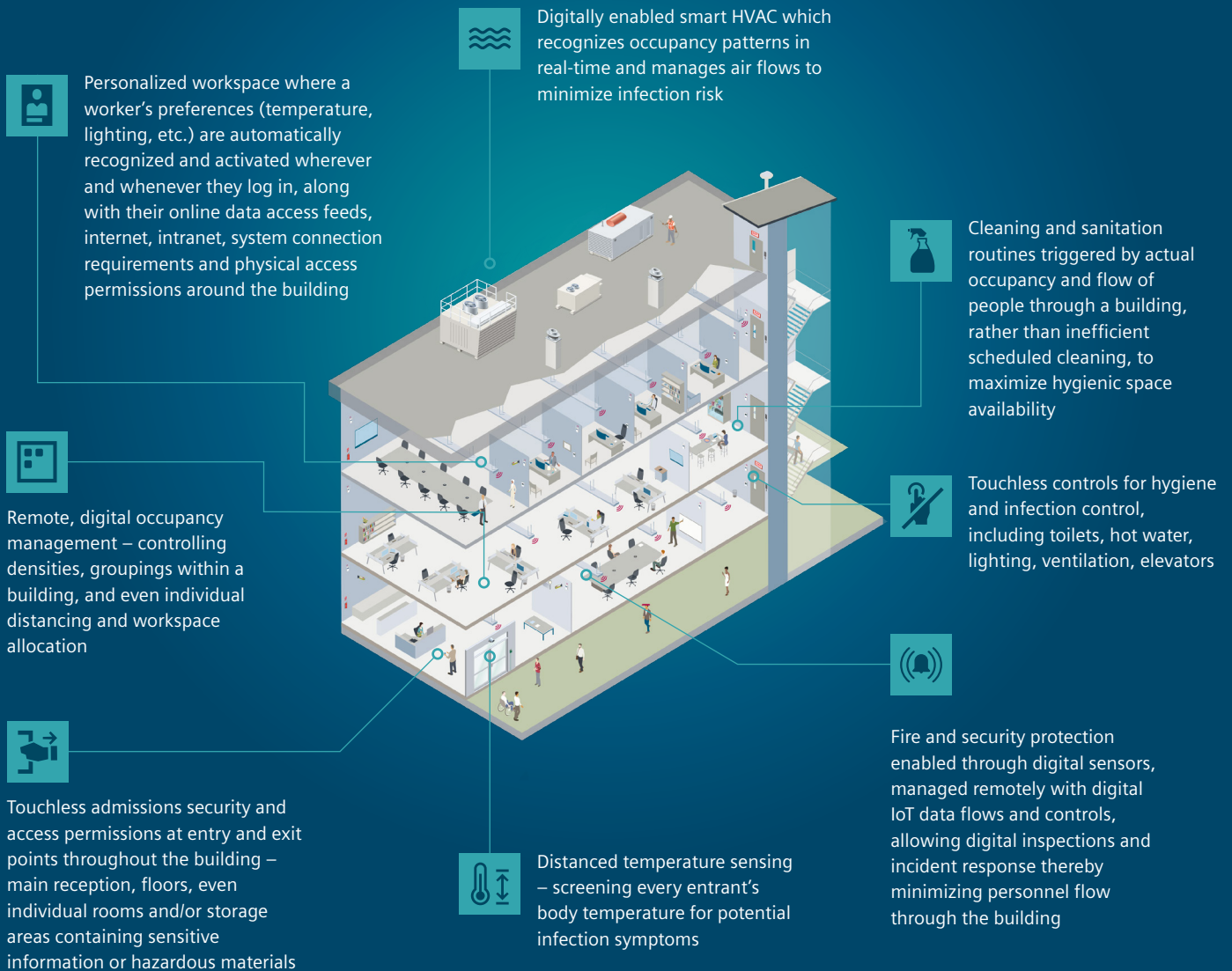
With smart technologies, buildings are managing workflow and occupancy, ensuring employee safety, recognizing and adapting to each occupant’s individual requirements or preferences, conserving energy, and providing a host of other intelligent and agile business support functions.

Yet in the post-pandemic world, business and public sector finances will continue to be under considerable strain for an extended period. At the same time, building owners and managers are having to invest in measures to make their buildings safe and occupiable, and are also being restricted on the density of occupation at any one time. In this environment, it is arguable that only smart buildings will present a sufficiently attractive proposition to potential tenants and workforce occupants. In other words, if a building is not smart, it is far less likely to be let or used or retained, fundamentally affecting property asset values.⁷ This pressure to offer “added-value” commercial property (to win tenants or justify continued ownership) is underlined by deep uncertainties over property funding models from the public markets.⁸

Smart building technologies that help manage the "new normal"

Even where different occupations have returned or are returning to fixed workplaces, physical distancing and personal safety measures are also making new technical demands and affecting the economics of building occupation.

Examples of a "new normal" in smart buildings



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Siemens and Salesforce partner to support businesses globally to safely reopen and deliver the future experience for physical workplaces



Orchestrate processes, people and things



Faster and more accurate emergency response



Real-time data-driven decisions



Touchless office



Keep employees informed and productive



Safe occupancy management system



Ensure user privacy



Flexible framework for future workplace experience

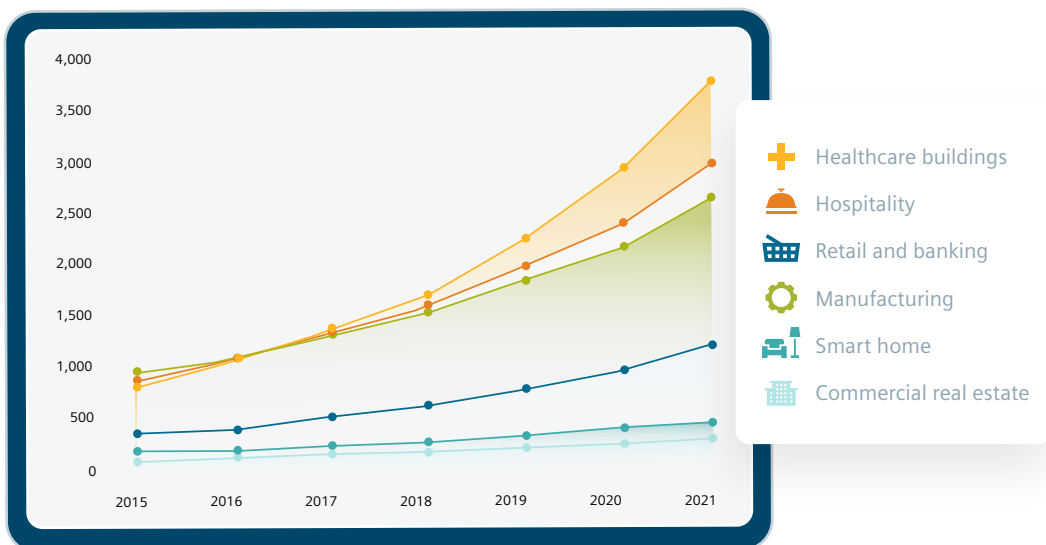
Return on investment from smart buildings

The added value offered by smart buildings has already been widely acknowledged amongst expert commentators. According to the European Commission report on Macroeconomic and Other Benefits of Energy Efficiency,¹⁰ a smart, higher-performing building can conservatively add as much as 11.8% in lease value and can ultimately yield 5% to 35% higher sale values.

This report specifically underlines how buildings that fail to become smart are likely to be left behind in the competition to appeal to tenants or managers, stating that “in the commercial sector, buildings that fail to keep up with technological advances, including widespread advances in energy efficiency, risk becoming obsolete, especially in unfavorable market conditions (such as periods of low or negative economic growth).”¹¹

Pre- and post-COVID recognition of the importance of making buildings smart is evidenced in various reports about smart building technology market growth. According to one recent commentator, “the smart buildings industry has a massive market opportunity ahead of it. In 2020, only 17% of companies are presently operating smart building policies and, of these, 22% indicate they will increase the budget allocated to smart building technologies over the next three years.”¹² Similarly, a market prediction published after the pandemic crisis had got under way has noted that, “the global building automation market size is projected to reach 112.3 billion USD by 2026, from 64.7 billion USD in 2019, at a CAGR of 8.2% during 2020-2026.”¹³

Growth in smart building connected devices over time



Figures show millions of devices Published by kind permission of Memoori (www.memoori.com)



The key current drivers accelerating smart building conversion can be summarized thus:

Economic drivers – heightened by the pandemic – are driving the search for cost efficiencies in buildings, especially through energy efficiency.

Pandemic pressures are demanding that commercial and public sector buildings offer smart and intuitive capabilities to protect occupants’ safety and justify their retention as enabling assets.

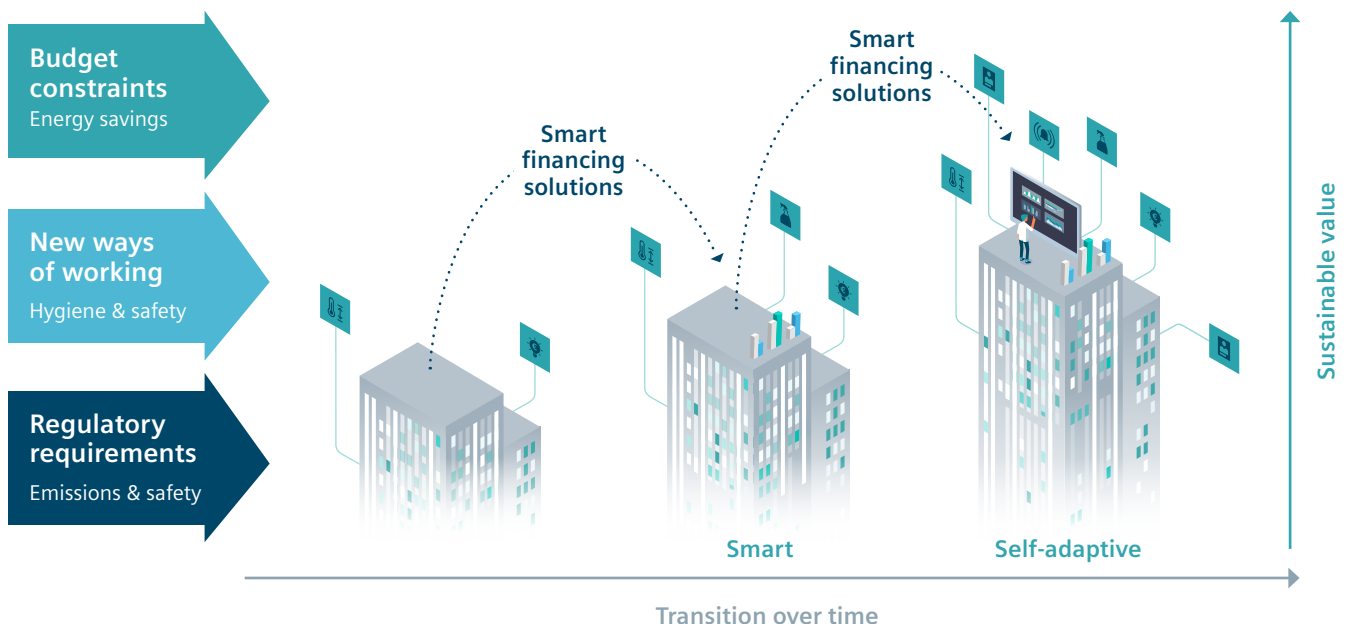
Patterns of work – especially remote or home working – are likely to change levels of demand for buildings generally, with the need to automatically and remotely manage occupancy.

Mixed, smart workspace (closer to people’s homes) is likely to see growth in demand,¹⁴ whereas corporate headquarters are likely to see suppressed demand. On the other hand, increased safety demands may actually amplify the need for space in schools. Manufacturing buildings also need smart technology to protect worker safety while also helping reduce operating costs and improve productivity.

There is evidence that **smart capabilities** tangibly add to buildings’ rental and asset values, and official commentators are of the view that buildings which do not convert to smart may become obsolete and radically depreciate in value.

And **existing and emerging regulatory pressures** – such as those around fire and security – have simply added to the pressure to make buildings smart and deliver more effective and efficient (digital and remote) controls.

Surviving and thriving in the “new normal”



A smarter way of starting – mandatory energy efficiency targets

While there is wide consensus around the need to make buildings smart, all countries and sectors need a way of making that conversion financially sustainable. How can this be done?

The starting point is to use smart technology to reduce energy consumption in buildings. This produces hard financial savings that – through smart financing arrangements – can be harnessed to subsidize or even pay for overall smart buildings conversion. This can be done at an enterprise level, or in small incremental steps, each of which proves its return on investment.

In some countries, there are mandatory requirements to upgrade buildings systems, which makes the need to find sustainable financing methods an urgent one. Examples include the ELAN law in France, which requires commercial buildings to hit energy efficiency targets. In Germany, the KfW program for residential and non-residential building imposes similar strictures. The current five-year plan in China will demand the energy efficient conversion of at least 100 million m² – the target in the previous five-year plan. It is not surprising that these targets are now being imposed, given that buildings globally account for 40% of energy consumption and over a third of carbon emissions.¹⁵ Typical energy efficiency savings for buildings are usually at least 20%¹⁶ and often far higher – representing very substantial operational economies.

There are regional moves afoot as well. Across EU territory, the Directive amending the Energy Performance of Buildings Directive (2018/844/EU) is encouraging accelerated progress toward energy efficient buildings. EU countries must establish strong long-term renovation strategies, aiming at decarbonizing the national building stock by 2050, with indicative milestones for 2030, 2040 and 2050. These strategies should contribute to achieving the energy efficiency targets in the national energy and climate plans (NECPs). To this end, EU countries must set cost-optimal minimum energy performance requirements for new buildings, for existing buildings undergoing major renovation, and for the replacement or retrofit of building elements like heating and cooling systems, roofs and walls. This initiative is joined by the EU’s “Renovation Wave” – part of the Green Deal – which seeks to address the fact that “currently, roughly 75% of the building stock is energy inefficient, yet almost 80% of today’s buildings will still be in use in 2050.”¹⁷

What, then, do the smart financing arrangements that enable energy-efficiency and smart building conversion look like? How do they work?

40%

Buildings globally account for 40% of global energy consumption

20%

Typical buildings energy efficiency savings are usually at least 20%

100m m²

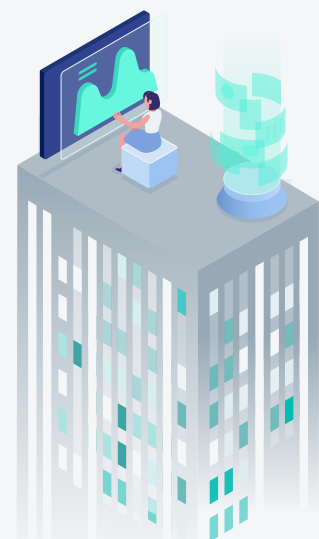
China will demand the energy efficient conversion of at least 100 million m²

75%

of EU building stock is energy inefficient

80%

of today’s buildings in EU will still be in use in 2050



Smart buildings – the financing solutions

Smart financing techniques to enable energy efficiency conversion and smart implementation split into two main camps.

First, there are whole building arrangements, where energy savings are harnessed to fund the cost of a complete retrofit. In many cases, however, building owners and managers want to undergo the energy-efficiency and smart technology transformation in smaller, incremental stages.

So financing techniques which ease cash flow and spread the capital burden of conversion are equally important – financing that is available for building owners/managers, technology vendors, distributors, value-added resellers, solutions builders and construction companies alike, from the very largest to the very smallest.

Option 1 – Building Efficiency as a Service



For whole building and multi-building projects, budget-neutral schemes are available from specialist financiers to enable conversion. They are increasingly becoming known as "Building Efficiency as a Service" (BEaaS) arrangements. The integrated solutions provider introduces technology and systems to create smart buildings which deliver a clearly predictable level of energy savings. The reduction in energy costs is then harnessed to effectively fund the cost of conversion.



While the level of energy reduction will vary, depending on external climate, cost of power, and other factors – in most cases the savings can be reliably reflected in a financing structure to deliver self-financing smart building upgrades anywhere in the world, although the technique, to date, is most mature in the Western world. After the end of the financing period, the owner benefits from the ongoing reduced energy consumption, along with all the other added benefits of smart buildings.



Throughout, the building's owner has had to put no capital at risk, and has conserved their own funds for strategically important development activities – whether commercial growth or improved public services. In the post-pandemic period, where cash reserves have been used up and revenues are experiencing a downturn, the idea of self-financing smart building conversion becomes even more compelling than before the crisis.

Option 2 – financing products and projects

Many building efficiency and smart buildings projects are undertaken in smaller incremental steps. If this approach is chosen, then the capital-neutral economics of BEaaS cannot be deployed. Nevertheless, there is a huge operating advantage in being able to spread conversion costs over a financing period – managing cash flow by aligning expenditure with the rate of energy savings.



The building technology products which make energy efficiency and smart capabilities possible come to market through a supply chain of distributors, value-added partners (VAPs), solution builders, and engineering, procurement and construction (EPC) companies. The smart financing tools which help these suppliers and their customers invest sustainably in energy efficiency fall into two brackets.



Firstly, various forms of smart equipment and technology finance are available to manage the cost of acquiring upgrades such as energy-efficient HVAC control and building automation (on-premise or via cloud), remotely managed digital controls for fire safety and security, remote occupancy management systems, touchless controls throughout a building, and much more. Where the solution provider has teamed up with an expert financier (who understands the technology, its applications and its benefits) then financing arrangements – often based on leasing structures – can be tailored to fit the building owner’s/manager’s precise cash-flow profile, aligning costs with the rate of benefits and/or savings gained.



Secondly, integrated forms of sales finance are a key part of the integrator’s or distributor’s value proposition, providing their clients with staged payments that ease the end-customer’s cash flow and make it easier to make investment decisions – often of higher specification solutions. For larger sales, the techniques are usually lease-based, whereas smaller product transactions might come with an extended payment term offer embedded. Again, specialist financiers tend to have more knowledgeable decision parameters, better suited to the industry’s specific dynamics.



Energy efficiency – the investment challenge

This insight paper has established the urgency and value of smart buildings conversion, as well as the mandatory drivers that are focusing attention on converting existing buildings to greater energy efficiency.

Evidence has also been offered showing how energy efficiency is the key financial starting point for meeting smart buildings aspirations, and that specialist financing techniques allow that conversion to happen without the need to source and deploy large amounts of capital.

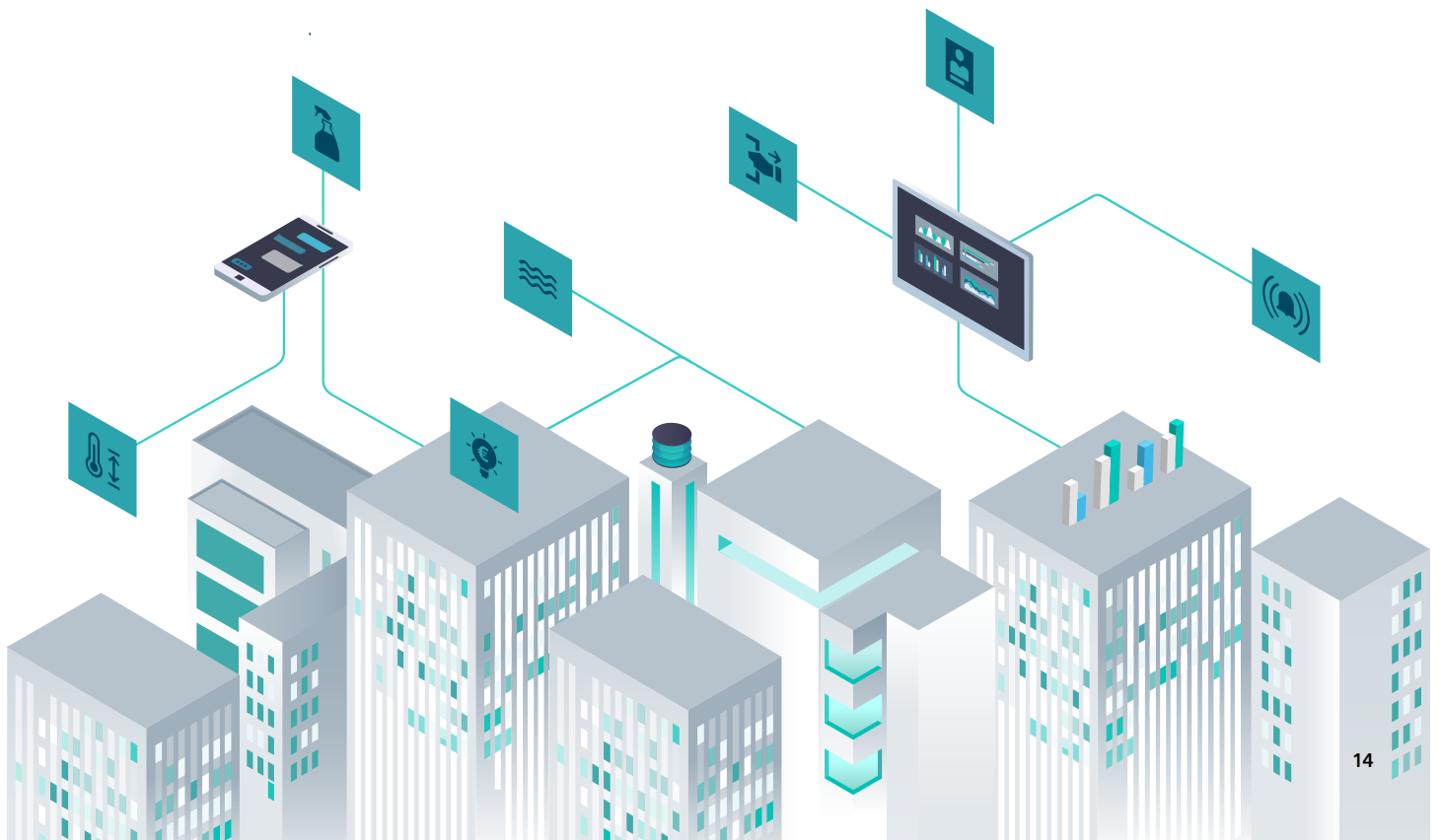
What, then, is the size of the investment challenge of energy efficiency conversion in buildings (that these financing techniques help to make happen in an economically sustainable way)? It is important to present an estimate of the sheer financial scale of energy efficiency conversion to appreciate how important the role of smart financing is – especially since many authorities in the public sector, for instance, have noted that it simply cannot be afforded out of public capital alone.¹⁸

This insight study has built an estimation model for the building energy efficiency investment challenge. Its starting point is data from the Global Alliance for Buildings and Construction (GABC) – a multi-country organization managed by the International Energy Authority and the UN Environment Programme. In 2019, it published a report which noted that energy efficiency improvements in buildings are not yet on track to make their required contribution to emissions reduction targets. As the report notes, “decarbonizing the buildings and construction sector is critical to achieve the Paris Agreement commitment and the United Nations (UN) Sustainable Developments Goals (SDGs): responsible for almost 40% of energy- and process-related emissions, taking climate action in buildings and construction is among the most cost-effective. Yet, this 2019 Global Status Report on buildings and construction tells us that the sector is not on track with the level of climate action necessary.”

Decarbonizing the buildings and construction sector is critical to achieve the Paris Agreement commitment and the United Nations (UN) Sustainable Developments Goals (SDGs): responsible for almost 40% of energy – and process-related emissions.

In terms of action that needs to be taken, the report recommends that the world needs to “increase renovation rates in industrialized countries to an average of 2% of existing stock per year by 2025, and to 3% by 2040.” This ties in with the targets set by the Directive amending the Energy Performance of Buildings Directive (2018/844/EU). However, the COVID-19 crisis has made building owners very cautious about investing their capital in renovation – even in energy-efficiency refits where the energy costs saved significantly outweigh the cost of the refit (but only after a period of years). Moreover, post-COVID-19, competition for tenants is going to be greatly increased as corporations take a fresh view of their commercial property needs and only the best buildings – in terms of facilities, eco-footprint and running costs – will be successfully let and avoid long voids.

This insight paper from Siemens Financial Services takes the GABC’s recommended conversion rate between 2020 and 2040, and builds that into a conservative estimate of the capital cost of conversion over the same period. These estimates are calculated using third-party estimates of conversion costs and referenceable m² estate data across a number of key sectors.¹⁹

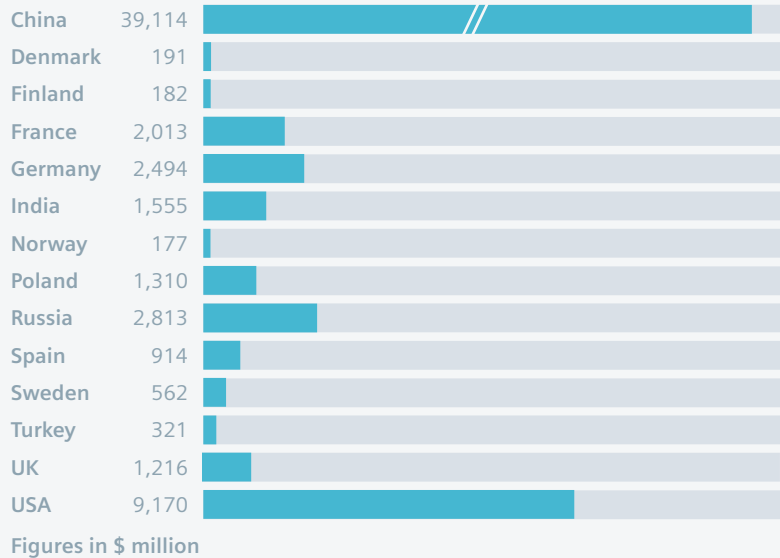


1. Offices

The future of office occupancy is under considerable scrutiny at the moment, with many corporations reassessing their real estate needs in the light of the pandemic experience.

Smart buildings have been seen to offer important benefits in terms of looking after occupant and staff safety through digital, touchless and remote capabilities. Equally, operating costs are also under the spotlight and the opportunity to save on energy costs without having to deploy capital is increasingly attractive.

Investment challenge – Energy efficiency conversion to 2040



Smarter office energy

A not-for-profit organization in Columbia, South Carolina, USA, required critical infrastructure upgrades at various office and public-facing buildings. The project included upgrades to lighting, building controls, building envelope, heating and HVAC systems, and had a conversion cost of \$9.7 million in capital. Traditional lenders could not provide the organization with a competitive financial product.

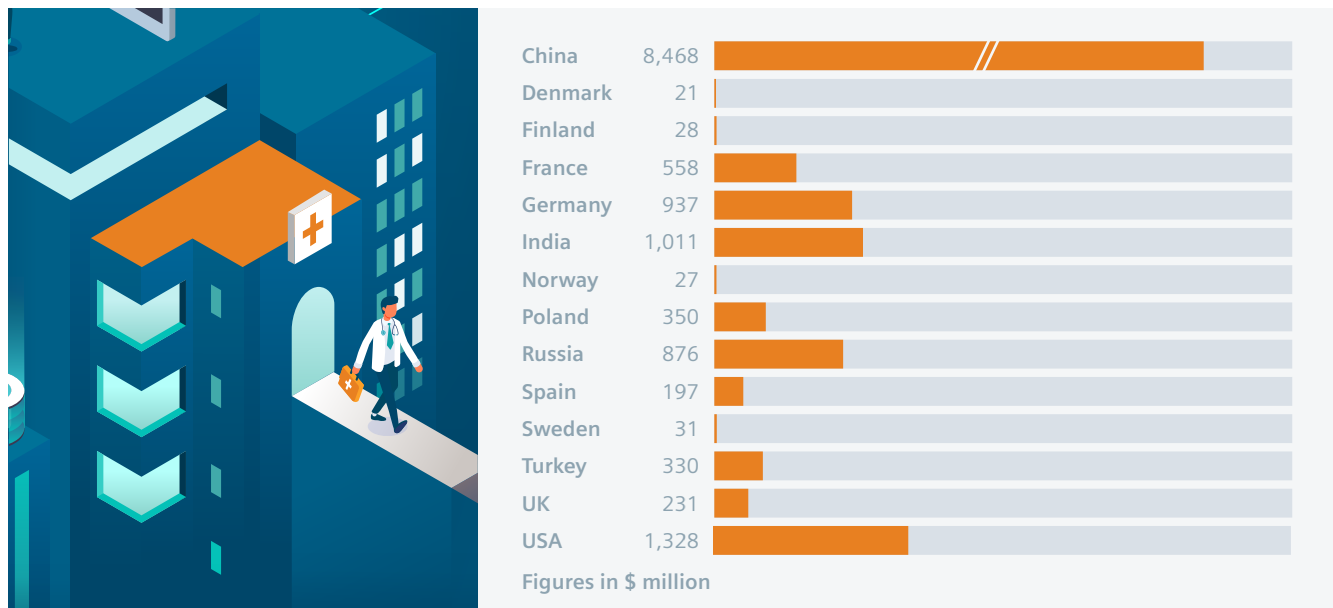
Siemens Financial Services tailored a 15-year tax-exempt lease solution for the organization which covered construction costs and included an energy performance guarantee from Siemens Smart Infrastructure. With the organization now powered by Siemens, a master agreement is in place to enable the acquisition of further equipment updates as the organization grows.

2. Hospitals

In hospitals, smart, adaptive building systems can provide ideal conditions for patients’ recoveries by leveraging artificial intelligence to optimize temperature, air quality and flow (vital for infection control), lighting and other variables within patient rooms as well as optimizing energy consumption.

Ultimately, patient safety and outcomes improve, length of stay is reduced and patient throughput for the hospital increases.

Investment challenge – Energy efficiency conversion to 2040



Smarter healthcare estates

Signature Healthcare, an award-winning health system based in Brockton, Massachusetts, USA, worked with Siemens to identify critical upgrades to its main heating and cooling systems at its primary hospital campus, resulting in a \$9 million infrastructure improvement plan.

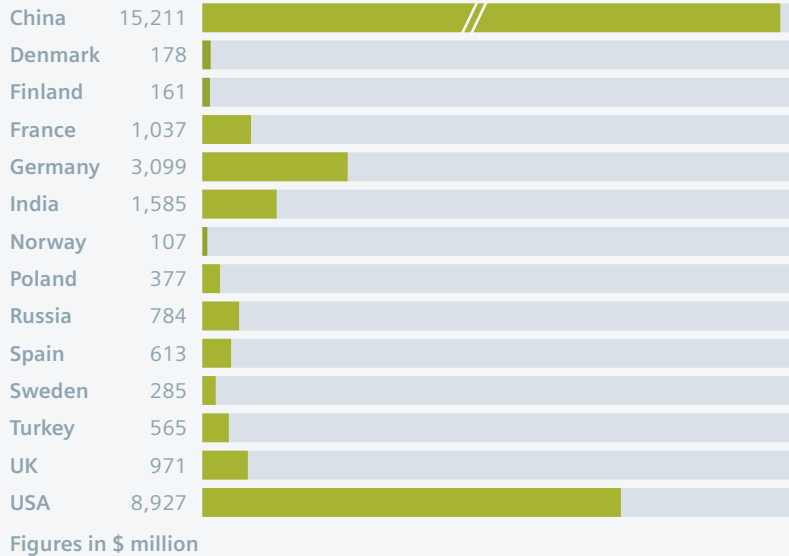
By leveraging the full breadth of Siemens’ expertise and smart financing structures, Signature Healthcare was able to fund the infrastructure plan, simplify its debt structure and, ultimately, provide for financial flexibility.

3. Manufacturing

There can be little doubt that the economic aftershock of the pandemic crisis will be felt for some considerable time.

Manufacturing sectors have all been affected, even those like food and beverage, pharmaceuticals or medical products, where demand has not fallen but has nevertheless been disrupted. Manufacturers large and small will still have to seek enhanced operating agility, flexibility and efficiency, as well as reducing energy costs, to cope with the “new normal”, qualities that expert commentators say are enabled through automation, digitalization and a variety of other technology and machinery investments, whether replacement or retrofit.²⁰

Investment challenge – Energy efficiency conversion to 2040



Energy efficiency in manufacturing

ZAO Khlebokombinat Inskoy, a major bread making organization in the Novosibirsk region of Russia, wanted to upgrade its on-site electricity transformer substation and develop its production capacity.

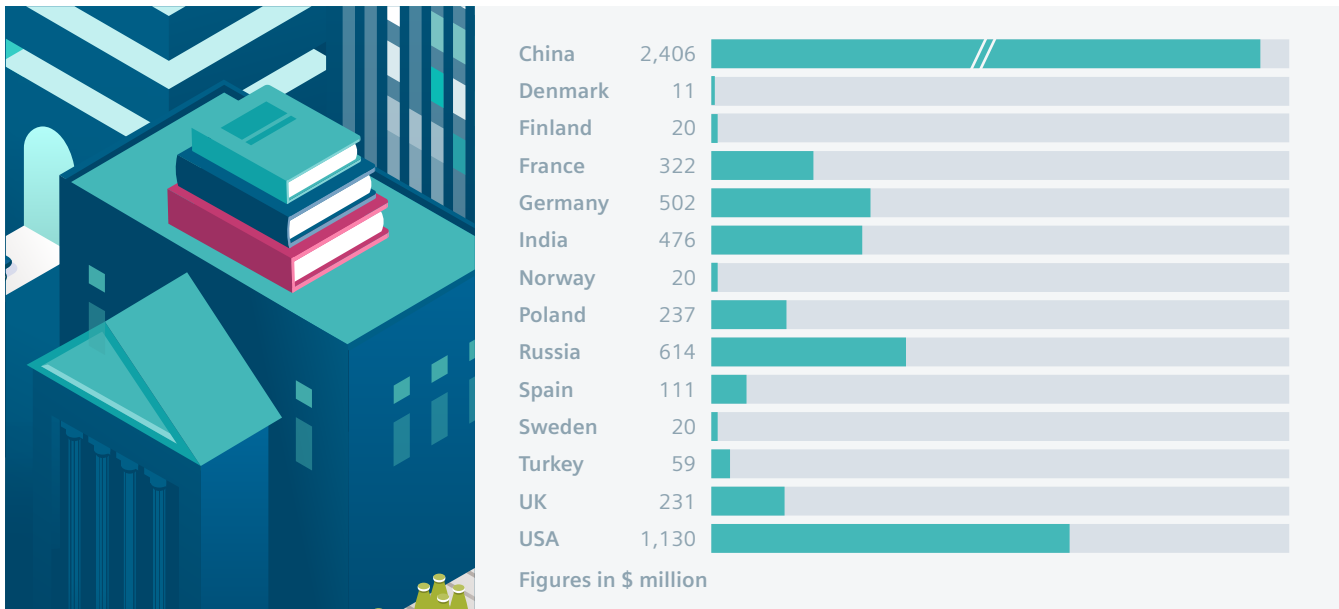
The entire upgrade was financed by Siemens Financial Services, including the acquisition of switchgear from Siemens to minimize the loss of electrical power during transmission. Optimal interest rates were arranged and payment schedule flexed to suit the company's cash flow profile.

4. Public buildings

Coping with the pandemic aftershocks will put a major financial strain on public finances. Smart buildings help to deliver better and more efficient public services, using digital data flows to reduce administration costs and introduce enhanced use of public funds.

Building energy efficiency initiatives, supported by smart financing from private capital, create additional budget capacity to deliver smart conversion in cities, regions and national infrastructures.

Investment challenge – Energy efficiency conversion to 2040



City energy savings

A city in the state of Michigan, USA was looking to implement technology to optimize energy efficiency at various buildings within its municipality – specifically a best-in-class solution from Siemens Smart Infrastructure.

To make this \$6.6 million investment possible, Siemens Financial Services created a tailored

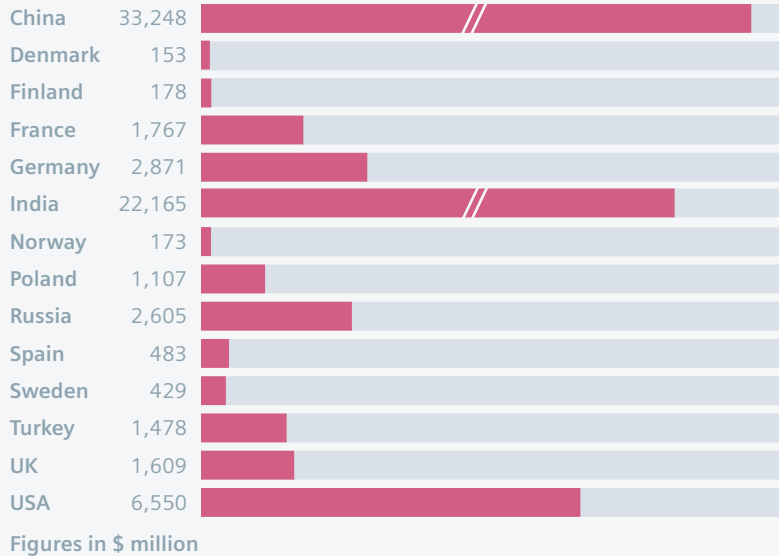
financing solution that included a twelve-month payment deferral to accommodate the construction period, as well as performance guarantees. The total solution generates energy savings that more than pay for the project, making the whole initiative budget-neutral for the city.

5. Education

In schools around the world, smart buildings have already been enhancing comprehension and the ability to focus. Now they are managing space occupancy and student safety.

By improving various factors like temperature, air quality, and lighting, smart buildings will not only know what the ideal learning conditions are but automatically adjust the classroom environment to create the perfect place to learn. They will also be helping the remote and automated management of “cohorting” to ensure infection rates are minimized with children returning to their essential education.

Investment challenge – Energy efficiency conversion to 2040



Energy savings fuel education

The Wiązowna commune near Warsaw, Poland, was experiencing growth in its child population, generating more demand from its educational institutions. There was a need to expand and improve school buildings, but the commune did not have available capital to do so.

An integrated solution created by Warbud, Siemens Smart Infrastructure and Siemens Financial Services allowed five school buildings to be refurbished and developed. The arrangement harnessed future energy savings to pay for the project across the financing period, removing the need for the commune to raise capital.

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Siemens Financial Services
80200 Munich, Germany

For more information:

Phone: +49 89 636 40019

E-mail: communications.sfs@siemens.com

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