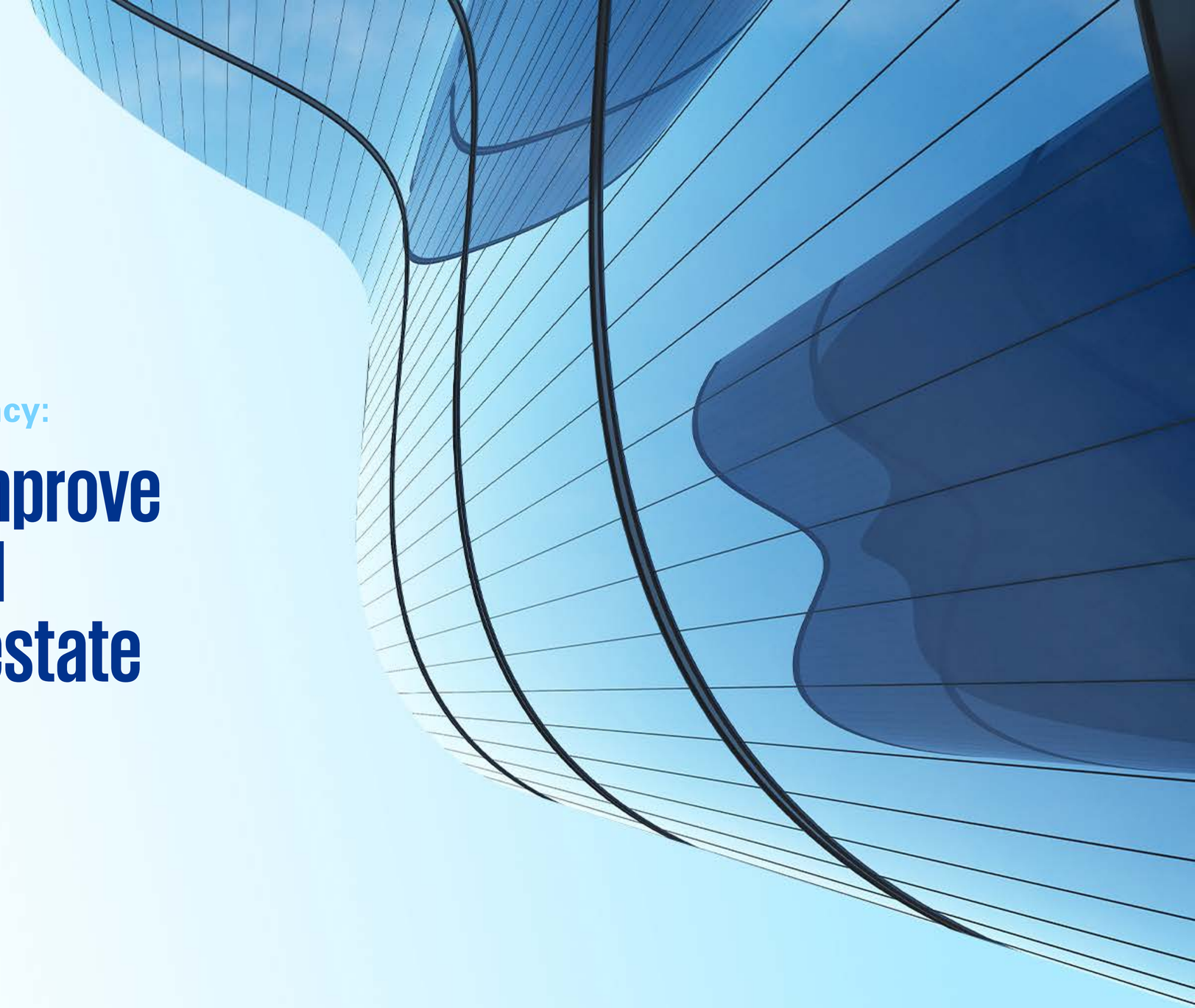
Artificial intelligence, real efficiency:

How AI is helping to improve energy efficiency and management in real estate

KPMG Global Decarbonization Hub



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Foreword

The heat is on in the real estate sector

With climate change being one of the biggest challenges of our time, decarbonizing operations and assets is one of the most powerful interventions in support of fighting rising temperatures and its adverse effects.

One of the main contributors to global green house gases (GHG) emissions are buildings, accounting for about 40% of global emissions, 27% of that coming from energy used to heat, cool, and power[1]. It is also known that urbanization is here to stay, with 68% of global population living in cities by 2050[2], making it necessary to focus on the decarbonization of real estate to ensure that both existing and new assets are not contributing to extra GHG emissions.

In this report, we aim to demonstrate, through practical case studies and professional insights, that it is critical to invest in decarbonization and key technologies, such as AI. Strategic energy conservation and optimization management paired with technological solutions can turn the climate challenge into an attractive value creation opportunity, helping enhance property value and build competitive edge.

In particular, we argue that with the rise of human-centric AI, we can now harness the power of change and create cities where people's well-being and sustainability are at the core.

Michael Deane
Global Lead Director - Strategic Energy Management
KPMG International

[1] usgbc.org/articles/advocating-building-materials-low-embodied-carbon
[2] un.org/uk/desa/68-world-population-projected-live-urban-areas-2050-says-un

AI saving energy 24/7

240,000 MWh energy saved, 90,000 t GHG emissions avoided and 26 mil EUR saved to real estate managers.

One of KPMG firms' strategic energy efficiency measures in commercial real estate sector includes the utilization of AI-powered SaaS solutions, such as "Jenny", to autonomously optimize HVAC systems' performance 24/7.

Read KPMG Estonia's case study on AI Jenny application with R8 Technologies on page 9 of this report ***here.***

Activating virtual power plant

AI is adjusting energy consumption to help TSO to balance the grid

Technical anomalies detected

AI audit algorithms have detected HVAC (Heating, Ventilation, and Air Conditioning) anomalies impacting system efficiency - alarm sent to technical team

Shifting energy demand

AI is preparing the building for upcoming high occupancy phase based on historic data, volatile energy prices and high temperature weather forecast

Reducing energy demand

The energy market is anticipating costly hours – AI is optimizing HVAC settings in accordance with user comfort

Maximizing indoor climate comfort

Adjusting HVAC to maximize indoor comfort in critical building zones. AI is adapting to changes in occupancy patterns, usage scenarios and external conditions

The rise of human-centric AI -

a game-changing technology for climate action?

The recent massive introduction of various AI-based solutions across different industries has triggered a fascinating discussion between policy makers, businesses, and academia. Will AI deliver the much-needed breakthrough solutions in solving world's grand challenges such as climate change? What is the role of the human in the era of AI? How can you establish trust between humans and AI driven solutions?

KPMG reached out to the leading experts and professors from Tallinn University of Technology, **Eduard Petlenkov** and **Juri Belikov**, to gather some insights on these pressing questions and learn how AI will likely shape the future of real estate.

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ESG & Sustainability Manager, KPMG Estonia

Eduard Petlenkov
TalTech | Tallinn University of Technology

Tenured Full Professor, Head of Centre for Intelligent Systems: Department of Computer Systems

Juri Belikov
TalTech | Tallinn University of Technology

Tenured Associate Professor, Head of Nonlinear Control Systems Group: Department of Software Science

What makes AI such a critical tool that has grabbed everyone's attention recently, including real estate owners and managers?

Eduard: Recent successful AI applications in the commercial space have indeed opened many new eyes to the fact that AI has an enormous potential to help people in their daily tasks, allowing them focus on more complex challenges instead of spending time on standard routines that can and must be automated. AI can also help to manage tasks that a human cannot manage alone, extract valuable information from massive amounts of data, and make informed decisions.

To bring a simple example, average size commercial building has **several thousands of points that can be controlled and tuned** thus directly influence energy performance and CO_2 emissions. Because of dynamically changing situation such micro adjustments are needed several times per hour. Moreover, in order to find the most energy efficient solution, one should take into account additional factors like weather, weather forecast, building occupancy, required comfort level, technical conditions and maintenance, sustainability goals, historical data and predictions, data-driven predictions, energy market, etc. This becomes just an impossible mission for a human being or even a group of experts, making of AI a critical tool.

We are currently witnessing a global race to dominate AI. In your opinion, what determines the applicability and success of an AI technology?

Juri: When creating successful AI solutions that actually work for people, we need to focus on three main things: making sure they're **reliable, trustworthy,** and **adaptable to human needs**. This paradigm shift emphasizes the importance of sustainability, ensuring that AI technologies not only serve their intended purpose but also minimize their environmental impact and contribute to long-term societal well-being. This approach seeks to harness AI's potential to advance human interests and address societal challenges while upholding ethical principles and values. By prioritizing the needs and well-being of humans, it aims to build a future in which AI technologies co-exist as trusted partners in enhancing human abilities and improving quality of life.

There are high hopes on AI in tackling global challenges such as climate change. In the context of real estate, what are the most helpful and practical AI applications?

Eduard: Buildings are remarkable energy consumers and solving operational efficiency issues of real estate is also key to reducing GHG emissions globally. Heating, ventilation, and air conditioning (HVAC) energy consumption accounts for 40% of a commercial building's total energy demand. HVAC operators usually communicate with the technical equipment through a building management system (BMS) and almost every large commercial building has a BMS that contains thousands of data points. This provides the data, control points, and flexibility needed for AI application use case.

Furthermore, buildings' energy performance and related GHG emissions significantly depend on technical conditions of HVAC equipment. Implementation of novel machine learning and AI based techniques makes possible **detecting faults that are not visible or obvious to a human operator** but may have a huge impact, for example, by resulting in increased energy demand. Thus, machine learning methods have received increased interest in fault detection and diagnoses (FDD) problems due to their ability to capture non-linear relationships in multi-dimensional data by outperforming traditional methods. At the same time, it becomes imperative to create AI models that are transparent in the sense that the user is presented with an explanation of why the model generated a certain output or made a specific decision, all while preserving the high performance and accuracy of the model.

If AI is applied to control buildings' technical systems, how do we make sure that human interests, comfort and health is not compromised?

Juri: In controlling buildings' technical systems, human-centric AI principles play a crucial role since buildings are designed and constructed for people. By adhering to these human-centric AI principles, building control systems can create healthier, more comfortable, and sustainable indoor environments while empowering occupants with greater control and flexibility over their surroundings. *(Explore the principles of human-centric AI on page 8)*

What determines the impact and success of AI in its tasks?

Eduard: The key point for the success of any AI based system is the data and knowledge base used for training. Like with human education, it is always important to learn from good books and good teachers. Every successful AI tool has a very strong team of engineers, researchers and top-level specialists in the related fields behind it. Initially, the system learns from them. This is like a team of professionals who helps you 24/7.

Juri: Recent technological advances also play a critical role. General level of buildings digitalization provides nowadays sufficient amount of data. New AI and ML (Machine Learning) methods as well as computational power make possible processing this amount of data within reasonable time suitable for real time implementation. Recent advances in eXplainable AI (XAI) make possible to create explainable, trustworthy and reliable solutions.

Where do you think the current AI race will lead, particularly in real estate application? What can we expect from AI research and application in 5 - 10 years?

Eduard: AI will work with building managers and technicians in order to improve energy performance and achieve carbon neutrality goals. By using these new technologies, buildings will start playing an important role as energy prosumers taking also more responsibility for balancing the whole energy grid and providing energy security.

Juri: The current progress in AI domain indicates that in the horizon of 10 years, AI-based technological solutions will reach the level of maturity. Will it be a game-changing technology? For sure. Will it help to solve XXI century grand challenges such as climate change? Yes. But the final result will depend on how people develop, adopt and interact with such complex tools.

How do these advancements in AI and other technologies shape the way people live or work in buildings?

Eduard: IT technologies have already become an integral part of our daily lives, and they are now giving rise to a phenomenon that has a potential to transform the urban landscape - **Cognitive Buildings**. Initially, buildings served as simple physical structures crafted from wood, concrete, steel, and glass. The integration of automated systems designated a new era of efficient building management. Then, smart buildings emerged as an intersection of technology and sustainability, emphasizing energy optimization and enhanced user comfort. However, the current paradigm shift offers a glimpse into the future with the advent of Cognitive Buildings.

The emerging concept of Cognitive Buildings represents a new era in which structures can react to their surroundings and adapt to the needs of their occupants. This evolution is steered by a mixture of enabling technologies such as Artificial Intelligence (AI), IoT, data science, smart materials and electronics, a human-centric approach, and new business opportunities. By leveraging advanced frameworks, buildings are evolving into intelligent entities that cater to the well-being and preferences of their residents.

Juri: These structures prioritize safety and a healthy environment by anticipating user behaviour and customizing experiences accordingly. The human-centric approach ensures that buildings augment the quality of life, highlighting a new era in the relationship between inhabitants and their physical environment. By utilizing a personalized approach, these structures redefine the notion of a living or working space, providing a comfortable experience. Establishing trust between visitors and cognitive buildings becomes essential, as a trusted environment can lead to greater acceptance and appreciation of these advanced capabilities, and must be supported by transparent and responsible technologies.

> The concept of Cognitive Buildings challenges the traditional view of static structures by imagining a future where buildings show signs of consciousness. As we go through this shift, the boundaries between humanity and technology blur, leading to an era of symbiotic coexistence between occupants and their cognitive habitats.
>
> **Prof. Juri Belikov**

Human-centric AI principles in real estate

If we want to succeed in creating truly sustainable AI technologies for climate action, human-centric AI principles play a critical role. In real estate, these principles focus on enhancing user comfort and well-being, improving building's energy performance and sustainability, enabling adaptability and flexibility of building's control systems, providing transparency and control, as well as facilitating interoperability and integration of different systems.

Reliable and trustworthy AI solutions that are adaptable to human needs should be embraced by building occupants much quicker, allowing AI to serve its intended purpose in generating positive environmental and societal impacts.

User comfort and well-being

Human-centric AI in building control systems focuses on maintaining optimal indoor environmental quality. It dynamically adjusts building systems based on occupant preferences to create a productive and healthy indoor environment.

Energy performance and sustainability

Human-centric AI optimizes building control systems to minimize energy demand and environmental impact, while maintaining high comfort level. It employs advanced algorithms and predictive analytics to optimize heating, ventilation, and air conditioning (HVAC) systems, and other energy-consuming devices based on real-time data and occupancy patterns.

Adaptability and flexibility

Human-centric AI enables building control systems to adapt to changing occupancy patterns, usage scenarios, and external conditions. It employs machine learning and adaptive control techniques to learn from historical data and dynamically adjust system parameters to meet evolving needs and preferences.

Transparency and control

Human-centric AI provides transparency and control over building systems, allowing building owners to understand how the systems operate and adjust settings according to preferences of tenants and visitors.

Interoperability and integration

Human-centric AI facilitates interoperability and integration between different building systems and devices.

Heating systems optimization by human-centric AI solution

KPMG Estonia case study with R8 Technologies

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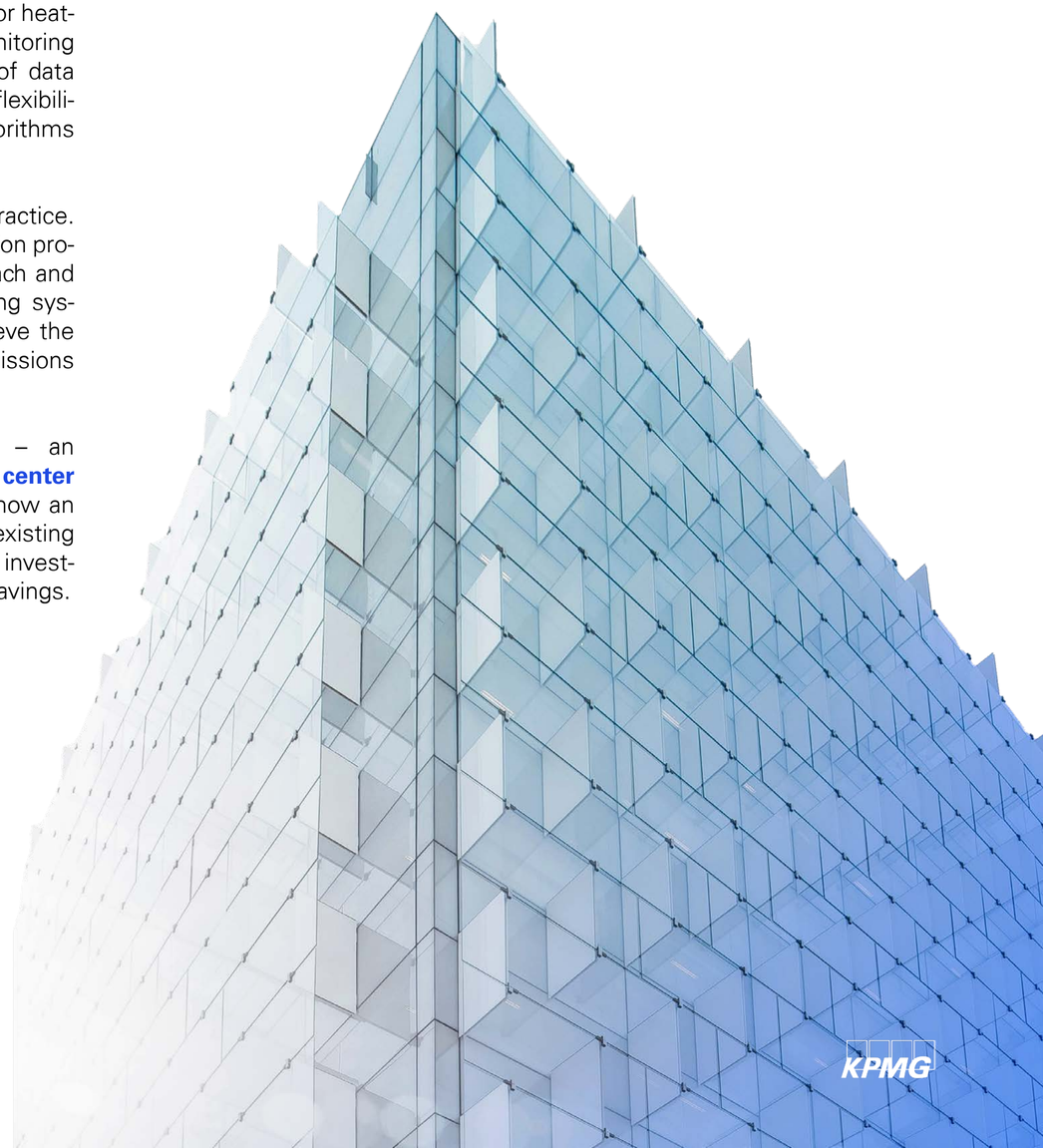
Head of Technology Advisory
Partner, KPMG Estonia

Ahmet Köse
Co-founder and Chief Executive Officer of R8 Technologies

In previous sections of this KPMG publication, we raised the question on whether human-centric AI could be a game-changing technology for climate action. We highlighted that almost every large commercial building generally has a building management system (BMS) for heating, ventilation and air conditioning (HVAC) monitoring and control. These systems contain thousands of data points which provide the data, control points, and flexibility needed for applications of machine learning algorithms in daily operations.

In this section, we are putting the theory into practice. KPMG Estonia shares its experience with AI solution provider R8 Technologies on how data-driven approach and AI-based control achieves high-performing heating systems for real estate. The primary goal is to achieve the desired climate comfort while reducing GHG emissions and lowering energy costs.

The presented real-life use case examples – an **office building** (~ 10,000 m²) and a **shopping center** (~ 60,000 m²) located in Europe – demonstrate how an AI-powered SaaS solution targets the use of existing hardware and infrastructure, avoiding additional investments and helping to achieve significant energy savings.



The spotlight in this energy optimization case study belongs to **Digital Operator Jenny, a human-centric AI-based Demand Side Management (DSM) software** solution created by KPMG firms' technology alliance partner R8 Technologies in close cooperation with AI scientists of Technical University in Estonia (TalTech).

In the following pages, built on the collaboration experience between KPMG, R8 Technologies, and Digital Operator Jenny, we will showcase the potential of AI in achieving real estate energy efficiency and decarbonization through following three steps:

1. **The challenge** – defining the typical issues that data-driven heating systems of large-scale buildings commonly face, leading to energy waste and discomfort for occupants.

2. **The solution** – providing a sustainable solution for the defined challenge with the help of Digital Operator Jenny. We will describe the general workflow of KPMG Estonia and R8 Technologies professionals in setting-up and launching the AI-based Demand Side Management software for a commercial building.

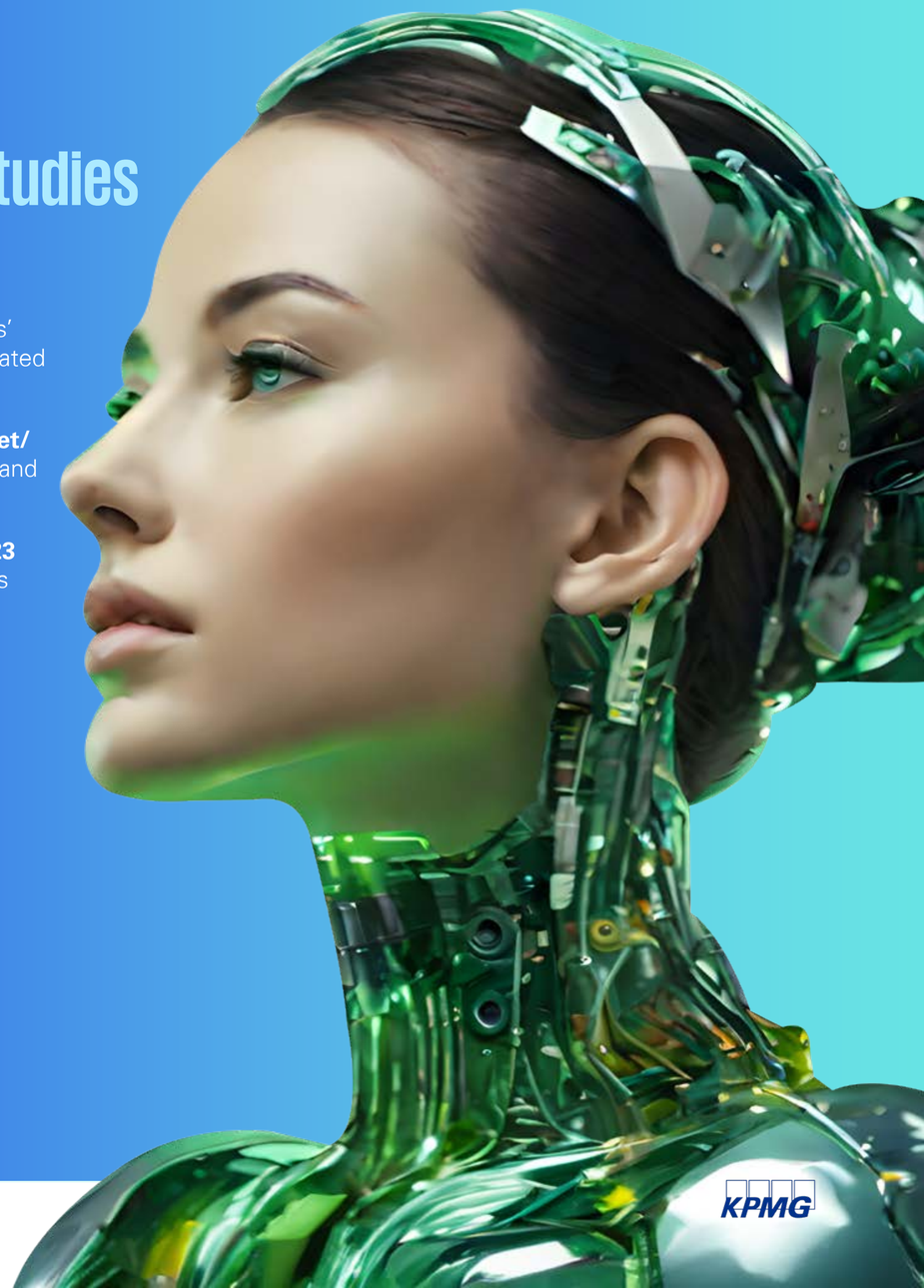
3. **The use cases** – illustrating the impact of the solution by Digital Operator Jenny with two common use case examples for AI-based Demand Side Management software – i.e. how multiple-level optimization is required to achieve maximum energy efficiency in complex commercial buildings while prioritizing climate comfort for building occupants.

While this case study is focused on **heating**, AI-powered solutions can deliver similar impacts also in the optimization of **cooling and ventilation systems.**

Meet Jenny - the hero of these case studies

- Developed by **R8 Technologies**
- AI-powered SaaS solution to optimize buildings' HVAC systems' performance **24/7** with automated adjustments **every 15 minutes** if necessary
- Connects remotely to buildings via **API, BACnet/IP, OPC UA**. No hardware installation required and zero CAPEX
- **Employed on 4 million m² of real estate in 23 countries**, managing over 14 million datapoints and delivering ESG impact:
  - **90,000 tonnes** GHG emissions reduced
  - **>20%** (30-60 kWh/m2/year) energy savings achieved
  - **240 000 MWh** (~ 26 mil €) energy consumption saved
  - **41 mil autonomous HVAC adjustments** made without human support
  - **Over 90% indoor climate comfort** maintained during occupancy hours

Source: R8 Technologies



The challenge:

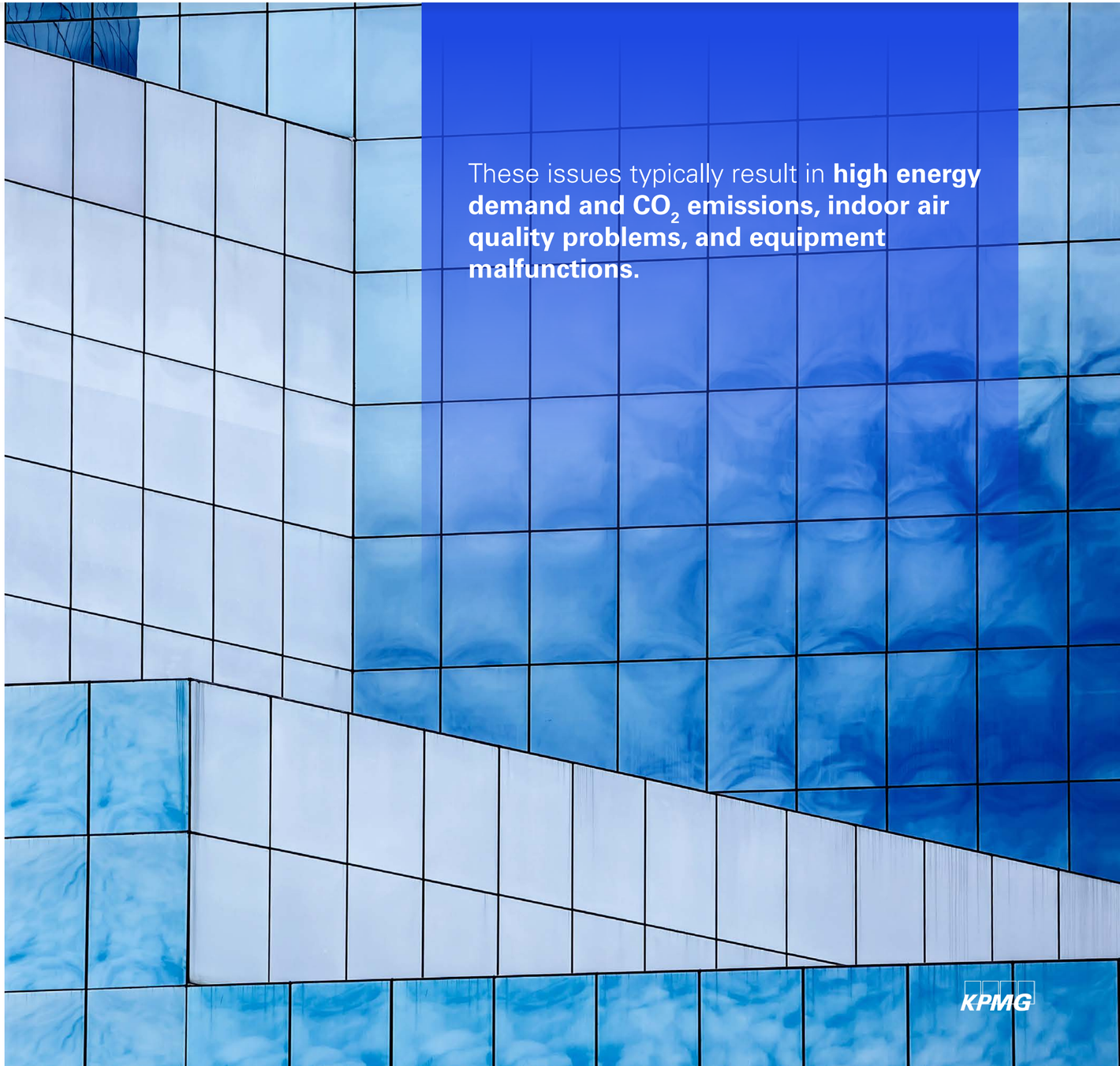
Heating demand optimization

In this energy performance challenge, the focus is on data-driven heating systems' optimization in large-scale buildings, including heating sources (plants, gas boilers, heat pumps), supply circuits, and consumers (ventilation units, room and zone heating units).

These systems encounter multiple challenges, leading to suboptimal energy consumption while trying to maintain an indoor climate with the necessary heating energy. The commonly encountered issues include:

- Missing advance interconnection between source, circuit, and consumers in the buildings' automation
- Inadequate regulation of circuits, ventilation units, and room controllers
- Schedule limitations between Eco and Comfort modes, and anomalies in operations
- Overreactions in traditional operations to keep extremely high temperatures
- Sensor faults related to the demand-side and sub-systems

These problems lead to waste of heating energy and discomfort for occupants.



These issues typically result in **high energy demand and CO_2 emissions, indoor air quality problems, and equipment malfunctions.**

The solution:

Digital twin, specialized knowledge, AI-based control

The previously described heating systems optimization challenge is an ideal case where AI-based solution Jenny can help KPMG professionals effectively identify HVAC system faults and anomalies causing inefficiencies, as well as achieve the desired energy management objectives in day-to-day operations of the building.

Digital Operator Jenny is a Demand Side Management (DSM) solution that considers data-driven estimation of a building's inertia and performs heating optimization in response to actual heating needs without compromising indoor comfort.

In other words, the DSM algorithms utilize information about weather forecasts, occupancy profiles, heating and electricity prices, tenants' preferences and buildings' dynamics to optimize the heating cost, prepare the indoor climate, and maintain comfort during occupancy hours.

KPMG Estonia and R8tech advisors collaborate closely with the buildings' technical team members to enhance operational efficiency. These collaborative efforts help lead to the formulation of an effective, data-driven DSM solution to optimize heating systems. The general workflow to achieve sustainable buildings include the following key steps:

1. Developing a digital twin

KPMG Estonia and R8tech specialists create a digital twin of the building using R8 internal integration tools. Establishing interconnections between all system components and buildings' dynamics is required to obtain the quality data. The digitalization phase enables us to create an AI-driven model and cost optimization algorithms. The digital twin is transparently accessible online through the analytics platform for the building's team members.

2. Conducting a smart audit

Using internal reporting tools, KPMG Estonia and R8tech specialists create a data-driven audit to address the issues and anomalies in the buildings. The smart audit contains energy benchmarking, indoor climate overview, faults of mechanical systems, and detected anomalies in the operations. The building's analysis report, presented to the building's technical team on-site or online, aligns with international standards and best practices.

3. Launching AI-based control

KPMG Estonia and R8tech specialists onboard the building's technical team during the control launching phase. That allows a transparent and smooth transition towards AI-based control. The input for the Digital Operator Jenny is configured according to the prior knowledge of the building characteristics, expectations, and operational matters.

The use cases:

Optimization in multiple levels

As every building has unique parameters, multiple-level optimization is required to help achieve maximum energy efficiency. Multiple factors must be accounted for in order for the optimization to be cost-efficient, while also maintaining optimal climate comfort.

Factors including weather, temperature fluctuations, occupancy, energy prices, time of the day, and more, are incorporated into the algorithms to enable proactive data-driven AI decision-making. It is equally crucial for AI to account for building type.

AI-based control case in office building: room level optimization

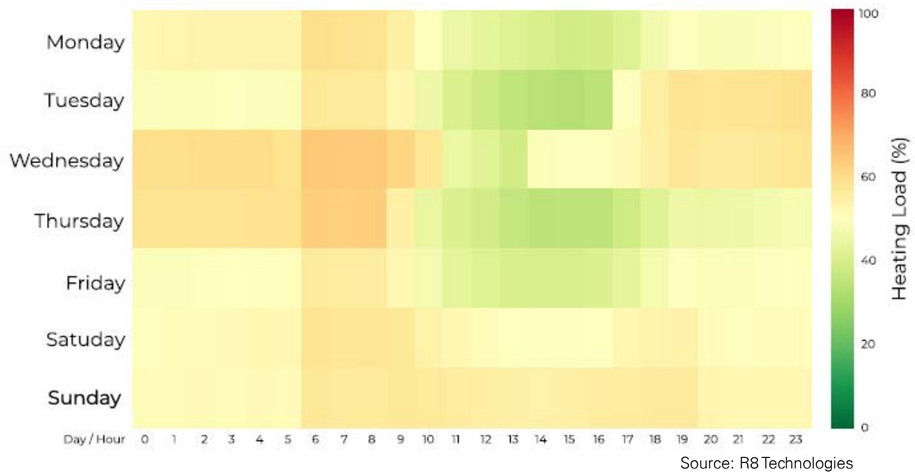
This case study features a recently constructed office building (over 10,000 m²) where Digital Operator Jenny was employed to proactively manage heating components at both circuit and room levels.

Improving HVAC energy performance in office buildings is essential for reducing operational costs and environmental impact. At the same time, it is crucial to prioritize thermal comfort for occupants when implementing any HVAC improvements.

To achieve this, the AI-based control employs variables like weather predictions to enhance preheating and achieve optimal heating loads based on dynamic occupancy patterns. It also learns the impacts of heating equipment to maintain the desired indoor climate, eliminating unnecessary heating during nonoffice hours and preventing overheating in office areas.

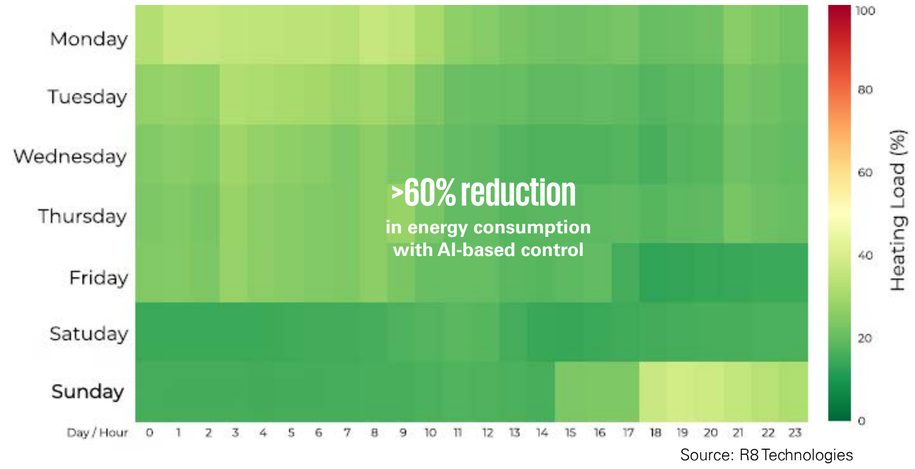
The heatmaps on the right, Image 1 and Image 2, depict the previous state of heating valve positions and the improved state with the Digital Operator Jenny.

One immediate observation is that, prior to the implementation of AI-based control, the office building excessively utilized heating equipment beyond regular office hours, including weekends and nighttime.



Source: R8 Technologies

Image 1. Average monthly heating load in the office **before** Digital Operator Jenny.



Source: R8 Technologies

Image 2. Average monthly heating load in the office **with** Digital Operator Jenny.

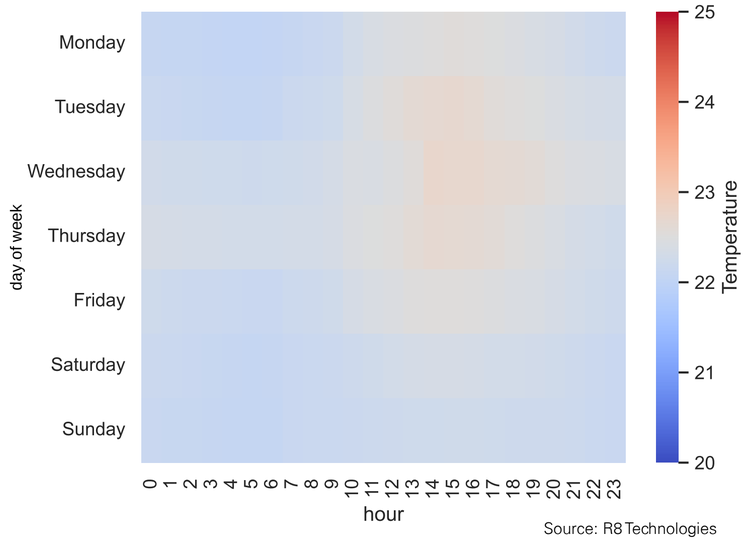


Image 3. Average monthly climate comfort in the office **before** Digital Operator Jenny.

The figures on the left, Image 3, and right, Image 4, present two scenarios, which refer to the indoor climate comfort before and with the Digital Operator Jenny for over a month, with both instances occurring within similar monthly average temperature ranges. These ranges were -0.9°C before the Digital Operator Jenny and -0.3°C with the Digital Operator Jenny. The indoor climate is showcased following EN 16789 standards, with some modifications per the facility manager's requests.

As a result, Digital Operator Jenny managed to **reduce the heating consumption over 60% while maintaining the desired indoor climate** during occupancy hours of the examined office building. The solution has proven to deliver significant outcomes in this building by proactively managing heating components at both circuit and room levels.

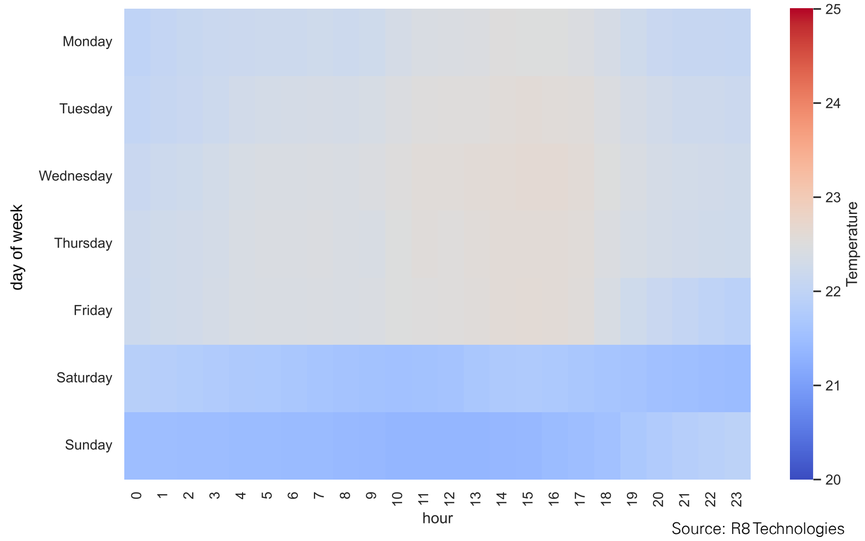


Image 4. Average monthly climate comfort in the office **with** Digital Operator Jenny.

AI-based control case in shopping center: AHU level optimization

This case study features a shopping mall (over 60,000 m²) where Digital Operator Jenny was employed to showcase a substantial improvement possibility to HVAC performance. Large-scale commercial buildings, commonly equipped with ventilation units, typically use heating circuits to supply the required heating energy.

Factors, including inertia, desired air temperature, technical parameters, conditions, and faults, influence the actual heating requirement. The AI-based solution continuously learns using machine learning models through the building-related data and those factors to optimize HVAC operations 24/7.

Therefore, implementing AI-based control reduces heating energy costs significantly, while maintaining desired indoor climate (Image 5), which is supported by sophisticated demand-side management. Besides that, if the operators are willing to make changes to HVAC equipment, the Digital Operator Jenny will recognize the interactions made through building management systems and adapt accordingly.

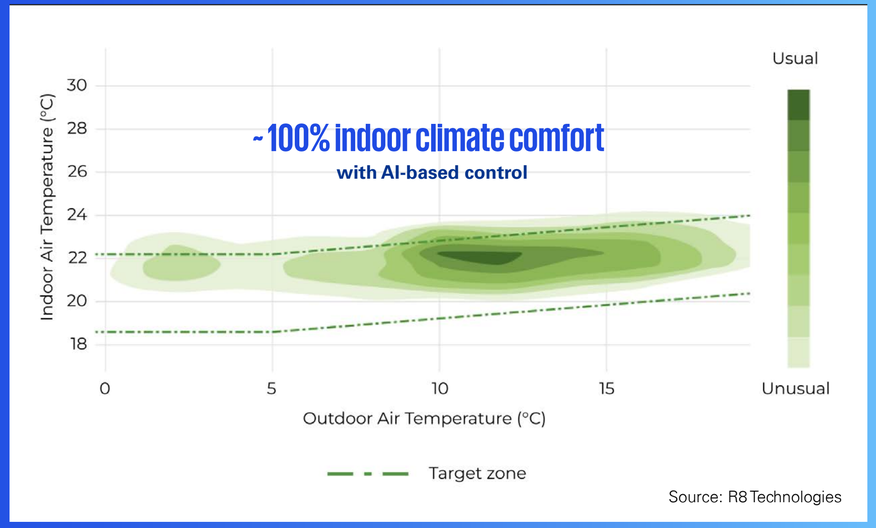


Image 5. The targeted temperature range within half a degree difference together with the air quality target was achieved 100% by Digital Operator Jenny.

The central heating circuit valve in the shopping center is presented in two figures, Image 6 and Image 7, on the right to demonstrate the status during the traditional operations and with the Digital Operator Jenny. Both scenarios occur within similar monthly average temperature ranges.

These temperature ranges were 9.5°C with Digital Operator Jenny and 8°C before Digital Operator Jenny and similar occupancy profiles in the facility. As a result, the central heating valve opening was reduced by **more than 70%**.

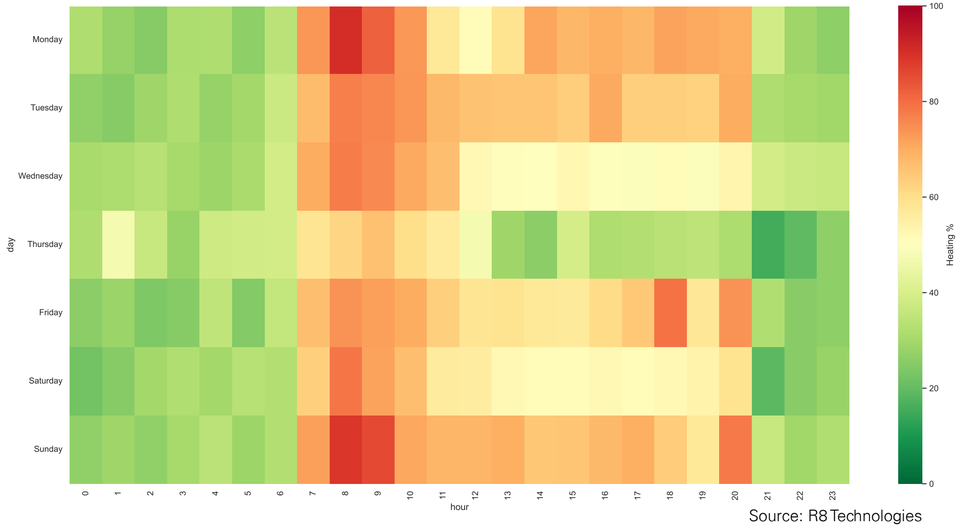


Image 6. Average monthly heating load in the shopping center **before** Digital Operator Jenny.

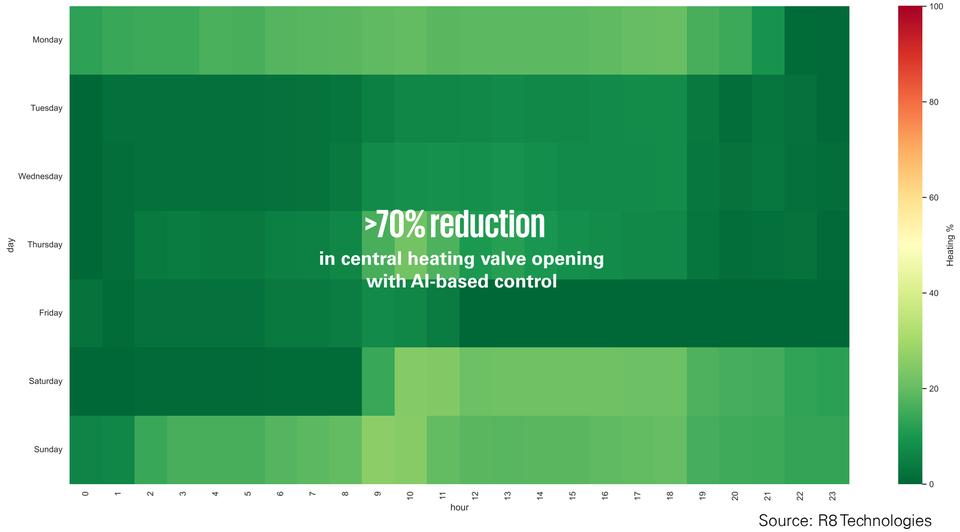


Image 7. Average monthly heating load in the shopping center **with** Digital Operator Jenny.

A strategic shift

The presented case studies underscore the importance of data-driven strategies in achieving energy efficiency goals, aligning with regulatory efforts for a sustainable, zero-emission building stock.

AI-optimization of buildings can appeal to various stakeholder groups. While real estate managers may primarily seek cost-savings from optimized energy systems and technical insights, owners of the real estate can benefit from a sustainability driven competitive edge and higher asset valuations. Banks tend to focus on a portfolio's climate risk management, utilizing energy performance of financed real estate as one of the key metrics in decision-making. For tenants, indoor climate comfort might be the primarily driving factor for utilizing AI-based control for building's heating, cooling and ventilation systems.

However, a systematic and strategic approach to change management is needed to help enhance the benefits of AI employment and manage possible transition risks. For that purpose, **Strategic Energy Management (SEM)** can provide the necessary framework that enables organizations to take a holistic approach in unlocking different energy conservation, optimization and efficiency measures and ensuring the successful execution of planned programs.

We will explore the SEM framework in more detail in the following sections of this publication.

“

In today's real estate market, we're seeing a clear shift towards AI-powered solutions that drive both operational efficiency and environmental sustainability. For example, property owners are increasingly implementing machine learning algorithms to regulate HVAC and lighting in real-time based on occupancy patterns, reducing energy consumption by double-digit percentages while improving tenant comfort. Another emerging trend is predictive maintenance: by leveraging IoT sensors and AI analytics, building managers can identify equipment inefficiencies before they turn into costly failures, minimizing downtime and extending asset life. Managing buildings to the levels of operational efficiency required today cannot be achieved by already stretched facility management teams but will likely require smart and data-driven tools and solutions.

Similarly, AI-powered tools are going to be increasingly used to assess real estate portfolios from a climate risk perspective – helping owners, investors and insurers make more informed decisions about property acquisition, management and disposal. As these leading tech solutions gain traction, AI is no longer just a nice to have – it is an essential strategy for helping reduce carbon emissions, mitigate climate risk, and future-proof real estate portfolios.

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Enabling AI for more energy efficient buildings

The role of strategic energy and people management

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Amanda Queiroz
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KPMG International

To reach net zero emissions and lower costs from existing buildings, real estate companies can use a myriad of solutions consisting of different levels of complexity - from eliminating the use of on-site fossil fuels and focusing on the procurement of 100% renewable energy, to implementing energy conservation, optimization, and efficiency measures. Energy efficiency is the single largest measure to avoid energy demand in the Net Zero Emissions by 2050 (NZE) Scenario and IEA research[1] shows that doubling efficiency progress could cut energy bills by one third and make up 50% of GHG reductions by 2030.

However, operationalizing energy efficiency can be a challenge to real estate developers and managers alike. In light of that, AI can be a powerful ally to operationalize energy efficiency. The World Economic Forum research[2] demonstrates that RMI Grid-interactive Efficient Buildings (GEBs)[3] can reduce energy costs by up to 20% through active demand management. Nonetheless, while AI can be one of the technologies with the greatest impact on real estate over the next coming years, one aspect that must go hand-in-hand is the holistic management of energy, including – most importantly – capability development. This is because AI is as powerful as the understanding of its functionality and applicability by humans, so it is crucial to ensure that there are systems in place that support humans to make the best use of AI technologies for more energy efficient buildings.

Instilling energy efficiency practices backed by AI can offer buildings additional benefits of resiliency during extreme weather and other events, including geopolitical turmoil. In this sense, **Strategic Energy Management (SEM)** can support in catapulting the power of AI, given its strong focus on systemic, organizational changes that can support the real estate sector in decarbonizing and in gaining competitive advantages. Among the best ways to reduce carbon emissions and use energy with greater efficiency is to harness people's power to change business strategies, practices and processes in a cost-effective way.

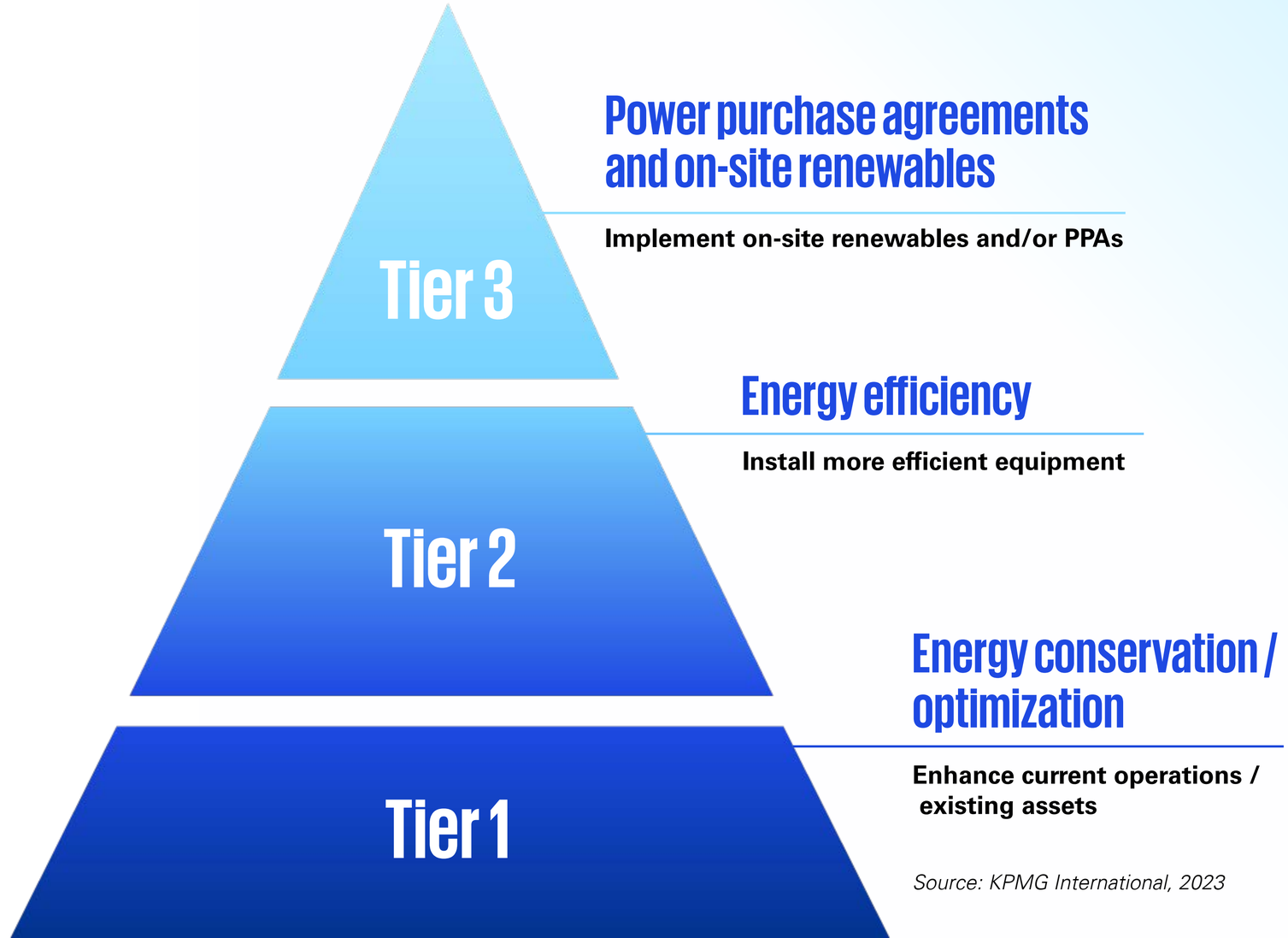
In this sense, as also concluded in KPMG's insight publication "ACED through AI", AI can have a transformative role in driving radical efficiency in energy systems if combined with a people-centric approach to energy management.

[1] iea.org/reports/energy-efficiency-2023/executive-summary
[2] weforum.org/stories/2021/09/how-to-build-zero-carbon-buildings
[3] rmi.org/insight/value-potential-for-grid-interactive-efficient-buildings-in-the-gsa-portfolio-a-cost-benefit-analysis

So what is SEM?

Strategic Energy Management (SEM) can be seen as the bedrock supporting efficient application of AI for real estate. SEM is a holistic, continuous improvement framework that enables organizations to adopt a culture of energy efficiency and decarbonization. This helps reduce energy consumption and costs, while also cutting scope 1 emissions from sources owned or controlled by the organization and scope 2 emissions from the generation of electricity, steam, heating and cooling that the organization purchases and consumes. These are key emission factors throughout the real estate sector.

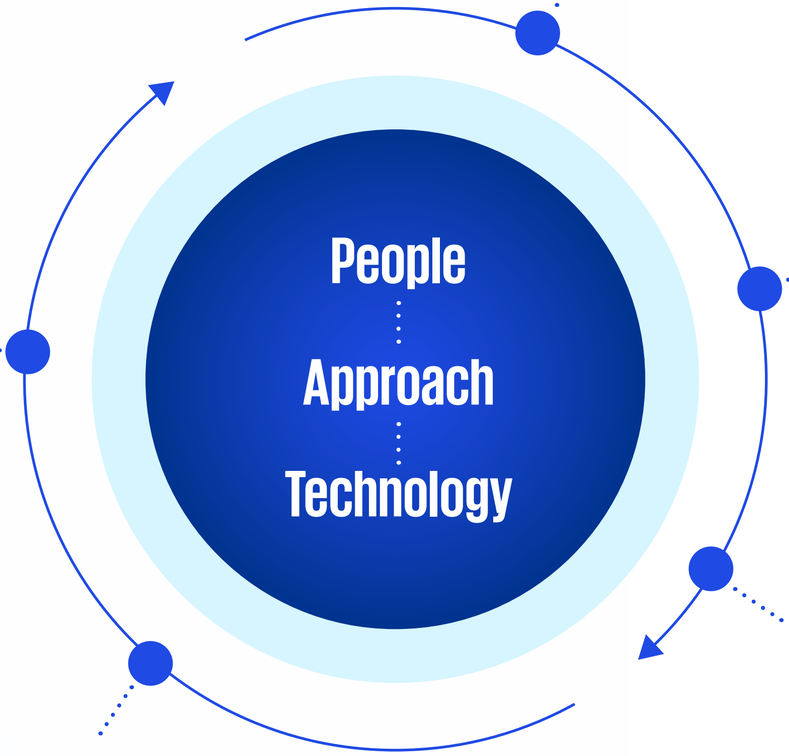
SEM's people-centered approach is based on three tiers of interventions with increasing levels of investment and complexity. On average 5-7% of savings can be achieved annually through optimizing current assets in tier 1 (it is worth noting that KPMG has also seen savings upwards of 30% in some buildings, depending on current practices and inefficiencies). These savings can be unlocked quickly, allowing teams to make further improvements across tier 2 by upgrading equipment, and then tier 3 by implementing renewable energy. However, any benefits from adding renewable energy assets may be significantly reduced if energy consumption is not yet being optimized, so it is crucial to pursue conservation and optimization measures to help lead to the best results overall.



Source: KPMG International, 2023

The SEM approach

Underpinned by active governance, stakeholder engagement, organizational change, project planning, risk mitigation and reporting insights, SEM comprises a cycle of improvements across five pillars:



1. Assess

Evaluate the facility portfolio, measure current energy performance, assess energy reduction ambition, develop data collection, monitoring and deployment plan.

2. Discover and plan

Identify energy saving measures involving conservation, optimization and efficiency; review financing, tax, regulation and government policies; develop implementation plan; set energy reduction target.

3. Implement

Program, project, change, data and performance management, emphasizing the people element by assigning responsibility across functions.

4. Build capability

Deploy communication and engagement plans to ensure progress is shared company-wide via capacity building and cultural enablement.

5. Monitor and report

Embed control, monitoring and reporting, providing meaningful insights to support continuous improvements and progress updates.

Conclusion

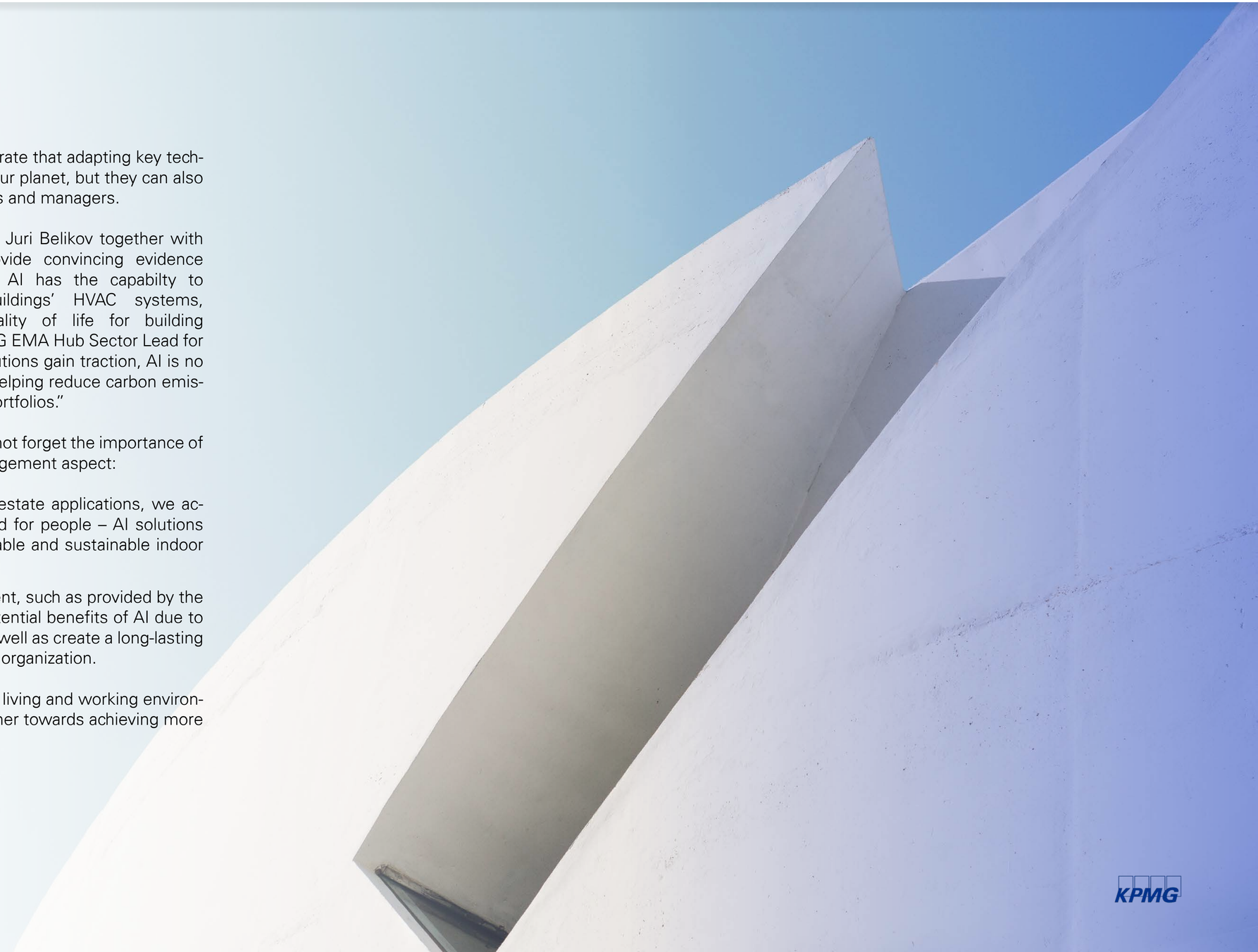
In the foreword of this publication, we set out to demonstrate that adapting key technologies such as AI are not only critical for the benefit of our planet, but they can also make a compelling investment case for real estate owners and managers.

To that end, insights by Prof. Eduard Petlenkov and Prof. Juri Belikov together with KPMG Estonia case study with R8 Technologies provide convincing evidence that AI can have a profound impact on the sector. AI has the capabilty to radically enhance the energy performance of buildings' HVAC systems, drive operational efficiencies and augment the quality of life for building occupants. To reiterate the view of Francesca Galeazzi, ESG EMA Hub Sector Lead for Real Estate, KPMG Germany: "as these leading tech solutions gain traction, AI is no longer just a nice to have – it is an essential strategy for helping reduce carbon emissions, mitigate climate risk, and future-proof real estate portfolios."

However, when employing AI-based solutions, we should not forget the importance of people – both, from technological as well as change management aspect:

- by adhering to the human-centric AI principles in real estate applications, we acknowledge that buildings are designed and constructed for people – AI solutions should always strive to create healthier, more comfortable and sustainable indoor environments;
- a systematic approach to energy and people management, such as provided by the SEM framework, can help to avoid undercutting the potential benefits of AI due to lack of trust, understanding or capabilities by people, as well as create a long-lasting culture of improvements in energy efficiency within the organization.

It will be fascinating to see how AI will not only shape our living and working environments, but also how buildings and people will work together towards achieving more efficient and secure energy systems in our cities.



About KPMG firms' decarbonization, climate and nature services

Business commitments to reach net zero emissions and reduce their impacts on the planet have increased rapidly. As the global push towards decarbonization accelerates and the impacts of climate change play out globally, businesses are preparing for a low-carbon future — rising to stakeholder demands for accountability on plans, action and progress.

Strong decarbonization targets and robust transition plans to decarbonize business operations and supply chains, together with targets and actions to reduce impacts on nature, are now expected. Boards are under significant pressure to address environmental issues, and it is critical that businesses grasp the implications of climate and nature risks and opportunities.

KPMG decarbonization, climate and nature teams form an extensive global organization of deep expertise, established services, innovative technologies and carefully selected alliances, spanning:

- Climate risk & response
- Nature and biodiversity
- Decarbonization strategy and implementation
- Climate policy and incentives advisory
- Low carbon deal advisory

KPMG professionals can help navigate this increasingly complex landscape, enabling you to deliver on your environmental ambitions for your business, people and the planet.

You can with AI

In the AI era, anything seems possible. Untapped value, constant innovation, new frontiers. Especially with a knowledgeable guide by your side.

We help clients harness the power and potential of AI. From strategy to implementation. Small steps to solving seemingly impenetrable problems. Underpinned by trust.

KPMG provides holistic services to help guide your AI transformation journey.

- Realize value from AI
- From idea to implementation
- Transform your enterprise
- Build trust in AI
- Empowering and augment human capabilities

Discover endless opportunities with AI on KPMG webpage.

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