SIEMENS

Attractive **higher education campuses**

Shaping the future of how we live and learn
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Smart higher education campuses stand out.
They are environments that care about their users,
their communities, and the world around them.
We take pride in supporting universities, colleges,
and polytechnics to create and operate such campuses
that excel in both efficiency and sustainability.

Matthias Rebellius,
Member of the Managing Board of Siemens AG
and CEO Smart Infrastructure

Challenges for campuses

Changing forms of learning

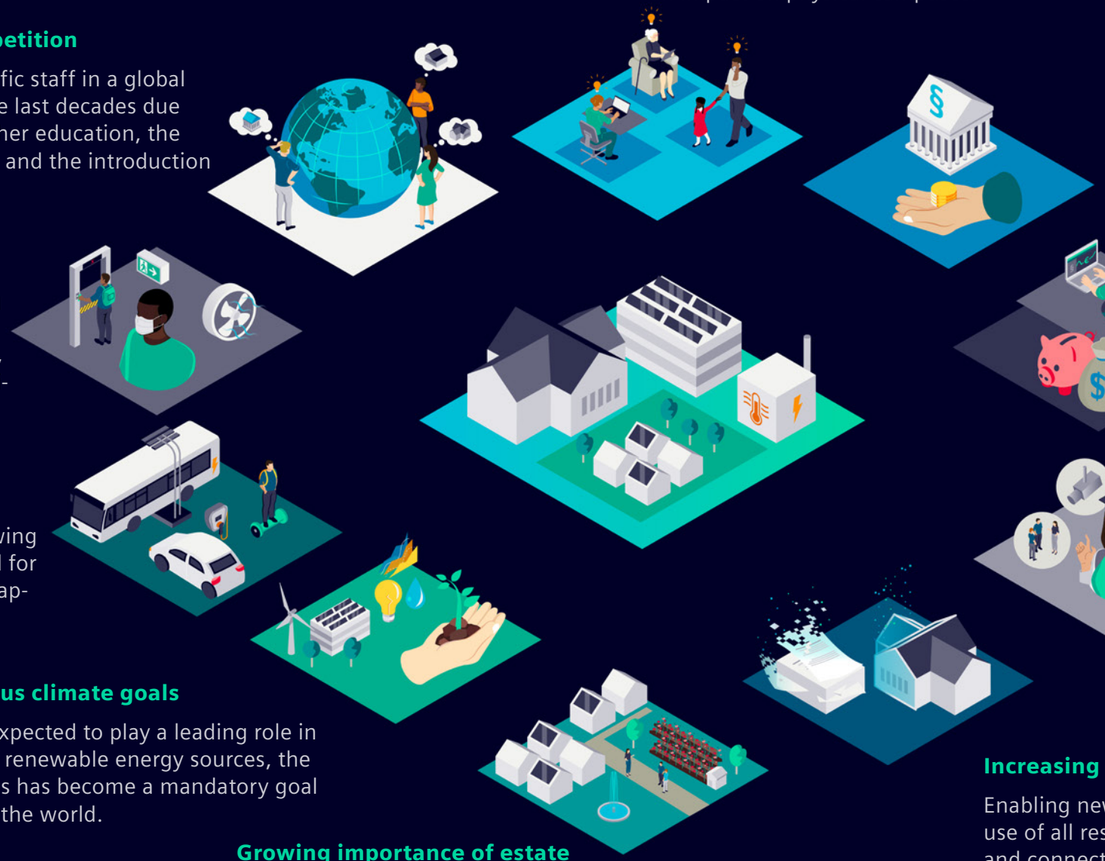
Global educational trends, such as part-time programs and remote learning using digital learning environments, have an impact on physical campuses.

Growing local and international competition

Competition for both students and scientific staff in a global market have dramatically developed in the last decades due to factors such as the globalization of higher education, the development of the knowledge economy, and the introduction of market-based mechanisms.

Growing cost pressure

Many universities, colleges, and polytechnics are facing a challenging and complex financial situation. Public funding is in a stalemate or has even been reduced. Pressure is mounting to explore and establish new sources of income and new approaches toward how research and teaching is funded.



Demand for safety and security

In view of what's expected to be the "new normal" following the coronavirus pandemic, it has become even more important for higher education campuses to be safe, secure, and resilient. Operations need to be maintained even in critical situations while students and staff must be protected.

Need for strong investments

Higher education institutions in many parts of the world need smart financing solutions that bolster their ability to invest in infrastructure and improvements to teaching in order to maintain and expand their academic offerings.

Need to establish trendsetting and future-proof mobility

Increasingly diverse student demographics and the growing importance of linking external spaces to the campus call for innovative, comfortable, low-carbon travel options and appropriate infrastructure.

Higher expectations

Today's students expect more than a romantic backdrop when it comes to investing in their future. Surveys found that a vast majority of students consider campus facilities important or very important when deciding which educational institution to attend.

Need to contribute to ambitous climate goals

As educational institutions are expected to play a leading role in energy efficiency and the use of renewable energy sources, the completely decarbonized campus has become a mandatory goal for universities in many parts of the world.

Increasing degree of digitalization

Enabling new ways of learning and collaboration, the optimal use of all resources, and better results in less time, digitalization and connectivity support the scientific community just as much as the campus management.

Growing importance of estate

Modern teaching facilities, inspiring and enjoyable indoor and outdoor spaces for studying and leisure, and highly appealing accommodation are increasingly becoming a key element within an educational institution's specific value proposition.

What is a campus – and what makes it smart?

The campus of the future will leverage digitalization and technology to boost the reputation of the institution, attract students and teaching staff, and become a perfect place for research and education. Even when budgets and resources are limited, much can be done, from energy to buildings, mobility, and safety and security.

What all campuses have in common

As different as institutions of higher education may be around the world, they have one thing in common at their core: They offer a shared power, building management, HVAC, water, IT, and even mobility infrastructure for students, faculty, and employees to learn, live, and work.

In a way, most campuses reflect cities: They contain both historic and modern buildings, have an Internet and electricity grid that meets today's needs with little margin, and aspire to increase their usage of renewably-sourced electricity. This means that campuses, which are usually located in an urban environment anyway, can benefit from the same smart technologies that are making cities cleaner and more efficient.

Since higher education campuses also provide this infrastructure in a relatively manageable and usually clearly separated space, they can play a pioneering role in shaping the world of the future by intelligently linking the physical and digital worlds. Embracing the right technologies, they can make the students' educational journey ever better and create an experience that improves results and makes it a place that attracts the very best students and scientists. They can become ideal living laboratories to test innovations that will shape the campuses and cities of tomorrow. These technologies, including grid-interactive buildings, small-scale renewable electricity, on-demand transportation, and the democratization of the energy system, offer wide-ranging benefits including cost savings, pollution reduction, and on-campus learning opportunities.

Campuses point the way to the future

Digital, agile, and flexible, a modern higher education campus uses digitalization and smart infrastructure to shape the lives of students and scientists, their academic success, and the health of the world around it. It manages costs and uses resources efficiently, is adaptable to changing demands, and makes life and work easier while helping to create more caring environments.

Campuses can quickly become thriving and cost-optimized ecosystems that create value by attracting investment and donations and by taking their opportunities as a laboratory of the future to boost their attractiveness for highly qualified employees and for students, especially for those living there.

In order to reach their full potential, however, campuses must be carefully and intelligently designed, established, and operated. This usually requires a technology partner with extensive experience and expertise in a wide range of technologies from energy, building, and security systems all the way to IT.

Added value for any campus

Siemens is harnessing its end-to-end solution capabilities and expertise to create healthy, resilient, sustainable, and livable campuses. Across entire higher education campuses, the company is combining renewable and intelligent energy supply and energy efficiency, smart buildings, and e-mobility charging solutions to help create integrated environments that understand and manage changing conditions, that support the people who use them, and that make lives better.

Establishing or optimizing the building and energy infrastructure of a campus requires numerous interfaces that connect technology, buildings, and energy seamlessly. That's why the Siemens experts use their knowledge about system integration and about handling the complexity of IoT projects to enhance building performance and mobility options and to contribute to the emerging distributed low-carbon energy landscape.

Thanks to their particular proximity to ongoing research, higher education campuses can play a pioneering role as "living labs" in this context.

Developing innovative solutions that are adaptable and future-proof, Siemens supports the creation of campus environments that care about their student and academic communities and at the same time have a lasting positive impact on the balance sheet.

Where are higher education campuses heading?

A well-designed campus adds huge value for universities, colleges, and polytechnics by creating the perfect conditions for learning and living as well as for the sharing of knowledge and collaborative working. It helps make the institution more attractive and reinforces its brand and reputation.

In recent years, however, the characteristics of an attractive university, college, or polytechnic have changed just as fundamentally as the ways and means of achieving and consolidating this position.

Profound change in higher education life

For centuries, higher education life and learning was characterized by teachers lecturing to classes full of students, individual studying from time-honored books, and the writing of term papers. Within just a few years, this notion has become a complete thing of the past.

Today, digitally native students use digital devices to stay connected to their fellow students, their teachers, and their educational institution. They have an online curriculum, attend recorded or remote live lectures, and even take exams online. And prospective students as well as faculty seeking this kind of higher education teaching and learning environment expect a setting that comprehensively enables and promotes innovative forms of learning and scientific work.

Enter the smart campus

In the wake of omnipresent digitalization, the higher education campus is transforming into a flexible facility that intelligently adapts to the requirements of its users. Put simply, it is becoming a smart campus with intelligent energy systems and buildings that contribute to an attractive environment.

Linking devices, applications, infrastructure, and people, a smart higher education campus reacts quickly and adaptably to the current needs of teachers and students in the academic world. It provides all relevant resources exactly where and when they are needed. It supports digital learning models, collaborative work, flexible workspaces, and the optimal use of all resources. In this way, it supports the scientific community and enables better results in less time.

Whenever changing conditions require a quick response or, ideally, anticipation, for example in terms of energy consumption, building utilization or safety and security, digitalization also enables the implementation of effective steps. It makes possible the quick introduction of safety and security measures that help to maintain operations. A good example is the automatic monitoring and limiting of the number of people in rooms with the help of sensors and access control systems.

The power of data and digitalization

It all starts with ubiquitous and reliable connectivity. But that’s not a goal in itself any longer. Today, it’s the foundation of a smart campus that enables students and faculty to interact with each other and enable experiences and efficiencies that weren’t possible before.

Even more important than the new communication and interaction opportunities is the interconnection of a smart campus' entire infrastructure. Power distribution, intelligently connected to and interacting with building management systems, as well as security surveillance and physical access systems, parking facilities, and even charging stations for electric vehicles share a common technology infrastructure and are connected to the educational institution's IP network and the Internet of Things (IoT).

Devices and sensors produce data that can be collected, stored, accessed, and used by campus operations teams to reduce costs, maximize energy efficiency and use local renewable energy sources to reach ambitious emission goals, refine services to make them more convenient and effective, and make the campus safer and more secure for everyone living, learning, and working there.

It is our aim to offer consulting services to higher education institutions and to design, implement, deliver, maintain, and operate smart camus environments – campuses that are setting new standards and help position the institutions as innovative, responsible, and enjoyable places for the students' educational journey.

Trends in higher education

Critical to the success of universities, colleges, and polytechnics will be their ability to adapt to the changing trends in where, how, and when we all learn.

Global educational trends, such as the change from traditional forms of lecturing to digital learning environments, have an impact on physical campuses. That's why it is important that leaders of educational institutions consider the physical future of their campuses in light of these changing trends. There are several factors that profundly reshape how students study, learn, and live, how students and staff can be attracted and retained, and how a university, a college, or a polytechnic can gain and maintain a place on the forefront of research and teaching.

Digital learning

While campus-based full-time students will remain their focus, many higher education institutions offer more and more distance and part-time programs and their campuses need to cater to part-time students. Managing space to have a flexible supply of housing and study spaces is becoming essential, just as much as campus information and communications infrastructure to seamlessly connect students to educational materials, each other, and the professor, even when some or all of them are offsite. Campus wayfinding apps as well as safety and security systems are likely to become ever more necessary with a rising number of part-time students.

Remote learning, video conferencing

Remote learning, such as e-learning courses over the Internet, live webinars, live face-to-face Internet training, and pre-prepared, tailored podcasts, opens up new opportunities for both students and universities. However, the necessary communication and IT infrastructure must be created in order to be able to implement such offers campus-wide and, if required, even at different locations.

IT infrastructure

To implement remote learning options successfully, universities, colleges, and polytechnics must use the best available communication technology. However, there are many regions that lack sufficient bandwidth. In such cases, innovative ways must be found to achieve good results nevertheless.

Student demographics

Student demographics are becoming more diverse, which entails less demand for on-campus residential space, but a rising demand for on-campus meetings, shared spaces, and satellite campuses. This calls for new ways to allocate, monitor, and manage space with the help of digital occupancy and space allocation apps as well as with sensors in each individual room and in areas where walls can be moved. It will also be crucial to optimally link external spaces to the main campus.

Trends in higher education

Students' expectations

Today's students are expecting quality experiences and spaces in return for their tuition payment, as well as a return on their investment in the degree. Pressure to ensure that higher education fills both local employment needs as well as more aspirational opportunities is growing. Educational institutions are increasingly cooperating with local companies to train new entrants to the jobs market and offer mid-career training targeted on specific company needs.

Big data

Data help improve all aspects of the educational experience and the physical campus, including recruitment and admissions, facility operations, student experiences, and sustainability. But campuses need to be equipped with the required sensors, monitors, and reporting procedures to collect the data and implement software solutions that can analyze data to extract trends and recommendations.

Digitalization

In the wake of the disruption digitalization and automation is causing in many employment areas, more and more people will seek to reinvent their careers. Campuses will need to reflect this change and move away from lecture halls to more project space with a wider variety of equipment and technologies – especially as even sectors such as law or medicine, which were previously considered to be immune to disruption, are already undergoing substantial change. Educational institutions must ensure that programs teaching high-demand skills have adequate resources and room to grow. They must also give students the opportunity to gain hands-on on-campus experience with emerging technologies such as distributed energy systems and renewable power generation.

Financing

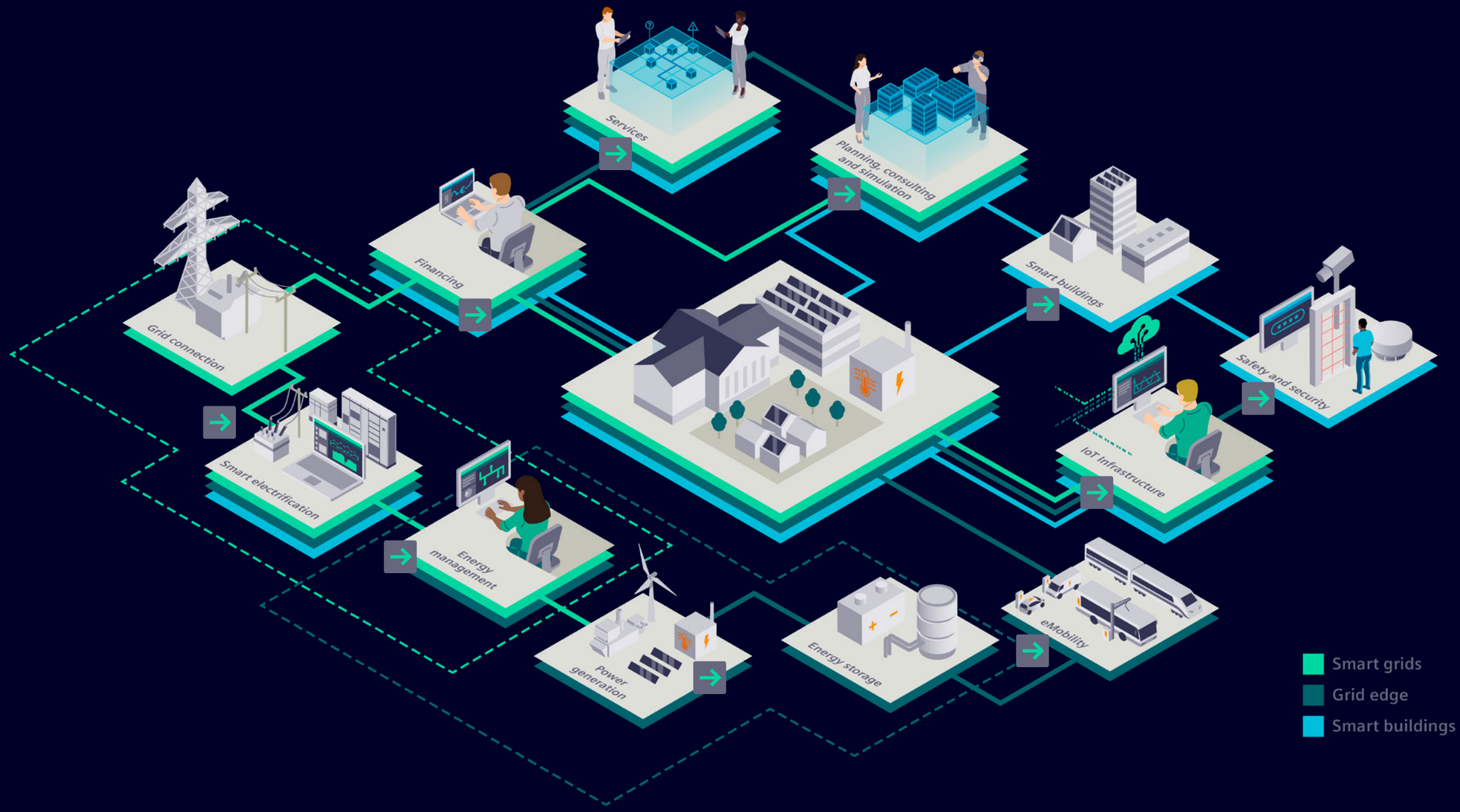
When it comes to establishing a more sustainable and, in the long term, more cost-effective energy supply, higher education campuses can benefit from a number of new and innovative ways to fund new energy management and microgrid projects. A common method for funding energy-related infrastructure projects is the build-own-operate model (BOOM) that enlists a qualified third party for the installation, operation, and maintenance of the required equipment on the basis of either an energy performance contract (EPC) or a power purchase agreement (PPA), Other funding opportunities often involve internal and public sector financing that may even include government grants and subsidies, and "green financing" through green banks and funding to assist in the development of environmentally friendly projects.

The components of a smart higher eduction campus

A campus that is smart in every respect intelligently networks energy, buildings, spaces, and people. To do this in the best possible way and with optimal results for all stakeholders, numerous technologies from a wide range of trades must interact seamlessly. This is the only way to achieve an optimal balance between cost efficiency, excellent user experience, and environmental as well as health and socio-economic requirements.

A huge and steadily growing number of digital technologies is available on the open digital business platform *Siemens Xcelerator*. They provide the basis for adaptable and scalable solutions that enable greater cost-efficiency, streamlined management and planning of space utilization and people flows, more sustainable, people-centric transportation solutions, and better academic life. In addition, educational institutions can benefit from the available data and connectivity in research, teaching, and learning.

That's why Siemens provides expert support to higher education institutions throughout the entire life cycle of a smart campus. As a true technology partner, the company is ready to provide solutions, services, expertise, and even financing solutions from the first planning steps to the implementation of suitable technologies and all the way to maintenance and the continuous optimization of the entire campus.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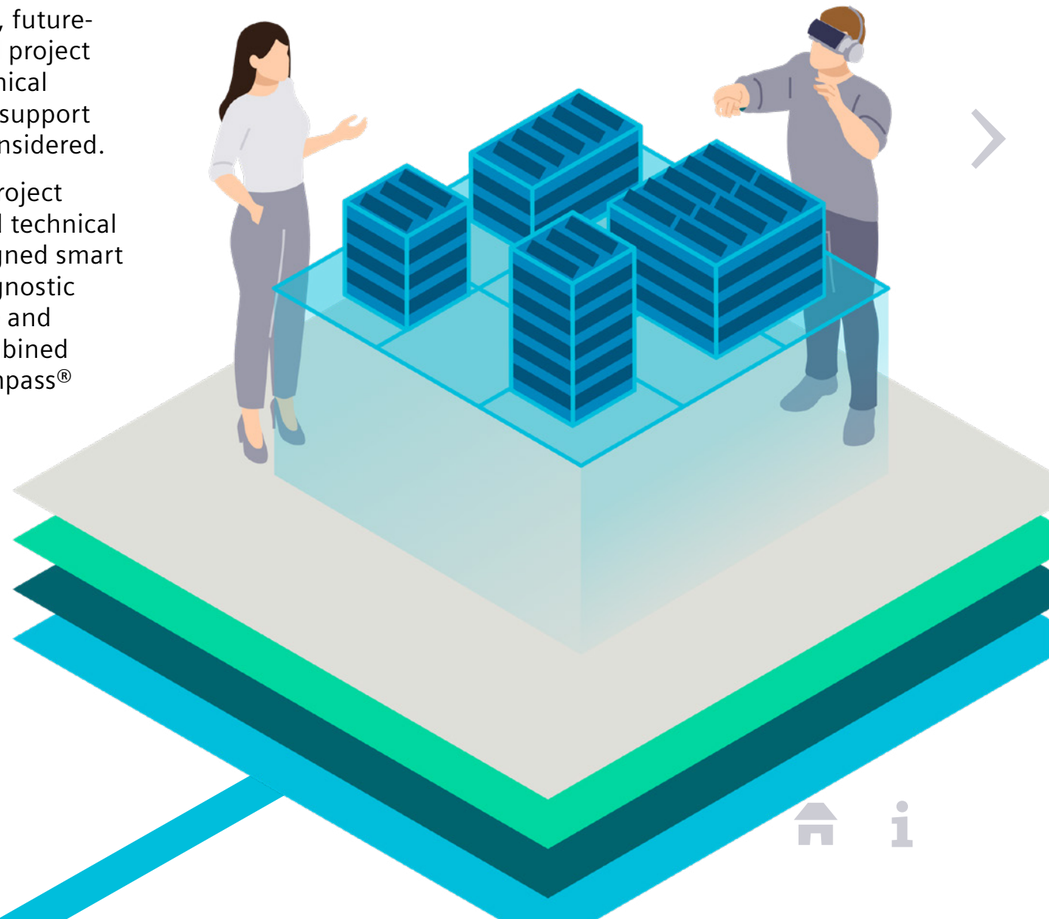
Planning, consulting, and simulation

Whether renovation and update or greenfield project: The foundation for a smart campus is laid well before the construction phase. Important decisions are already made during the first planning steps and numerous questions must be clarified. First, of course, it is necessary to clearly identify and balance the demands and requirements of the different stakeholders, which may even be conflicting. An objective, holistic, and rigorous approach helps to identify, analyze, and quantify project-specific objectives as well as available technologies and solutions from the stakeholder and end-user perspecective.

In view of the enormous range of currently available solutions and the exponential evolution of smart technolgies, it is essential to identify those that are robust and dependable, future-proof, and suitable to directly benefit the goals of all project stakeholders. At the same time, the underlying technical architecture and interconnections that are meant to support and optimally exploit these technologies must be considered.

To help advance a smart higher education campus project from its early, aspirational planning stage to detailed technical concept selection, Siemens offers a specifically designed smart scoping study. This study, carried out in a product-agnostic manner, brings to the table Siemens' comprehensive and detailed technological expertise and experience combined with rigour through Siemens PTI's proven Smart Compass® methodology.

The study allows project stakeholders to gain more clarity of business objectives and perform reliable future-proofing on a dependable basis. At the same time project performance can be improved at the earliest possible stage. It is here where the course is set for minimum possible energy consumption and emissions as well as for an optimal user experience and long-term sucess.



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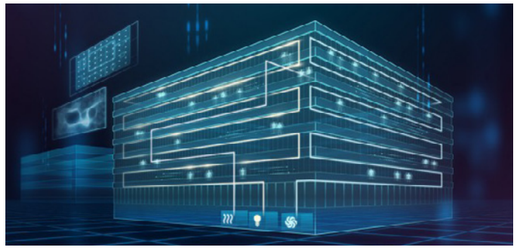

Building twin

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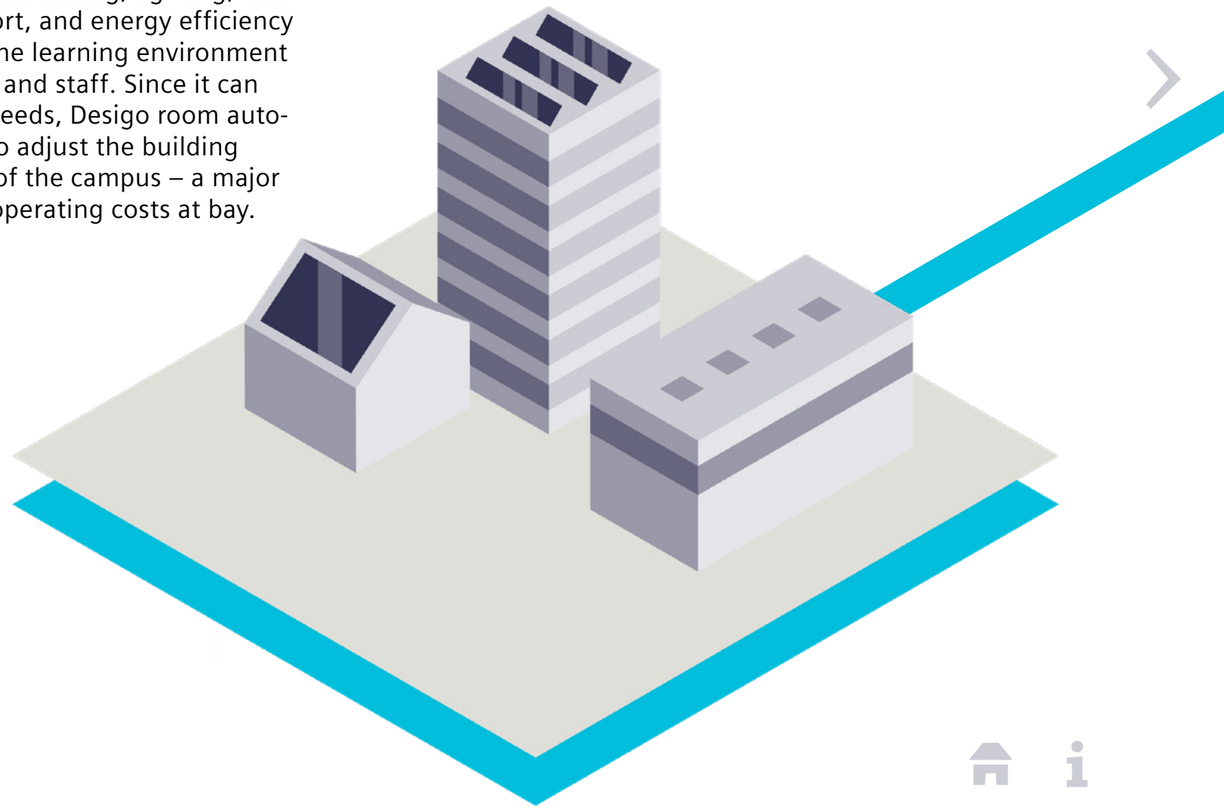
Smart buildings

A low environmental footprint, ample comfortable space for all scientific and social activities, and an outstanding degree of student engagement are important discriminating factors for higher education campuses. Smart buildigs that use digitalization and automation opportunities make it possible to achieve corresponding goals. They open up numerous possibilities to significantly improve the performance and the public perception of the campus in many ways, especially when the interact with a superordinate campus control center and with modern solutions for the generation and distribution of electricity.

In view of generally rising energy costs and the introduction of carbon taxes, energy savings and the reduction of emissions are an important contribution to a more economical campus operation. At the same time, there is increasing political pressure to make buildings more energy-efficient and environmentally friendly. Universities, colleges, and polytechnics are often expected to play a pioneering role here. A combination of various systems and solutions provide the opportunity to meet sustainability targets by integrating renewable resources and make the campus a greener place to live. Main components are photovoltaic solutions, a microgrid control systems that converts the entire campus infrastructure into a smart energy system and prosumer facility, battery storage solutions to store excess energy from own photovoltaic systems or windmills, and the Siemens Navigator, a customizable, cloud-based data management platform that enables continuous energy KPI monitoring.

With higher education increasingly moving towards digital and remote learning as well as part-time programs, transparency on the actual use of spaces is becoming more important for the campus administration, because flexible expansions and contractions must replace fixed room conditions. Siemens' Desigo™ room automation, a system that links all room disciplines, and multisensors from Enlighted support facility mangers in providing the required flexibility today and in the future. Using real-time sensor data, Desigo room automation guarantees ideal settings of heating, ventilation, air conditioning, lighting, and shading, in this way optimizing comfort, and energy efficiency in each individual room and making the learning environment as productive as possible for students and staff. Since it can easily be adapted to changing room needs, Desigo room automation ensures maximum flexibility to adjust the building layout to the changing requirements of the campus – a major contribution to keeping the campus' operating costs at bay.

Software-based IoT-based multisensors from Enlighted provide real-time data for smarter decisions in managing space as well as lighting, HVAC, and safety. They also provide the data required for the visualization of the de-facto space utilization history. This helps to ensure maximum space flexibility in existing buildings as well as economic decisions on campus enlargements.



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Safety and security

Today, and even more so tomorrow, higher education campuses need to be considerably more open to their environment than they have been before. New forms of learning require the more flexible use of all assets and facilities within a campus. This also means that safety and security requirements are changing – both in terms of access control and monitoring and for emergencies of all kinds.

An important contribution to campus safety and security is an emergency notification system such as Desigo Mass Notification. Facility managers can use it to broadcast quick and correct information about an emergency situation to people on the campus and inform about the required behavior.

Intelligent building management systems help to ensure that campus operations can be maintained even in critical situations such as a pandemic. The coronavirus pandemic has illustrated the usefulness of a system that allows the number of people in a room to be controlled and, if necessary, limited and technologies that help prevent infected persons from entering the campus or its buildings. Siveillance Thermal Shield, for instance, enables automatic and contactless high-accuracy elevated body temperature measurement at the entrance of a building to keep students and staff protected from infection risks. Such measures ensure operational resilience and contribute to a positve public perception of the educational institution and its campus.

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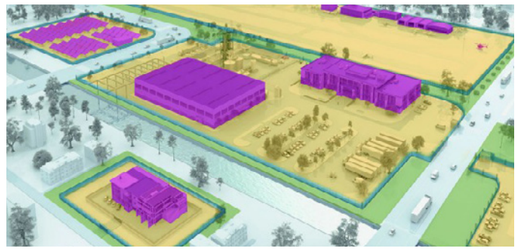

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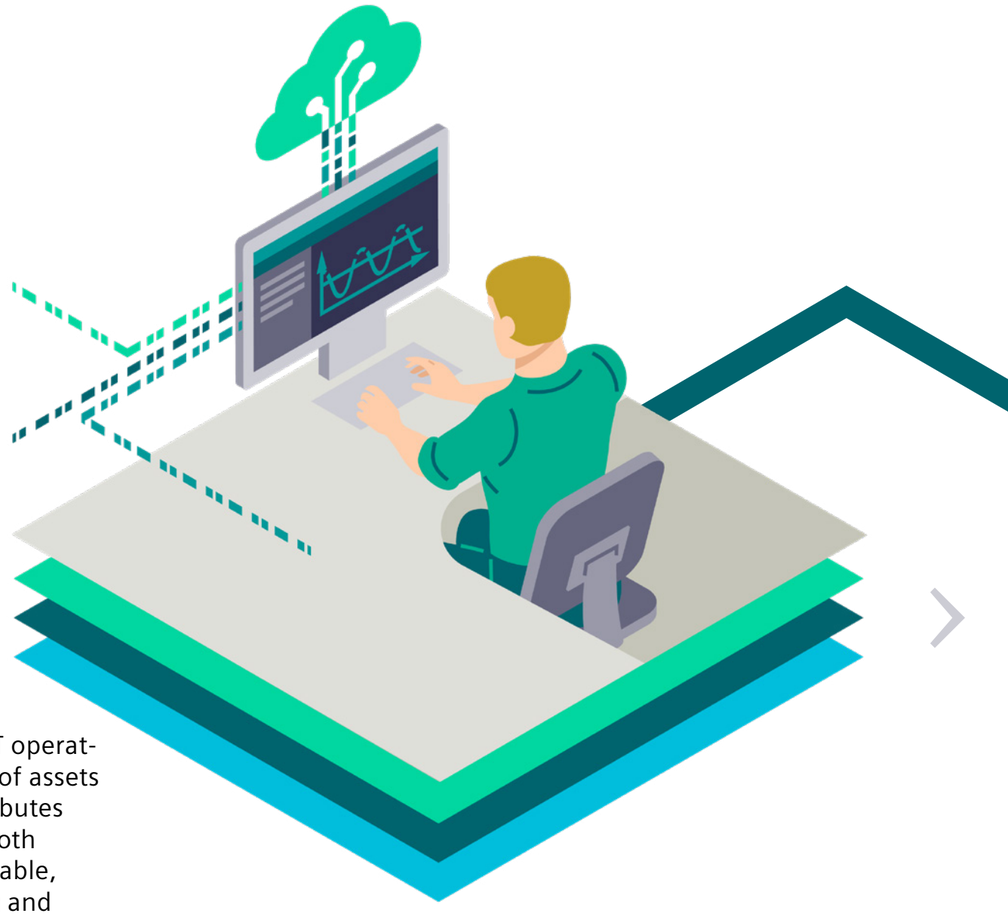

IoT infrastructure

From an IT perspective, a campus is a reletively independent, autonomous entity that generates huge volumes of data. Processed in a smart way, these data can help universitites, colleges, and polytchnics deal with challenges such as providing suitable infrastructure for digital learning, gaining operational transparency, and integrating silos of campus operations.

Making it possile to monitor and control the campus from a single central location, a campus control center enables the much more efficient management of time and resources, the most efficient use of building space, and the reduction of operational and possibly even capital expeditures.

Integrating a wide range of systems in a cloud-based IoT operating system and connecting the broadest possible range of assets with the help of sensors, a campus control center contributes to increasing convenience, security, and well-being of both students and staff while saving valuable resources. Valuable, timely insights make possible proactive decision making and fast response whenever needed to use resources – including operational data – in a targeted and controlled manner to improve processes and make campus life more amenable and secure for students and staff alike. State-of-the-art user interface design for various devices and training measures for all campus staff ensure that the advantages of such an integrated campus control system can be exploited to the full.

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IoT solutions for campuses

IoT infrastructure

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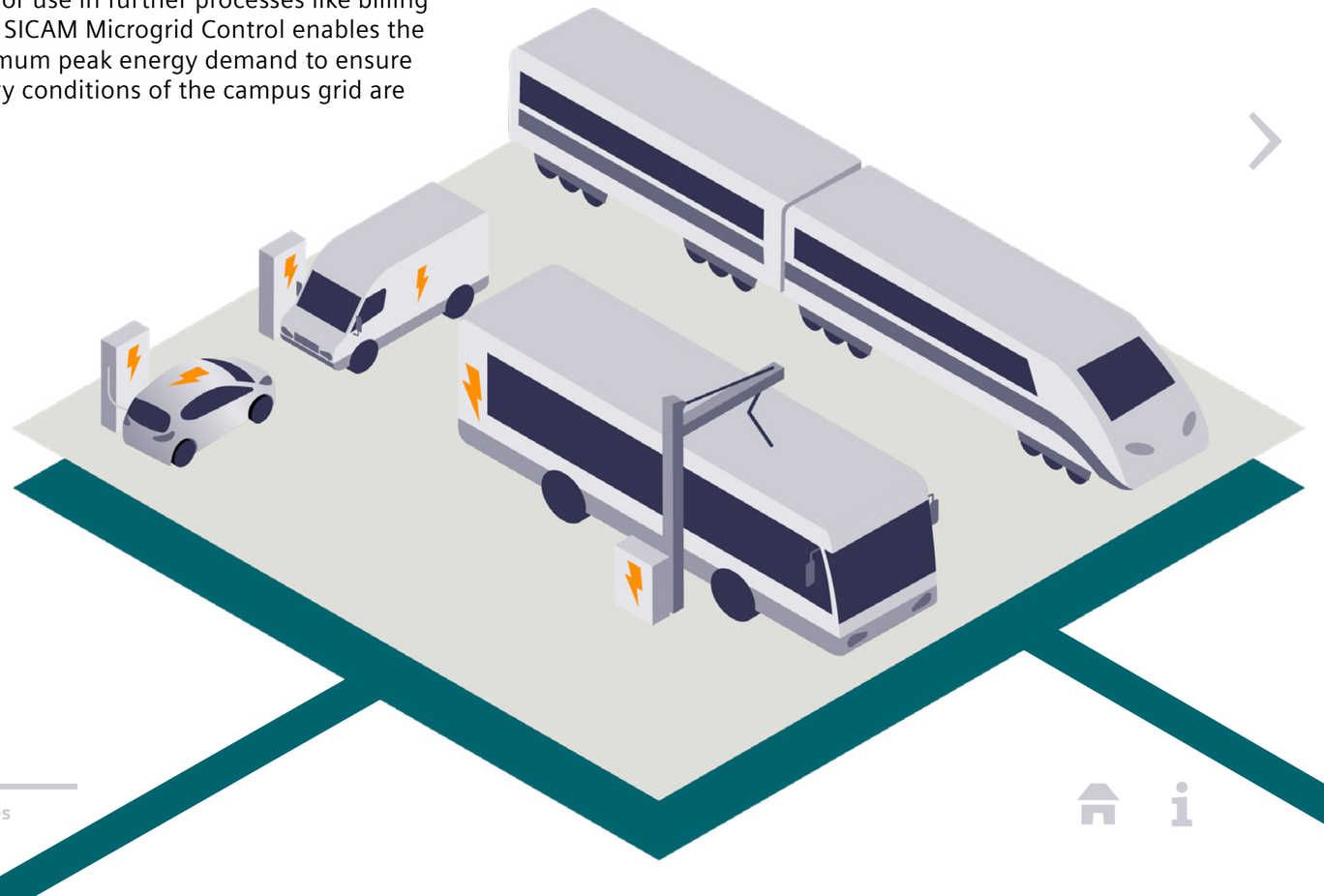
eMobility

Considering increasingly diverse student demographics with a growing number of part-time students as well as the growing importance of linking external spaces to the campus, it becomes clear that transport is increasingly becoming an issue for cam-puses. With electromobility moving into the mainstream and the implementation of comprehensive e-charging infrastructure high on the agenda of decision makers on all levels, campuses benefit from new opportunities and can and improve their public image at the same time. Implementing a powerful on-campus e-charging infrastructure, eductional institutions can leverage investments in own renewable energy assets to generate additional revenue. This infrastructure can also serve to power innovative, comfortable low-carbon travel options such as on-demand e-shuttles and e-bike sharing programs.

With the help of the Siemens E-Car Operation Center and the SICAM application Microgrid Control, campuses can implement an e-charging infrastructure in the short term – without the need for a grid connection upgrade. The E-Car Operation Center manages the charging infrastructure and the grid that connects the charging points. The system also pro-vides semi-processed data to external systems for use in further processes like billing and telematics, while the SICAM Microgrid Control enables the real-time control of maximum peak energy demand to ensure that the physical boundary conditions of the campus grid are always observed.



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Inspiring students for the mobility of tomorrow

eMobility charging

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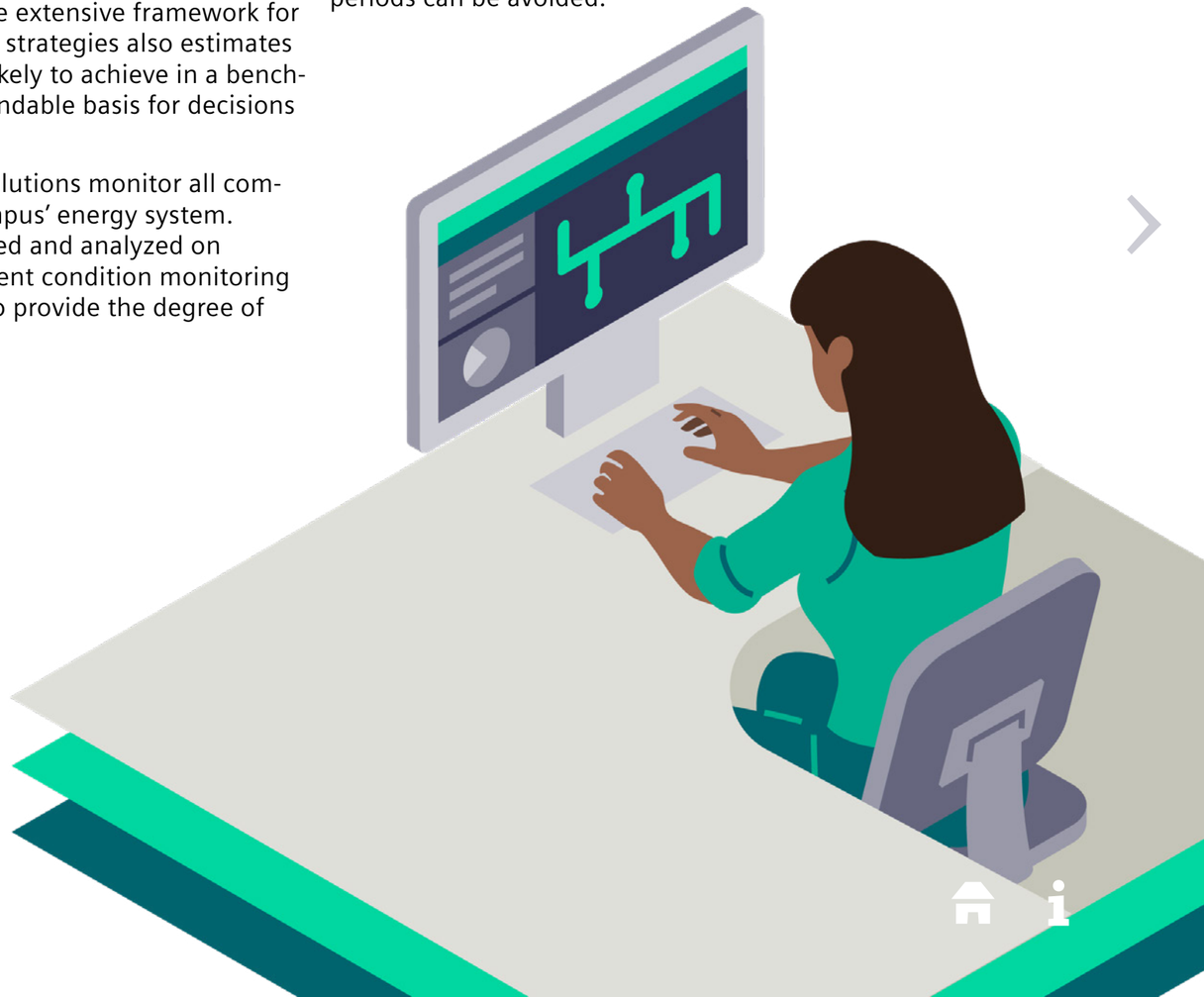
Energy management

Consistent energy management based on the data available throughout a higher education campus ensures the reliable, optimized, and efficient planning and control of the campus' energy supply – and ideally makes it fit for participation in the energy market.

When it comes to planning an optimized energy system for a higher education campus, Siemens' Smart Grid Compass® provides guidance towards a more energy efficient, sustainable, and resilient campus energy infrastructure based on distributed power generation and a microgrid. The extensive framework for the development of smart grid-related strategies also estimates the performance level the campus is likely to achieve in a benchmark comparison and provides a dependable basis for decisions that are focused on added value.

During operation, advanced control solutions monitor all components involved in the university campus' energy system. Real-time energy and status data hosted and analyzed on premise or in the cloud enable consistent condition monitoring to ensure flawless operation. They also provide the degree of transparency required to maximize the value of onsite energy resources in coordination with local utility or wholesale market rates. This can have a massive impact on the institution's operational expenditure: The demand for electricity from the public grid is reduced, power purchases can be economically optimized, and the institution becomes much less dependent on the utility and its pricing models. With the help of DEOP intelligent price and load forecasting and distributed energy optimization can be provided and costly power purchases during peak periods can be avoided.



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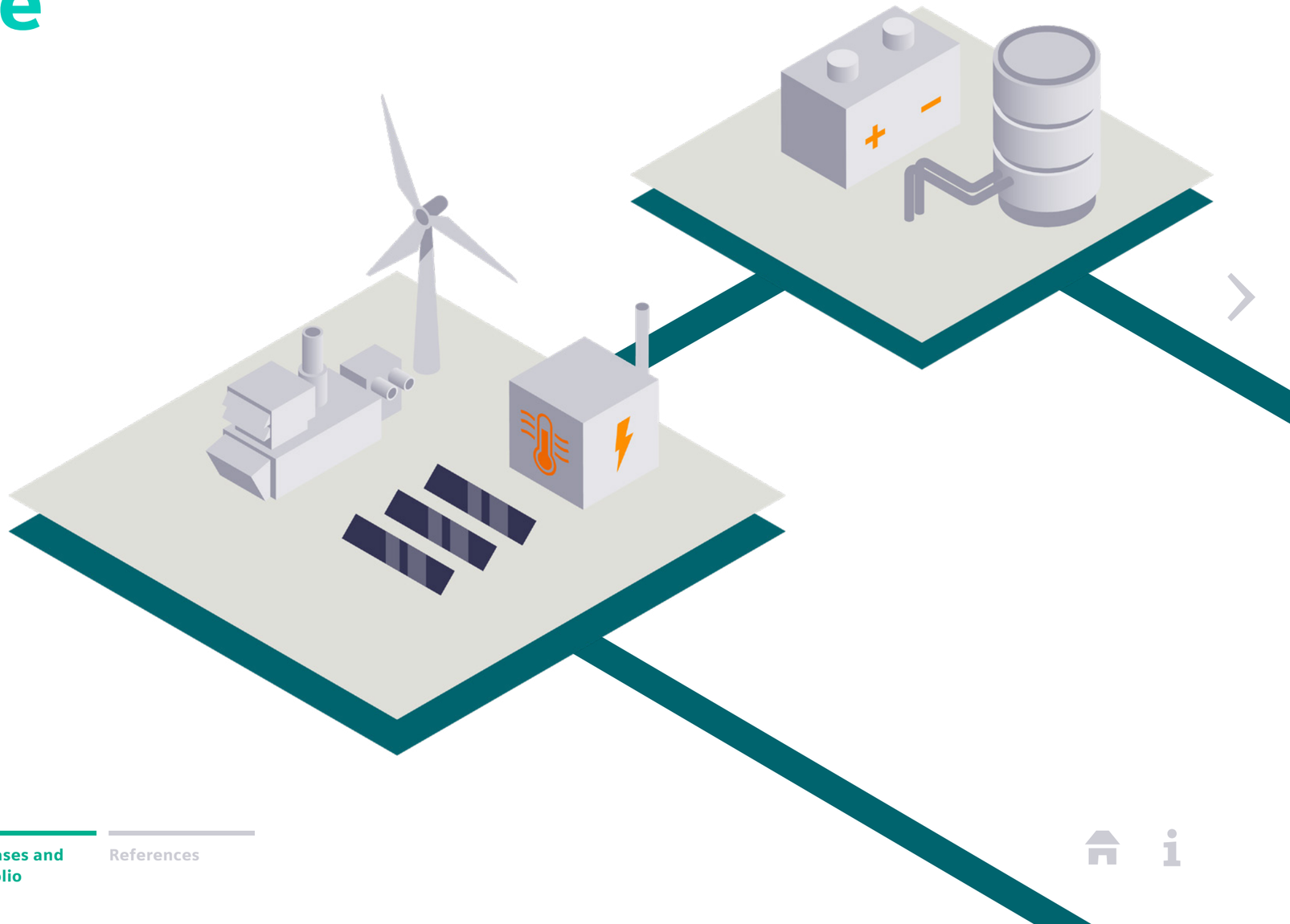
Onsite power generation and energy storage

Higher education campuses often comprise buildings and land that make good locations for hosting clean energy projects. Photovoltaic panels and small-scale wind power, for instance, create renewable, carbon free electricity that can be used right where it's generated. Another option is the establishment of an own district heating and cooling system based on a combined heat and power (cogen) plant.

Combined with battery storage or even a Power-to-X solution such as hydrogen electrolysis in an own microgrid, such forms of power generation provide optimal opportunities to make the power supply of a higher education campus more economical and at the same time more reliable. Such a microgrid can have a massive impact on the educational institution's operational expenditure: The demand for electricity from the public grid is reduced, power purchases can be economically optimized, and the institution becomes much less dependent on the utility and its pricing models. A microgrid also ensures a plus in resilience for the campus, since power remains available from own sources in the case of a grid blackout. Even better, surplus generation can be fed into the grid, in this way providing a new source of income.



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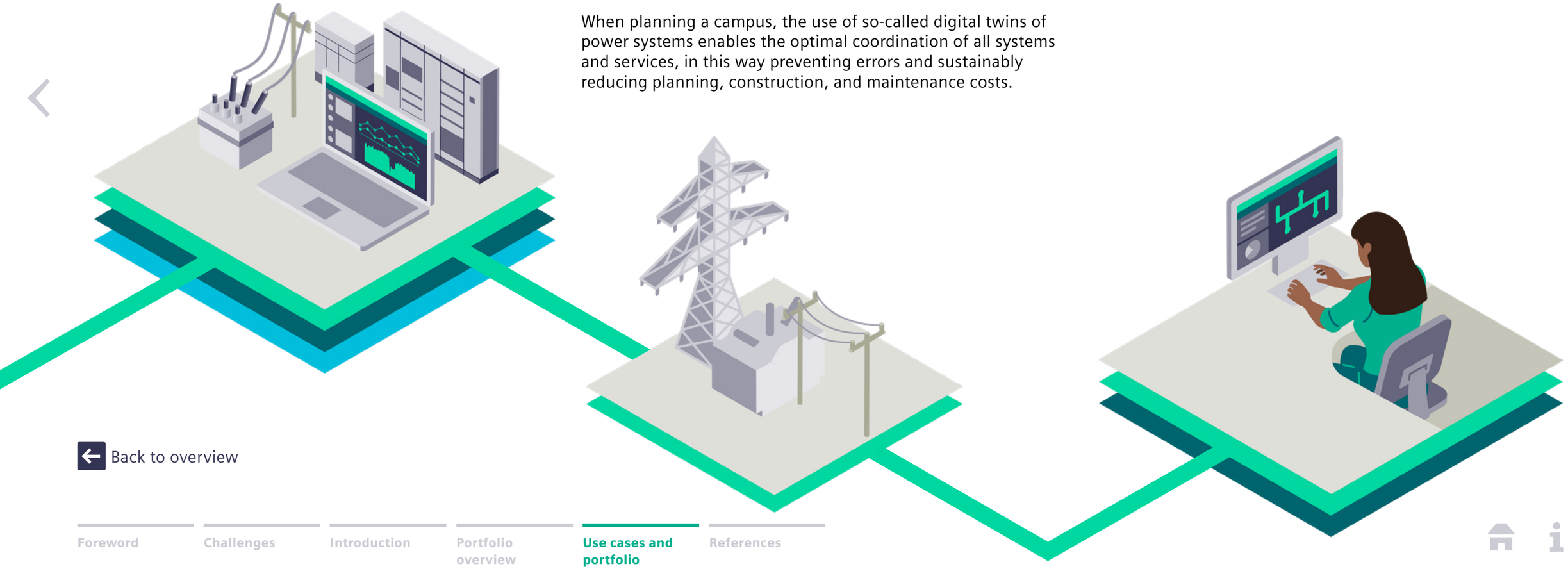
Grid connection and smart electrification

An effective, reliable, and safe power supply is the operational backbone of a campus. It's often seen as an inflexible but essential cost, but an intelligent power supply has the potential to be a business asset, saving money, creating efficiencies, helping to reduce carbon emissions, and creating greener operations. A smart electrification system covers everything from medium-voltage switchgear all the way to low-voltage switchboards and busbar trunking systems, and it makes use of smart software tools and applications. It infuses intelligence across the entire power supply chain and takes care of the power infrastructure, in this way allowing campus operators and users to focus on their core business.

When planning a campus, the use of so-called digital twins of power systems enables the optimal coordination of all systems and services, in this way preventing errors and sustainably reducing planning, construction, and maintenance costs.

Harnessing the power of data is essential to maximizing the efficiency of assets. When campus operators know in detail about the condition and status of all assets, they are able to make informed decisions to ensure effective performance. Digitalization opens new potential in this field through performance and condition monitoring, reporting, and automated analyses and evaluation.

Using all available energy and status data, campus operators can actively detect situations that may have adverse effects on the system's efficiency, and they can continuously optimize operations, energy consumption, and maintenance intervals.



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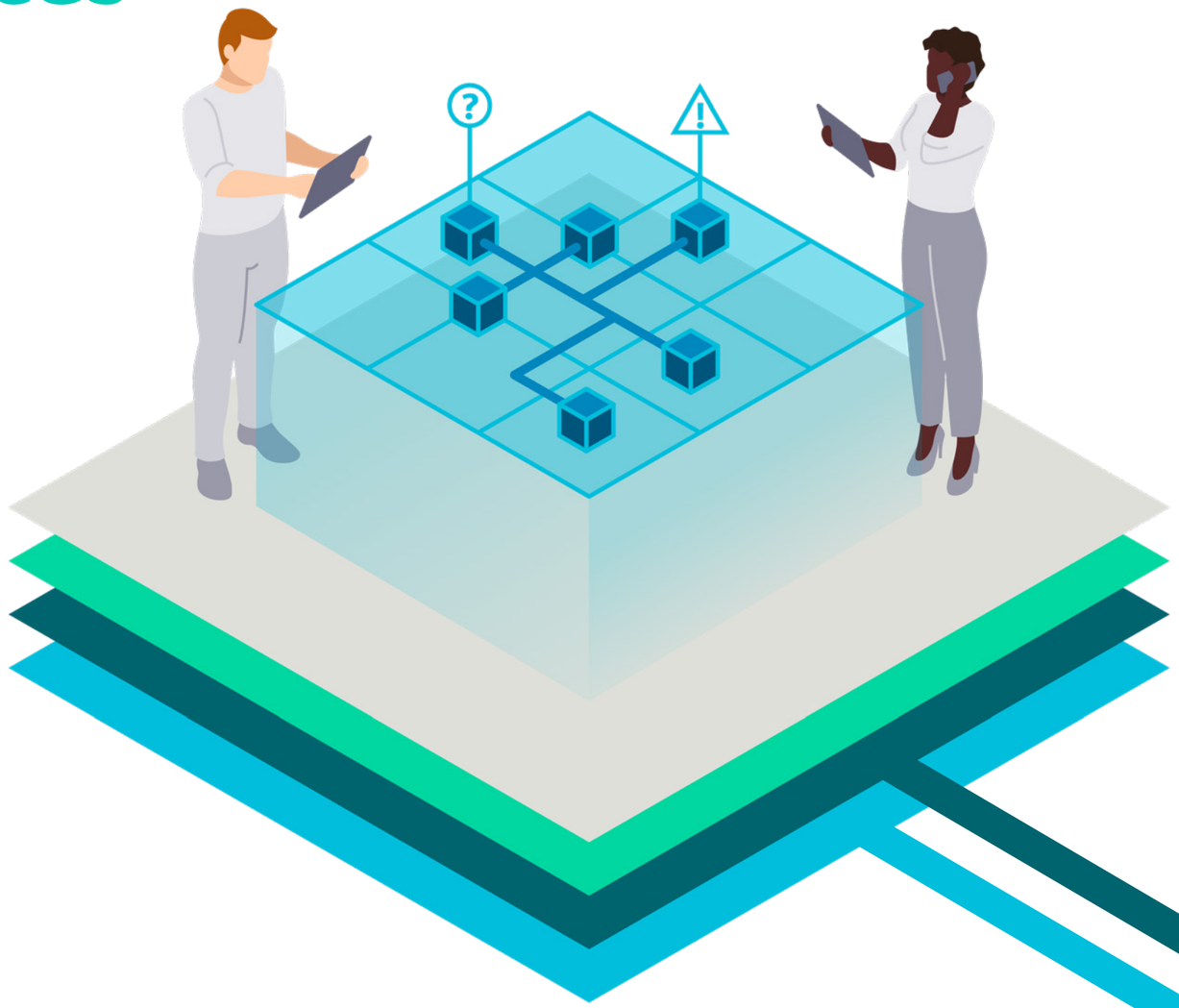
Services



Digitalization, the main driver behind a smart campus, helps universities become a driver of innovation in managing campus real estate and implementing more resource-efficient, sustainable, and cost-saving infrastructure – and to be perceived as such. However, it's not an end in itself, because intelligent infrastructure enables numerous digital services and applications that pay off day after day.

Building performance tools and analytics such as Siemens Navigator and the Siemens Service Portal provide the transparency and analytics that help take campus operation to a completely new level of efficiency and, at the same time, increase the assets' reliability and the resilience of the entire campus. Facility mangers obtain an overview of important operational data from all facilities, while rule-based analytics make it possile to deliver desired conditions in all facilities and identify inefficient operational conditions of systems such as HVAC instantly.

Analyses of the comprehensive data available also make the need for physical checks of equipment a thing af the past. Instead of having staff check numerous items on a regular basis, which is costly, slow, and ineffective, the continuous overview of current asset conditions allows for targeted predictive maintenance, in this way reducing the risk of failure considerably. In addition, this approach can reduce maintenance efforts by up to two thirds and also makes it possible to track maintenance performance over time.

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Financing

Higher education campuses house, cater for, and employ thousands of people at a time. Smart technology makes it possible to master the challenges associated with this difficult task noticeably better. It can help run campuses much more efficiently, reduce costs, save valuable resources, and better serve the entire campus community. One particular impediment, however, can be the financing of trendsetting, smart technology. The initial cost can be deterring at first sight.

That's why Siemens Financial Services offer a wide range of financing models that facilitate the acquisition and implementation of innovative technologies. Smart financing can help higher education campuses acquire the desired technological benefits through a wide range of financing solutions, such as public-private partnerships, performance contracting models, and service contracts that ensure that generated savings are greater than the payments made. Such smart and flexible financing solutions have become a key enabler for university campuses to stay ahead of the curve.

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Algonquin College, Canada

3.2 m

Annual OPEX savings in US$

Aiming at a zero net carbon footprint by 2042

Algonquin College, Ontario's fourth largest college with about 20,000 students, has created a unique culture of sustainability and set ambitious targets in its College Sustainability Strategy Framework, which focues on reducing its ecological footprint while pursing economic strength and enhancing student success. With sustainability as a compulsory subject in the curriculum of all undergraduate disciplines and a dedicated graduate certificate program, the college is considered a leader in sustainability across global academic institutions. It is only logical that Algonquin College wants to become a zero net carbon institution by 2042.

Much more than energy savings

Algonquin College has partnered with Siemens for the launch of its ESCO2 project, a 20-year energy savings contract (ESCO). Within the scope of this energy performance contract, Siemens delivered a number of infrastructure upgrades, such as HVAC retrofits, chiller plant optimization, and building automation control optimization. The infrastructure upgrades have resulted in annual savings of US$ 3.2 million and 1,200 tons of CO_2. This is a big step toward the college's aim of a net zero carbon footprint, and the savings will add up to tens of millions of dollars in OPEX savings and reduced deferred maintenance costs over the long term.

Eduction for a more sustainable future

Siemens is also supporting the college's educational mission by providing students with new research opportunities and hands-on access to the newest technologies. Siemens experts are teaching students about sustainability in the course of the college's sustainability graduate certificate program. There even is a dedicated Siemens sustainability officer on-site to drive and promote Algonquin's sustainability initiatives.

Working with Siemens, Algonquin College can give its students state-of-the-art lab experiences in new technologies that will drive the jobs of the future. Algonquin College has future-ready learners coming out of its programs who are ready to change the world. Throughout the project, Algonquin College and Siemens enjoyed a unique spirit of partnership.

RMIT University, Australia

39%

Annual reduction in electricity usage

Committed to a sustainable future

In 2007, the Royal Melbourne Institute of Technology (RMIT) in Melbourne, a global university of technology and design and Australia's largest tertiary institution, set out on an ambitious sustainability program to reduce energy and water use and carbon emissions by 25 percent: the Sustainable Urban Precincts Program. At the time, it was the largest of its kind in the southern hemisphere and represented a commitment of AU$128 million across the three universitiy campuses in Melbourne.

A comprehensive range of smart meaures

RMIT commissioned Siemens with the works on the city campus, which takes up roughly six percent of Melbourne's central business district and includes some of the city's oldest buildings. With a mix of old and new buildings, RMIT wanted to better connect and integrate its utility systems and services in order to improve efficiency.

A key aim was to become less dependent on mains electricity, build resilience to potential grid constraints, and make operations more efficient by installing a local energy supply solution. For this purpose Siemens created a single point of connection with the high voltage ring main, integrating three substations and an autonomous cogeneration plant. Siemens also installed its HVAC systems and building management platform, Desigo CC, to provide full control of temperature and air flow in every area of the campus, making it a comfortable and pleasant place to learn and work. The chiller and boiler systems were upgraded and some 12,000 lights were replaced with modern, energy-saving bulbs. A water management system was also implemented, saving 37,000 kilolitres of water annually.

On top of that, Navigator, the cloud-based energy and sustainability platform from Siemens, was implemented to monitor and control the campus on the basis of reliable data. Information from 17,000 connected data points is analyzed to give actionable insights on how to maximize the buildings' performance.

Impressive results in next to no time

RMIT's targets were to reduce grid electricity use by 263 million kilowatt hours over eight years and achieve an annual reduction in CO_2 emissions of 30,000 tons and 53 million litres of water. Impressively, these targets were achieved four years ahead of schedule.

University of Birmingham, UK and UAE

20%

carbon emissions reduction by 2020 – and the remaining 80% tackled with a clear vision of the smart campus.

Designing the world's smartest net zero campuses

In many cases, a university campus is home to buildings from different eras: time-honored, often listed buildings and classicist edifices, functional modern architecture from the 20th century, and trendsetting buildings from the last two decades. That's why it is difficult to make a historically established campus fit for a decarbonized, sustainable, and increasingly digitalized future. But even when a new campus is being built on a greenfield site, a great deal of expertise and planning is required to create a truly smart campus.

At the University of Birmingham, both cases occur simultaneously - and the university considers this a unique opportunity. In a global partnership with Siemens, the university wants to make its Edgbaston and Dubai campuses the smartest campuses in the world. "Our goal is to deliver the campus of the future by using the latest technologies to make our Edgbaston and Dubai campuses the smartest worldwide," says Professor Tim Jones, Provost and Vice-Principal of the University of Birmingham.

Increased transparency and a strong partner for guaranteed results

To meet its sustainability and carbon emissions targets despite budget constraints, the University of Birmingham has selected Siemens as a strategic partner to provide building efficiency as a service (BEaaS) with guaranteed energy efficiency results. The university pays service fees for technology and services over a 10-year period, Siemens Financial Services (SFS) finances the underlying technology under a prime contractor lease.

First measures included the replacement of obsolete building management system components and the implementation of new energy management software to track the performance of energy intensive equipment. In addition, the university is working with Siemens to generate a digital twin of the campus energy system, which will also increase transparency and provide a basis for optimization decisions. "Collaboration with a partner like Siemens is the first step toward a net-zero campus," says Jones. "We're going to make the ways we use the campus, how we utilize the infrastructure, how people work, and how they learn more efficient."

IoT technology on a broad scale in a university setting

23,000 LED lighting devices along with Enlighted sensors enable automatic light level adjustments and made the University of Birmingham the world's first university to introduce IoT technology on a broad scale. "The goal is to acquire new knowledge from the data that we're able to collect," explains Faye Bowser, Head of Energy & Performance Services GB&I at Siemens. For example, the Enlighted sensors measure ambient light along with motion (people in room), energy consumption, and temperature, in this way enabling comprehensive optimization of space and energy utilization as well as new research opportunities.

New opportunities for education and research

In addition to reducing the carbon footprint, the joint project is creating new educational and research opportunities. In a living lab, students will investigate energy demand and power generation based on live data – on the system level and on the levels of the individual power generator, consumer, and prosumer. At the same time, Siemens will sponsor a team of PhD students at both the UK and Dubai campuses whose research projects will be co-designed by Siemens and the university to address important challenges in the areas of data, technology, urban systems, and the net-zero goal.

Everything it takes to make a campus smart

A smart campus requires smart infrastructure

Only the intelligent connection and interaction of energy systems, buildings, safety and security, mobility, and all other elements of a campus infrastructure will create an ecosystem that intuitively responds to the needs of people and helps universities, colleges, and polytechnics to better use resources, offer a highly attractive environment for learning, teaching, and living, and point the way to the future.

Numerous technologies and entities from the physical and digital worlds must interact seamlessly to make it possible for a smart campus to unfold its benefits to the full.

Siemens' unique, fully integrated approach

As a technology partner for higher education campuses, we combine our long-standing experience and expertise in the fields of energy, building technology, digitalization, and mobility in a unique smart infrastructure portfolio for higher education campuses.

The understanding behind it is that a holistic view of the entire campus with all its elements is required at all times. In all phases of a greenflied or a brownfield campus project – from the first planning steps to implementation, commissioning, maintenance, even financing – the focus must be on the contribution every single bit makes to the big picture.

Adhering to this understanding, we provide integrated solutions, services, and expertise for the entire lifecycle as well as support for the continuous optimization of the whole campus. Our networked, cloud-based digital offerings and services as well as our products, components, and systems help higher education institutions around the world thrive, progress, an d develop in a sustainable and cost-efficient manner.

Your partner for a successful future

Whether you want to enhance the performance of your buildings, meet ambitious sustainability and green energy goals, develop and operate adequate mobility solutions, or create the degree of flexibility that’s required to enable change and innovation, we’ll be at your side.

Let's create optimal and secure learning and teaching environments that position your higher education campus as a leader in the academic world that attracts the best scientists, faculty, and students.

Smart Infrastructure combines the real and digital worlds across energy systems, buildings and industries, enhancing the way people live and work and significantly improving efficiency and sustainability.

We work together with customers and partners to create an ecosystem that both intuitively responds to the needs of people and helps customers achieve their business goals.

It helps our customers to thrive and communities to progress, and it supports sustainable development to protect our planet for the next generation.

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