

ÖSTERREICHISCHE GESELLSCHAFT  
FÜR NACHHALTIGE IMMOBILIENWIRTSCHAFT  
AUSTRIAN SUSTAINABLE BUILDING COUNCIL



# Buildings & Energy

A brochure of the ÖGNI working group Buildings & Energy



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# TABLE OF CONTENTS

<b>KEYWORDS</b> .....	<b>3</b>
<b>INTRODUCTION</b> .....	<b>3</b>
<b>BACKGROUND AND OBJECTIVES</b> .....	<b>6</b>
About ÖGNI .....	6
About the DGNB certificate .....	6
Room for innovation in the DGNB certificate .....	6
Purpose of the working group .....	6
<b>RELEVANT STAKEHOLDERS</b> .....	<b>8</b>
Building owners, investors, energy suppliers and others.....	8
<b>CONTRIBUTION TO THE SUSTAINABLE DEVELOPMENT GOALS</b> .....	<b>11</b>
<b>KEY TOPICS</b> .....	<b>12</b>
Areas on the building and/or land for energy production .....	12
Use of storage possibilities and synergies.....	12
Use of internal potentials.....	13
Load shifting potentials in buildings and across property boundaries.....	14
Mobility concepts.....	14
Possibilities for financing energy efficiency measures.....	16
Legal framework .....	17
<b>CRITERIA FOR THE DGNB CERTIFICATE</b> .....	<b>19</b>
<b>CASE STUDIES</b> .....	<b>23</b>
BauConsult Energy – SMART BLOCK GEBLERGASSE .....	23
City of Vienna – Energy Regional Planning.....	25
Innovation lab act4.energy.....	27
ECOCOACH – On the way to self-sufficient accommodation in Switzerland .....	29
NEOOM – Intuitive energy management for sustainable housing estates .....	31
<b>CONCLUSION</b> .....	<b>32</b>
<b>PARTICIPANTS IN THE WORKING GROUP</b> .....	<b>33</b>



## KEYWORDS

Decentralized energy production, energy efficiency, sector coupling, building certification, legal framework, financing models, load shifting potential, mobility concepts, land resources

## INTRODUCTION

The expansion of renewable energies, especially solar and wind energy plants, but also the use of external heat and cold sources, is changing requirements in power supply as well as in heating and cooling systems. The massive shift in load flow situations as well as increasing distances for electricity transport change the demand and create new requirements for the management of electricity grids<sup>1</sup>. In the course of the energy transition, energy increasingly comes from decentralized and renewable sources instead of centralized power plants. Central power plants can thus be relieved and used for new tasks (e.g. backup). The transformation of the energy system means more than just a change of energy source and can therefore only be achieved through targeted technological innovations. The energy system of the future offers more flexibility to implement renewable energy into the grid, supports the integration of decentralized production concepts, meets the new demands on infrastructure, consumer participation and enables new business models for suppliers and service providers<sup>2</sup>. It is becoming more and more necessary to work together across industrial sectors and to link all energy supply sectors, which is why heating, cooling and electricity must always be thought of simultaneously in the future. Heating energy and, due to the rising temperatures, increasingly cooling energy have long been the main contributors to energy consumption. The phasing out of fossil fuel and nuclear energy generation, increasing population levels and progressive urbanization will only be possible through decentralized energy generation and sector coupling (heating/cooling/electricity). In addition to infrastructure and energy solutions, this requires new legal and social framework conditions as well as the appropriate mind-set.

Residents of a property used to be regarded as consumers only, but now they are also becoming producers and to a certain extent provide for themselves. These so-called prosumers are becoming increasingly important for a successful energy turnaround. As prosumers, consumers actively participate in the energy market. However, since, for example, electricity production involving renewables depends on whether the sun shines or the wind blows, there are sometimes high fluctuations in the grid. For energy producers and grid operators, the challenge of optimally coordinating production, distribution, storage and consumption of energy is increasing<sup>3</sup>.

Ever-increasing amounts of consumers, such as heat pumps and e-mobility, make an intelligent integration into the energy network necessary. In an intelligent power grid (smart grid), information on individual power consumption is communicated to the energy and grid operators by means of smart metering devices. This information enables a more efficient network operation and thus serves to increase the security of supply. More detailed information about consumers and grid statuses opens up many opportunities to respond even better to individual customer needs. Making energy consumption "visible" also sensitizes

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<sup>1</sup> <https://www.dena.de/themen-projekte/energiesysteme/stromnetze/systemdienstleistungen/>

<sup>2</sup> Fachkonzept Energieraumplanung

<sup>3</sup> <https://www.bmwi.de/Redaktion/DE/Artikel/Digitale-Welt/Intelligente-Vernetzung/Anwendungssektoren/anwendungssektor-energie.html>

customers and can increase motivation to save energy. In the course of the digitalization of the energy industry, legal framework conditions are also changing to enable prosumers to participate actively in the electricity market. Besides promotional measures, there must also be tax exemptions for individual buildings' consumption of self-generated electricity and the removal of investment barriers in order to support buildings as energy producers.

The advancing digitalization in the construction and building sector is already contributing to significant changes. Energy management is becoming a central issue. As an integrative component of building automation, it contributes to increasing energy efficiency and using renewable energies more efficiently. Active energy services can be realized, for example, through additional storage options in the building. If such a building acts as a grid-supported storage facility, it actively contributes to relieving the load on the electricity grid<sup>4</sup>. A suitable management of consumers, electricity storage facilities, generation plants and charging stations is essential, however. A platform is needed that connects, measures and controls all devices in order to generate the ideal energy flow and also distribute surplus energy in a sensible manner<sup>5</sup>.

One should also always bear in mind that a single building does not have to fulfil all functions. If you look at several buildings as clusters, as districts, communities or cities, there is enormous potential. Large solar-active roof areas, geothermal energy, the possibility of a common electricity storage system and energy management across buildings in energy communities all support the path towards a climate-neutral future. Available areas in buildings (especially new and renovated buildings) must be used in the best possible way for building-integrated solar panels. This expansion of photovoltaics serves to increase self-supply and thus also contributes to systemic relief of the supply network. Again, coupling of electricity/heating/cooling storage systems is required to compensate for the volatility of energy production. To be able to use all potentials, synergy analyses are required in advance. Is waste heat available, is geothermal energy possible, how much solar-active surface is available, how is wastewater used, which possibilities are available for energy storage? Only after these questions have been answered, interdisciplinary, integral, energy-efficient and climate-neutral planning measures can be taken<sup>6</sup>. System change requires integrated solutions for the generation, distribution, storage and consumption of energy. Buildings and districts provide the conditions to support these solutions. On a large scale, cities and surrounding areas must also be networked. The regions around cities can supply the city with sustainable energy, and cities can better connect the surrounding area by expanding public transportation.

The ÖGNI supports these developments with the evaluation of sustainable buildings and districts and would like to go one step further with this working group and the introduction of the DGNB version 2018.

In the future, buildings will play a fundamental role in energy storage. In addition to climate- and energy-neutral building operation, cross-building energy concepts and the solar-actively used area are to be promoted. The flexibility of the DGNB system enables a rapid response to new developments. New technologies, new concepts and processes can be integrated and made assessable. The certificate can thus be a kind of springboard for new energy-efficient

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<sup>4</sup> FMA - PowerPack Immobilie - Das Gebäude der Zukunft

<sup>5</sup> See <https://neoom.com/referenzen/energy-city-wkreisel-baut-an-der-stadt-der-zukunft/>

<sup>6</sup> FMA - PowerPack Immobilie - Das Gebäude der Zukunft



and climate-friendly innovations that can be implemented not only in new buildings but also in existing buildings.

However, these issues can only get into people's heads if there is increased awareness. Developers, energy suppliers, energy space planners, architects, transportation service providers and operators, but also every single person has to rethink. By 2050 at the latest, we must achieve the exit from the fossil energy industry – towards complete decarbonization. This step requires openness to change and disruptive approaches. This development, however, also opens up unimagined possibilities, opportunities and new business models. As many best-practice examples already show, investments in sustainable energy systems from renewable energies pay off and, in addition to a positive contribution to resource efficiency, also create a monetary advantage over the life cycle of the property. This is why the ÖGNI stands behind these developments and wants to push them further, because only ecologically sustainable developments that pay off economically are sustainable in the long run.

With this in mind, we hope you find this an exciting and informative read!



# BACKGROUND AND OBJECTIVES

## About ÖGNI

The ÖGNI – Austrian Sustainable Building Council – is an NGO (non-governmental organization) for the establishment of sustainability in the construction and real estate industry. The ÖGNI's work focuses on the certification of sustainable buildings – Blue Buildings.

## About the DGNB certificate

The DGNB system of the ÖGNI serves to objectively describe and evaluate the sustainability of buildings and districts. The quality is evaluated, taking into account all aspects of sustainability, over the entire building life cycle. The DGNB certification system is internationally applicable. Due to its flexibility, it can be adapted precisely to different building uses and country-specific requirements. The DGNB system considers all essential aspects of sustainable buildings. These include the six subject areas of ecology, economy, socio-cultural and functional aspects, technology, processes and location. The first four topics are equally weighted in the assessment. This makes the DGNB system the only system that gives equal weight to ecology and the other factors that make a decisive contribution to the creation of a sustainably successful building.



## Room for innovation in the DGNB certificate

Sustainability is often still a topic of the future, but if we look at buildings and districts of today, there are already many and good implementations. Nevertheless, it is the DGNB's aim to promote new and bold concepts with a long-term future potential. With this in mind, a new solution has been integrated into the criteria: the concept of innovation areas. For numerous criteria, these have been created with immediate effect, which is intended to motivate planners to pursue the best possible solutions that make the most sense for a given project. The innovation areas, newly anchored in this form, should also help to support a planning culture based on active involvement with the requirements of a specific construction task and contribute to the individualization of projects.

## Purpose of the working group

The current developments and creation of the legal framework for energy communities, where buildings take over an active part in energy supply and storage, illustrate the trend of decentralized energy supply with renewable energies. It has been recognized worldwide that security of supply must be strengthened by decentralized energy concepts and a broad sector coupling. Energy supply, but also heating and cooling supply, transportation and industry must be considered and planned together. Existing lighthouse projects (cities, municipalities, districts) show that integral concepts work. Decentralized energy solutions offer both economic and ecological added value for the end customer/user. Furthermore, the use of additional storage technologies supports the security of supply. In order to achieve the goal of decarbonization, all sectors and every individual must rethink. Since the DGNB system can react flexibly to new developments and innovations, it is a good strategy to integrate those technologies and processes that have already been established in lighthouse projects into the

certificate. Perhaps initially considered innovations, they can become standards and are incorporated into laws and standards.

Since it was clear from the beginning that this topic can only be dealt with in an approach spanning all industries, an interdisciplinary approach was a major concern for us in the working group. To this end, experts from the energy, heating and cooling supply, real estate development, architecture, urban and regional planning, law, financing and certification sectors, among others, were invited to join the working group.

With this brochure, we want to offer decision-makers in the real estate and energy industries as well as urban and municipal developers a broad overview of the topics of decentralized energy generation and supply, and raise awareness of the goal of decarbonization by 2050 at the latest.



# RELEVANT STAKEHOLDERS

## Building owners, investors, energy suppliers and others

### Building owners and investors

With their investments in real estate, investors primarily pursue economic goals over the entire life cycle of the building. In the planning and construction phase, holistic and interdisciplinary planning as well as product and process optimizations reduce investment costs by minimizing work, time and material expenditure. For example, several process steps in the installation of building services engineering can be significantly reduced through digitalization, which means time savings and work efficiency.

In the utilization phase, decisions are based on the potential for minimizing running costs and maximizing the sales price or rental price through the end user added value.

For example, a holistic sustainable energy concept delivers cost savings compared to fossil fuels. On the other hand, the concept enables added value for users through CO<sub>2</sub>-neutral living or sustainable mobility concepts, thus generating higher revenues for investors. The anticipation of possible future charges on CO<sub>2</sub> emissions also means investment security. If the investor is also the building developer, concepts that are less tangible in monetary terms, such as increasing energy independence (autonomy) in real estate and mobility, come to the fore.

### Architects and planners

A significant proportion of urban energy consumption is in the real estate industry. For the realization of efficient energy systems, both leveraging potential efficiency increases in buildings and transitioning to building-integrated and external renewable energy sources play a major role. For Smart Grid research, a central element is the utilization of the resource "building" with its load shifting potentials in the grid and the coupling of classic building automation with the IT infrastructures of Smart Grids that are currently being developed. The automation of buildings plays an important role in coordinating end consumption with variable feed-in in the intelligent energy system of the future.

Holistically integrated planning is an important component for the construction of sustainable real estate and requires the involvement of all disciplines that play a role in the development process. In order to achieve the highest possible building quality, only a lifecycle-oriented and integral planning process, which involves architecture, structural design, facility management, building services engineering and energy technology, can meet the specified sustainability objectives. The essential, interdisciplinary planning requirement makes the introduction of systematic and integrated planning processes necessary. These processes are supported by modern methods such as Building Information Modeling.

### Energy suppliers

Energy suppliers are developing a roadmap for the complete decarbonization of the energy system. Key points are the use of solar energy, the replacement of natural gas by "green gas" and a coupling of the energy, heat and transportation sectors. In addition to the conversion to renewable energy production, the entire energy demand, including the heat and mobility sectors, must be included. The three sectors do not only have to be thought of together, but also linked much more closely together. This is called "sector coupling". Electricity and heat networks can be linked together, for example, by means of so-called combined heat and power

generation in power plants or heat pumps. For 100% decarbonization of the sectors mentioned above, all potentials of renewable energy sources (from geothermal and PV to waste heat recovery, CHP, biogas and hydrogen) have to be used, exploited and coupled. Through foresighted planning, renewable energies, waste heat, mobility and efficient solutions can be implemented much more easily and cost-effectively and thus more competitively compared with fossil energy solutions. The necessary infrastructure for a CO<sub>2</sub>-reduced heat supply is often already available.

Energy suppliers and service providers, who address this issue at an early stage will benefit from a variety of new business models.

## Building users

Building users have the need to satisfy their rational and economic interests for inexpensive living space and comfort, but their emotional values and ideals also define their decisions. Sustainable real estate meets these economic needs through energy-efficient buildings, CO<sub>2</sub>-neutral energy production on the building and energy management including the provision of charging solutions. Comprehensive automation solutions with Smart Building Apps meet comfort requirements, which, for example, enable convenient living in old age as well as efficient control of commercial buildings. Building solutions can provide a foundation that users build on to maximize the efficiency of their own consumption and ultimately to become prosumers, that means, energy producers who simultaneously use the energy that they produce. Having taken on the prosumer role, a building user can also feel part of a community and together with others provide a climate-neutral energy supply in their living quarters.

## Developers

### Using the example of Value One and the Viertel Zwei urban districts:

Value One develops and operates extraordinary properties and urban districts that offer a high quality of life. Today, Viertel Zwei is one of the most diverse and exciting urban development projects in Vienna. Right from the start of the development, the aim was to create an extraordinary urban district of the future. This is about more than just the property alone. The developers take mobility, open space, community and also alternative energy concepts into account as essential components of the development from the very beginning. When it comes to sustainability, Viertel Zwei is a pioneering project. It is the first urban development area in Austria with platinum certification according to ÖGNI. With the visionary energy network "Energie Krieau" from BauConsult Energy, a way was found to effectively use the regenerative energy sources on site, to activate the seasonal earth storage with the help of probes and to connect the individual properties in an energy network in such a way that they can exchange heat and cold as required. This green intelligent energy network saves 70% of CO<sub>2</sub> emissions in the heating and cooling supply. As climate change progresses, the issue of CO<sub>2</sub> emissions and energy autonomy is becoming increasingly relevant for developers. With the project Viertel Zwei, the developers Value One and BauConsult Energy have created a showcase project and built up expertise that is in demand beyond the boundaries of Viertel Zwei.

[Author: Dr. Andreas Köttl, Value One]

This showcase project is intended to illustrate here what is already possible and has been implemented successfully. Such city district solutions are to be realized towards a sustainable urban/community development. City planners and project developers alike can make their contribution by holistically integrating sustainable energy concepts into their planning.

## Transportation providers

The growing interest in alternative sustainable mobility is an essential issue for real estate developers and builders to consider in project planning. For example, the number of electric cars is constantly increasing, the range of models and ranges are constantly growing, and the demand for charging infrastructure for electric cars is expected to rise steadily in the coming years. Anyone who drives an electric vehicle depends on a suitable charging infrastructure, whether on the road, at home or in the office. Apartments, office buildings and commercial real estate will therefore not only require charging infrastructure, but complete charging solutions, because the requirements of the users are complex: from the individual wall-box to the networked multi-user solution with different capacities. A complete charging solution not only ensures the attractiveness of the property, but ultimately also conformity with the building regulations and the associated legal framework for the construction of new buildings. However, this should not be limited to electric mobility alone; other concepts such as hydrogen propulsion are also a future alternative to conventional combustion engines. In this document we only want to show that a holistic cooperation between mobility providers, developers and energy suppliers is required in order to realize appropriate mobility solutions and concepts, regardless of which type of mobility or transportation will be used in the future.

## Energy communities

Energy communities are formed by different parties such as social enterprises, public organizations and citizens. Together with public authorities and municipal organizations, they participate directly in the energy turnaround by jointly investing in the production, sale and distribution of renewable energy and sustainable mobility.

In addition to reducing greenhouse gas emissions, there are many potential benefits for all stakeholders, including economic development, job creation, independence through self-sufficiency, community, social cohesion, and energy security. Regional authorities can support the emergence of energy communities by providing funding, expertise and advice.

In the future, it will be increasingly important to cover as many sub-sectors as possible and to interconnect them in a meaningful way. Not only electricity, but also heating/cooling supply, transportation and industry must all be taken into account. Energy communities are a good solution for jointly solving these challenges and exploiting the opportunities.





# CONTRIBUTION TO THE SUSTAINABLE DEVELOPMENT GOALS



With the Sustainable Development Goals (SDGs) as a central element of the Agenda 2030, the United Nations defined specific goals in 2016 to make the further development of our world meaningful and thus enable long-term rethinking and living in a sustainable world. ÖGNI supports these goals and wants to make a tangible, positive contribution to this achievement by means of certification. Together with other European Green Building Councils, the G17 Initiative G17 was founded in order to promote solutions based on the SDGs to make the European building sector as climate neutral as possible.

The working group also takes the SDGs into account, as the building sector must make an important contribution to a sustainable future. If the goals of the European Union – a climate-neutral EU – are to be achieved, something must be done. The DGNB certificate promotes sustainable and future innovations making sure that the focus is on people. If we consider the core issues described in this brochure, and – whether as individuals or enterprises – implement suitable measures in practice and daily life, we can make a contribution to the SDGs mentioned below. We can also become part of an economic turnaround, because climate protection and the well-being of all will also bring economic benefits in the long run.

- 3 Health and well-being
- 7 Affordable and clean energy
- 9 Industry, innovation and infrastructure
- 11 Sustainable cities and municipalities
- 13 Climate protection measures



For further information please click here:



# KEY TOPICS

## Areas on the building and/or land for energy production

(e.g. energy spatial planning in the City of Vienna)

In order to decarbonize the urban energy system, the existing energy supply infrastructures must be systematically redesigned. The energy spatial planning of the City of Vienna is an important example of this. It deals with the spatial dimensions of energy consumption and production and in this way combines urban and energy planning. This can refer to the development of new building areas or to the sustainable redevelopment of old buildings or existing areas<sup>7</sup>.

In the urban context, the focus of energy spatial planning is on heat supply, because buildings have a high energy consumption. With the help of spatial energy planning, existing and planned infrastructure is optimized, the energy demand is immediately covered to a greater extent by renewable energies (geothermal or solar energy, ...) and waste heat, and in new buildings, the use of innovative energy systems using renewable energy is encouraged. The emission-free production of solar energy is particularly suitable in urban areas with many sealed surfaces and roofs. Vienna has a very high potential in this area, as many roof areas could be used for the production of solar energy and over 2,200 hours of sunshine per year ensure good yields. Building-integrated solutions also allow architectural integration and simultaneous multiple uses, such as the combination of solar panels as shading elements to prevent overheating. In addition, Vienna has particularly favorable conditions for the use of groundwater and near-surface geothermal energy for heating purposes<sup>8</sup>.

## Use of storage possibilities and synergies

In view of the fluctuating availability of renewable energies, intelligent storage systems that can react flexibly to energy supply and demand will be needed in future. Energy storage systems not only enable supply generation independently of time, but also the transformation of energy forms across the sector boundaries of electricity, heating and mobility. One promising storage technology is the activation of building components for building temperature control (heating and cooling), which, by using concrete as an energy storage medium, enables the heating energy demand to be adapted to the supply of renewable energies. Furthermore, buildings themselves can also be regarded as contributors, as smart energy-flexible buildings can adapt to the energy supply and, for example, by preparing hot water in the event of a surplus of electricity from wind or sun energy. In addition, the ground is an important thermal storage medium that, in combination with heat pumps and geothermal probes, enables seasonal heating and cooling applications.

In addition, electric vehicles can be operated with renewable electricity and, as flexible storage systems, play an important role in the intelligent electricity system of the future. However, all this will only really work if holistic district solutions are considered. It is essential to use the synergies of individual buildings. A mix of new and existing buildings is definitely useful in this context. Thinking further, a sustainable energy supply requires cross-sector and inter-municipal cooperation.

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<sup>7</sup> <https://www.wien.gv.at/stadtentwicklung/strategien/step/step2025/fachkonzepte/energieraumplanung/index.html>

<sup>8</sup> Fachkonzept Energieraumplanung

The city and its environs are functionally closely linked and benefit from the mutual exchange relationship. Thus, the entire metropolitan area can be an important producer of renewable energy and benefit as a supplier through increased energy sales<sup>9</sup>.

## Use of internal potentials

Energy from wastewater can be used as a valuable contribution to the sustainable heating and cooling of buildings and districts. More than 40% of the global energy demand is used for heating and cooling, including hot water preparation. With the energy from municipal or industrial wastewater, an energy potential is available in the immediate vicinity of demand, especially in inner-city areas, which can be used with modern heat exchanger and heat pump technology to cover 10 to 15% of the heating requirements of apartments in Austria. In addition, the energetic use of wastewater can be optimally used for cooling buildings. Wastewater in municipal and commercial sewers is available 365 days a year, has a relatively constant temperature throughout the year and therefore represents a previously unused energy source. By introducing heat exchangers into the sewer (for projects up to approx. 500 kW capacity) or outside the sewer (wastewater is pumped through a shaft into a technical room where bundles of heat exchanger units are installed) for large applications, the available wastewater temperature can be increased to temperatures of approx. 40°C for the heating mode using high-performance heat pumps.

Due to the high outlet temperature in the sewer, correspondingly high COP values of 5 and above can be achieved. The same system can then be used to cool the building in summer by using the wastewater, which is cool compared to the outside temperature, for room cooling. The advantages are obvious:

- High efficiency due to the high initial temperature in the system
- High COP values of heat pumps
- Year-round use of the system possible for heating in winter and cooling in summer
- Resulting in relatively short amortization periods of 5-7 years on average (depending on the project)

Energy-from-wastewater solutions are mainly used in urban district-based planning as well as in public facilities (schools, sports facilities, hospitals, assisted living facilities, etc.), since correspondingly large sewers with sufficient energy potential are available here. The topic is also becoming more and more interesting for energy communities, as there are excellent opportunities to provide sustainable and economical solutions with renewable energy sources to the citizens, for example in connection with photovoltaic solutions as energy supplier for the operation of the heat pump.

Reference examples at home and abroad, where energy from wastewater solutions is already being successfully applied in the municipal sector, impressively demonstrate the possibilities and importance of this sustainable energy source for the environmentally friendly heating and cooling of buildings.

**[Author: Mag. Klaus Pichler, Rabmer GreenTech GmbH]**

\*COP – Coefficient of Performance

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<sup>9</sup> Fachkonzept Energieraumplanung



## Load shifting potentials in buildings and across property boundaries

An increased understanding of the connection between CO<sub>2</sub> emissions and climate change has led to an increasingly progressive energy market and a transformation process towards a less fossil fuel dependent and more sustainable energy system in recent years. However, with the progress of renewable energy production, distribution networks are becoming increasingly complex as they have to react to strongly fluctuating supplies. The increasing demands on this structure require the change from a centralized to a decentralized and interactive system in an intelligent Smart Grid. Buildings represent a relevant aspect in this context, as their role is increasingly changing from pure consumers to generators and, consequently, to storage facilities for thermal and electrical energy.

The use of buildings to generate energy by integrating renewable energy systems is thus one of the key principles of our changing energy system. Another important aspect is the storage of energy and the use of the load shifting potential of buildings to shift thermal and electrical loads beyond building boundaries for a certain period of time. For example, buildings with a high thermal mass can use their heat capacity with a combination of heat pump and building component activation to apply electrical energy for thermal purposes at peak times.

The conversion of surplus electrical energy in times of high electricity generation from renewable wind and solar energy sources into locally stored heat is one of the great potentials of buildings within the framework of an intelligent and sustainable energy system. With such systems it is possible to avoid high peak loads and thus expensive grid capacity extensions.

[Author: Dipl. Ing. Dr. Doris Österreicher MSc., University of Natural Resources and Applied Life Sciences Vienna]

## Mobility concepts

The automotive industry and transportation sector are in a state of upheaval. The current trend is towards electric mobility. The demand for electrically powered vehicles is steadily increasing and projections predict that every third car will be electric in 10 years' time<sup>10</sup>. This development is changing the function of parking spaces in real estate. They are changing from passively used areas to charging points for electric vehicles. Real estate is becoming part of an energy charging infrastructure for electromobility. The transformation of real estate requires technologies that control the related loads and thus optimally distribute the maximum power provided by the building connection. Billing solutions correctly charge the purchased energy and thus round off the solution.

However, electromobility only uses its CO<sub>2</sub>-reducing potential if the energy used comes from a sustainable source. Photovoltaic systems and suitable control systems, which charge the electric vehicles directly with solar energy, exploit this potential. This solution works on the parking areas where the vehicle is parked during the day. During the week, these are usually the parking areas near the workplace. In contrast, in the residential property segment, a PV system with a storage unit is a good option, which stores the excess solar energy during the day and charges it to the vehicle at night. On average, Austrians drive 34 kilometers per day<sup>11</sup>. The average consumption of the most frequently used electric cars is 22 kilowatt hours per 100 kilometers<sup>12</sup>. This means that around 7.5 kilowatt hours of energy are required every day to

<sup>10</sup> Bratzel, Stefan et Al. (2017): Marktentwicklung von Elektrofahrzeugen für das Jahr 2030: Deutschland, EU, USA und China, Bergisch Gladbach, Center of Automotive Management

<sup>11</sup> VCÖ (2016): VCÖ: Österreichs Autofahrer fahren im Schnitt 34 Kilometer pro Tag, online [21.11.2019]

<sup>12</sup> ADAC e.V. (2019): Aktuelle Elektroautos im Test: So hoch ist der Stromverbrauch, online [21.11.2019]

charge an electric vehicle. An expansion of a PV system with a storage tank therefore very quickly becomes a positive economic factor.

For communities and local authorities, but also for classic residential properties, a system is available which takes over the energy management in its entirety and optimally coordinates the consumption in the building and that of the charging points with the source's PV system, storage and grid, as well as solving the billing. Corresponding systems are already available on the market.

The usual individual solutions are thus covered, but new ideas can also be developed. An example of this is an energy budget per tenant, as implemented in a Swiss district (see Case studies). Each tenant will have an annual energy budget available, which replaces the usual service charge settlement. All operating resources, including mobility, can be measured continuously and displayed on an app. Thus, every user has an overview of their consumption at any time. In this way, the initiators want to promote awareness of energy and encourage its economical use.

**[Author: Dipl. Ing. Mattias Gienal, ecocoach AG]**

## Possibilities for financing energy efficiency measures

It should be noted in advance that almost all of the financing possibilities described below are based on the fact that the investor receives interest or the repayment of funds through the energy savings that the implemented measures achieve. A quite moderate financing of max. 2% seems to be quite appropriate in the current environment and also attractive for investors. In particular, the citizen participation model would also make it possible in private apartment buildings to give tenants the opportunity to save energy costs, which could lead to a reduction in housing costs in the medium term.

### PPP or civic participation models

Already on the occasion of the first boom in PV systems, it was shown that citizen participation models are a sensible method of financing the necessary measures and in return letting the citizens involved participate in the savings of electricity costs. This is also possible for all energy efficiency measures, as the housing users can be addressed as investors and in return participate in the savings of electricity and heating costs.

### Crowd funding

Crowd funding is also suitable for investments. Crowd funding in particular allows investors to raise small amounts of money and then earn interest and repayment from the corresponding savings.

### STOs or Blockchain financing

A mapping of financing via tokens in the context of security token offerings also offers the opportunity to raise funds from investors for necessary energy efficiency measures.

### Contracting

Similar to the citizen participation models, the supplier of the corresponding system/technology acts as a financier/investor and in return receives interest and repayment of funds through the savings in electricity and heating costs.

### Sustainability fund

There are already funds that specialize in investing in "green" measures.

### Energy efficiency loan

Similar to a housing loan, an energy efficiency loan could be subject to a KeSt (capital gains tax) exemption up to, for example, an interest rate of 2%. These loans would also be suitable as an investment for corporate investors within the scope of the profit exemption (§ 13 EstG) and would be very popular in this area.

### Tax relief

Financing through tax relief is possible both for property owners within the framework of higher depreciation rates and for private housing users through the temporary reintroduction of special expenses.

[Author: Karin Fuhrmann, TPA Group]



## Legal framework

### To promote the use of energy from renewable sources

The promotion of renewable energy sources is one of the main objectives of the European Union's energy policy. Directive 2018/2001 therefore sets a binding overall target for 2030 of at least 32% of the Union's gross final energy consumption to be met by energy from renewable sources.<sup>13</sup>

In addition, the provisions of Directive 2018/2001 aim at ensuring more flexible production of energy from renewable sources. The promotion of the use of electricity from renewable sources in the form of market premiums is intended to create an incentive for the market-based and market-oriented integration of electricity from renewable sources into the electricity market.<sup>14</sup> In particular, the principle of energy efficiency should be given first priority in the implementation of national rules on the authorization, certification and licensing procedures for installations producing electricity, heating or cooling from renewable sources (energy efficiency first), which should also streamline the procedure.<sup>15</sup>

The Directive also provides that consumers are entitled to be self-sufficient in renewable electricity and that renewable energy communities can be formed for the first time.<sup>16</sup> Renewable energy communities should have legal personality and serve the purpose of providing environmental, economic or social benefits to their members, but not financial gain. Natural persons, local authorities and small and medium-sized enterprises may participate in these energy communities in order to jointly produce, consume, store and sell renewable energy, among other things. In addition to such renewable energy communities, it should also be possible to join together to form citizens' energy communities, which should also have legal personality<sup>17</sup>.

The Member States have to transpose the provisions of Directive 2018/2001 into national law by June 30, 2021, at the latest and are obliged to set national contributions in the national energy and climate plans in order to jointly achieve the overall objective of the Union<sup>18</sup>.

In Austria, the Federal Government therefore adopted a climate and energy strategy (#mission2030) as early as May 28, 2018. The goal is to generate enough electricity by 2030 to cover the total national electricity consumption 100% (in the national balance sheet) by renewable energy sources. Hydropower, wind power and solar power (e.g. the "100,000 Roofs Programme" for photovoltaic systems) are the driving force behind the energy turnaround.

The National Energy and Climate Plan (NEKP), which emphasizes Austria's strong commitment to the Paris Climate Agreement's protection goals, was then adopted by the Council of Ministers in mid-December 2019 and submitted to the European Union. The NEKP provides for

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<sup>13</sup> Article 3 of Directive (EU) 2018/2001 of the European Parliament and of the Council of December 11, 2018 on the promotion of the use of energy from renewable sources (ABl. L 2018/328).

<sup>14</sup> Article 4 of Directive (EU) 2018/2001.

<sup>15</sup> Article 15 of Directive (EU) 2018/2001.

<sup>16</sup> Article 21 und 22 of Directive (EU) 2018/2001.

<sup>17</sup> Article 16 of Directive (EU) 2019/944 of the European Parliament and of the Council of June 5, 2019 concerning common rules for the internal market in electricity (ABl. L 2019/158).

<sup>18</sup> Article 3 of Directive (EU) 2018/2001.

300 measures to achieve the common energy and climate targets, which in particular provide for a 36% reduction in Austria's greenhouse gas emissions compared to 2005 levels<sup>19</sup>.

The government program of the new turquoise-green Federal Government published at the beginning of January 2020 provides for improving and solidifying the NEKP and for Austria to achieve climate neutrality by 2040 at the latest. Enactment of a new climate protection law and a mandatory climate check of existing laws and ordinances are necessary to guarantee Austria's climate neutrality<sup>20</sup>.

The currently existing statutory national framework conditions (e.g. Green Electricity Act 2012, Electricity Industry and Organization Act 2010 - "ElWOG 2010" - and Gas Industry Act 2011 - "GWG 2011") must be redesigned in view of the expansion of renewable electricity generation required by Directive 2018/2001 and the expansion aimed for by the Federal Government.

To this end, the new Federal Government, which was promised on January 7, 2020, aims to bring the Renewable Energies Expansion Act ("EAG") into force as soon as possible, and the areas of responsibility of the existing Green Electricity Act will be integrated into this.

Due to the unforeseen dissolution of the National Council in June 2019 and its new formation as a result of the elections held in October 2019, the implementation of Directive 2018/2001 and the adoption of the Renewable Development Act (EAG) has been delayed in Austria to a certain extent - in view of the principle of discontinuity between two legislative periods. Under European law, this is harmless as long as the Directive is transposed on time by June 30, 2021, at the latest.

To bridge the period until the new Austrian legal provisions come into force, only an amendment to the Green Electricity Act 2012 was adopted during the term of office of the transitional government in order to avoid a stop to the expansion of green electricity production and not to endanger the climate and energy strategy #mission2030 for the time being.

As a result, it is not possible at present to make a firm statement on the concrete future implementation of the Union provisions in Austria. This is especially true as the implementation of the measures planned in the published government program with regard to climate protection still depends in many cases on the agreement and concrete design of various topics, such as the envisaged eco-social tax reform.

**[Authors: RA Dr. Peter Vcelouch / RAA Mag. Julia Haumer-Mörzinger, CERHA HEMPEL Rechtsanwälte GmbH]**

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<sup>19</sup> [https://www.bmnt.gv.at/umwelt/klimaschutz/klimapolitik\\_national/nationaler-energie-und-klimaplan.html](https://www.bmnt.gv.at/umwelt/klimaschutz/klimapolitik_national/nationaler-energie-und-klimaplan.html)

<sup>20</sup> [https://www.dieneuevolkspartei.at/Download/Regierungsprogramm\\_2020.pdf](https://www.dieneuevolkspartei.at/Download/Regierungsprogramm_2020.pdf)

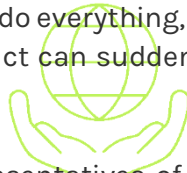
# CRITERIA FOR THE DGNB CERTIFICATE



The ÖGNI Building and Districts Certificate of the DGNB stands for sustainability in the construction and real estate industry. A further goal of this working group is the integration of the developed topics into the DGNB criteria catalogue. If many of the topics appear to be new at the moment, they will become the standard in the future.

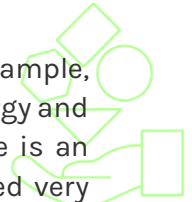
The new criteria catalogue for new buildings, version 2020 of the ÖGNI, already deals with some of the issues addressed and also evaluates them. New in this version are various BONI. For example, there is the topic of Innovation Rooms, which promotes and scores courageous and new innovations. In addition, each criterion describes the contribution to the Sustainable Development Goals and also rewards contributions to the promotion of the circular economy. Through these innovations, the DGNB system offers space for future concepts, all in the focus of decarbonization towards a CO<sub>2</sub>-neutral real estate world. As various studies and models show, an energy supply purely from renewable energy sources is possible in many places - for example, facades and roof surfaces offer enormous potential for solar energy, building component activation, geothermal energy and other forms of storage also allow unrestricted operation in case the incident sunlight is not sufficient.

As various best-practice examples (to be found at the end of the brochure) show, it is often the view into the direct surroundings that makes the best solutions possible. A single building often cannot and must not be able to do everything, but if they are combined to form an energy network, for example, an entire district can suddenly be operated in an energy- and climate-neutral manner.

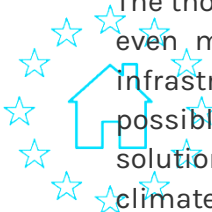


The ÖGNI, together with all the representatives of the working group, would like to make a contribution to this and formulates concrete requirements for sustainable buildings that will be necessary for a certificate in the future, be it through the use of the facade area for energy production, the use of synergies in the districts or new mobility concepts. All these specifications in the certificate contribute to the fact that these technologies will establish themselves in the future and will be part of the building standard.

The enormous advantage of certification is the transparency of all building data. For example, the life cycle calculation often quickly shows that an additional investment in solar energy and various storage options will pay off very quickly. Here the flexibility of the certificate is an enormous benefit, as future developments can be added to the system and evaluated very quickly.



The thought-provoking impulse that this working group would like to give is that in the future even more holistic cooperation between the trades and industries is required. Existing infrastructures and synergy potentials must be examined in advance and used in the best possible way. Each location, each building and also each district requires an individual solution, and no potential may remain unused in order to ensure climate-neutral or even climate-positive building operation with 100% supply security at the same time.



On the following pages you will find an exemplary list of existing and possible future certification criteria. Both the buildings and the districts criteria were examined.



New proposals were highlighted. In some cases, the desired criteria are already being considered in the district but are still missing in the building analysis.

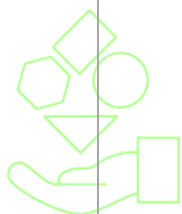
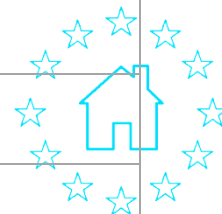
	<b>ECOLOGICAL QUALITY</b>
 ENV1.1 Buildings	<b>Life cycle assessment of the building</b> AGENDA 2030 BONUS: Climate-neutral operation (building): The CO <sub>2</sub> emissions of the building-related energy demand are covered at least climate-neutrally according to the DGNB definition for the determination of climate neutrality. AGENDA 2030 BONUS: Climate-neutral operation (users): The CO <sub>2</sub> emissions of the energy consumption-related activities of the users in the building are covered at least climate-neutrally in accordance with the DGNB definition for the determination of climate neutrality <sup>21</sup> . The life cycle assessment comprehensively evaluates the measures described in the criteria ENV2.2, ENV2.3, TEC1.4, TEC2.1, TEC3.1 and TEC2.4 and makes the optimizations visible by means of benchmark comparison. This should be used in variant studies at an early planning stage, which in turn is rewarded in the process quality.
ENV2.2 Buildings	<b>Drinking water &amp; wastewater</b> Integration into the infrastructure of the districts: The type of rainwater and wastewater disposal is geared to the existing infrastructure in the surrounding districts and makes use of all given possibilities for separation, reduction, etc. <b>NEW:</b> By means of heat exchangers (e.g. in the sewer), it is possible to extract energy/heating/cooling from wastewater. This can then be used to heat and cool a building. For this it is necessary to examine the existing infrastructure and identify possible synergies between buildings.
ENV2.3 Buildings	<b>Land consumption</b> <b>NEW:</b> Use of building space (facades) for energy production instead of "greenfield sites".
	<b>ECONOMIC QUALITY</b>
ECO1.1 Buildings	<b>Building-related life cycle costs</b> <b>NEW:</b> Local electricity production at the building/in the districts (PV, geothermal energy, wind, etc.) will increase massively. Feed-back into the grid, energetic load shifting beyond the property boundaries must be taken into account in future energy costs. See criteria TEC2.1 Districts. In line with the life cycle assessment, life cycle costs are made visible and can be compared using benchmarks.
ECO2.2 Buildings	<b>Marketability</b> <b>NEW:</b> Conducting a preliminary environment analysis in order to identify and exploit synergies in the districts that will enhance the quality of the building.


<sup>21</sup>DGNB Auszeichnung „Klimapositiv“ Rahmenwerk für klimaneutrale Gebäude und Standorte





	<b>SOCIO-CULTURAL &amp; FUNCTIONAL QUALITY</b>
SOC1.5 Buildings	<p><b>User influence</b></p> <p>Implemented measures for the possible influence of the user that cannot be assigned to the categories mentioned in the criterion (ventilation, sun protection/anti-glare protection, temperatures, control of artificial lighting) or are not listed as exemplary measures, but which demonstrably increase the comfort or well-being of the users, can be recognized as alternatives.</p> <p><b>NEW:</b> e.g. control of energy management</p>
	<b>TECHNICAL QUALITY</b>
TEC1.4 Buildings	<p><b>Use and integration of building services engineering</b></p> <p>Districts solution for regenerative energy: In the building, energy is constantly used to cover the building-related or user-related energy demand. This energy is generated in the surrounding districts or in the direct vicinity from regenerative energy sources (at least 10% of the building-related final energy demand). Alternatively, energy generated in the building or on the property from renewable energy sources is transferred to the districts/immediate surroundings (at least 10% more than the building-related final energy requirement).</p> <p>Grid-services energy system: The building provides storage capacities to a not insignificant extent (approx. 10% more than the building's final energy requirement) in the sense of grid services or uses integrated energy and load management.</p> <p>New concepts, use of energy storage, 100% from renewable energy sources, districts solutions for renewable energy. Surplus energy from the districts/the direct surroundings is used or released to the districts/the direct surroundings.</p> <p>If systems for heating and cooling distribution and transfer are not used and if systems are used that are fed 100% from regenerative energy sources, the corresponding indicators are considered to be fulfilled.</p> <p><b>NEW:</b> Should be implemented as in TEC2.1 Districts: Energy generation on roof surfaces: Percentage of roof surfaces used for regenerative energy generation.</p> <p><b>NEW:</b> Should be implemented as in TEC2.1 Districts: Energy efficiency: Qualitative evaluation of heat/cold.</p>
TEC2.1 Districts	<p><b>Energy Infrastructure</b></p> <p>Energy demand: An energy concept is available (or commissioned) in which the reduction of the energy demand of the districts as well as the regenerative energy production in the districts/location and surroundings is evaluated including an energy demand analysis (heating, cooling, electricity).</p> <p>Energy potential: In the energy concept, the existing energy potential (waste heat, renewable energies) and possible networking with existing energy infrastructure in the district (also with regard to waste heat) are analyzed.</p> <p>Use of synergies: Integral energy cycle – Integral energy cycles for electricity, heating and cooling are created to a significant extent through the joint planning of buildings and facilities.</p> <p>Energy generation on roof surfaces: Percentage of roof surfaces used for renewable energy generation.</p> <p>Energy efficiency: Qualitative evaluation of heating/cooling.</p>



TEC3.1 Buildings	<p><b>Mobility infrastructure</b></p> <p>Vehicle to Grid: Pre-equipment is available for bidirectional loading and unloading of electric vehicles (V2G - Vehicle to Grid).</p> <p><b>NEW:</b> Should be implemented as in criteria TEC3.1 for districts: Promotion of alternative drive technologies, self-supply of charging infrastructure.</p>
TEC3.1 Districts	<p><b>Mobility infrastructure - Motorized traffic</b></p> <p>Promotion of alternative drive technologies: There are sufficient charging/fueling stations for alternative drive technologies (electric, hydrogen, natural gas, etc.) available in the neighborhood/at the location or in the direct vicinity.</p> <p>Self-sufficiency of the charging infrastructure: The outdoor charging stations assigned to a building (private parking spaces) at the site/in the neighborhood are fed by electricity generated at the site.</p> <p>Vehicle sharing offers: There is a sharing offer for motorized vehicles (commercial/private sharing, company vehicles, etc.) in the neighborhood/at the site or in the direct vicinity (max. 5 minutes on foot).</p>
TEC2.4 Districts	<p><b>Smart infrastructure</b></p> <p>Continuous availability of data: Planning and utilization phase - billing data and real-time data from sensors/smart meters (e.g. energy demand, air quality, ...)</p> <p>District-related online platform(s): There is one or more online platform(s) via which the inhabitants/users of a district can connect with each other (e.g. communication, solar register, eParticipation, day-care center, neighborhood navigator, car sharing, etc.).</p>
	<p><b>PROCESS QUALITY</b></p>
PRO1.1 Buildings	<p><b>Quality of project preparation</b></p> <p><b>NEW:</b> Implementation of site analyses/district surveys in order to be able to use possible energy synergies. Comprehensive mobility concepts, energy networks, storage possibilities, use of waste heat, etc. To be proven by the corresponding concept. Should be implemented as in criteria TEC2.1 for districts: Use of synergies.</p>



# CASE STUDIES



## BauConsult Energy – SMART BLOCK GEBLERGASSE

The aim of the redevelopment of the districts in Geblergasse 1170 Vienna is to implement energy supply as sustainably as possible. The project "Smart Block Geblergasse", which is currently being implemented by the building owners and BauConsult Energy as a provider of decentralized energy supply solutions, was developed from these objectives.

In the SMART BLOCK GEBLERGASSE project, the long-term aim is to supply as many properties as possible in the existing block between Ottakringerstraße and Geblergasse with mainly sustainable energy through a joint energy network. This energy network connects the properties to be supplied on the individual properties, but also integrates additional heat sources and heat sinks such as geothermal probe fields located on the individual properties into the higher-level supply. In the overall system, these probe fields also work as seasonal storage tanks, i.e. they allow summer waste heat to be stored for the winter, which is then available in heating mode as a warmer flow for the heat pumps.

The first building is currently in operation. Another one is in the process of completion. The long-term goal is to expand the energy supply network in modular form and to connect the entire block of houses. The following system components will be integrated in the final expansion:

geothermal probes, PVT systems (system power – primarily own consumption – heat for regeneration of the geothermal probes), heat pumps in the individual objects, coolers (redundancy – failure safety – regeneration of the geothermal probes), gas boilers (redundancy – fail-safe).

### Success factors

The most important success factors in a small-scale project with existing buildings such as SMART BLOCK GEBLERGASSE are the cooperation and close coordination with the individual property owners. They have to support and share the idea of a sustainable energy supply that extends beyond their property boundaries. In addition to specifications for planning and construction technology, BauConsult Energy also quickly coordinated the service-institute concept and laid the foundation for the comprehensive contract.

Since this is a new form of energy supply in a very small-scale ownership structure, communication with stakeholders is essential to eliminate any possible prejudices and leave no questions unanswered.

### Added value

A significant reduction in the primary energy used can be achieved by lifting the regenerative energy at the site and the seasonal storage of waste heat and cooling.

This also results in considerable savings in CO<sub>2</sub> emissions, as gas heating systems are usually replaced by a central, sustainable energy supply.

Since the summer solar radiation is also used for regeneration of the geothermal probes, this also has a positive effect on the temperatures of the roof surfaces.

## Costs – business model

Close cooperation with stakeholders is also essential when considering costs.

Measured by the investment costs in construction, especially in small-scale properties, a renewable energy supply is more expensive in the first step than a conventional one. In the face of rising primary energy costs and the longevity of the plant components (energy grid, geothermal probes, ...), however, it is essential to make a comparison over the entire life cycle and also consider the later advantages for the customer in the form of more stable supply prices (which in turn facilitate the resale/re-letting of the property/individual apartments accordingly).

In the business model of BauConsult Energy, the costs for the client (construction cost subsidy) correspond to the amount of costs of a conventional supply system. Any investment costs exceeding this amount are borne by Energie Krieau and refinanced in the long-term operation of the system.

For the energy customer (tenant, apartment buyer) the energy costs are insignificantly lower than those of a conventional energy supply system.

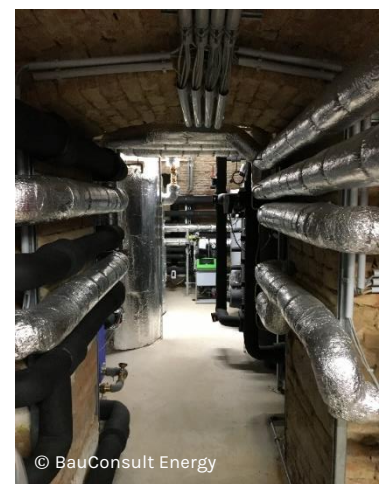
In contrast to conventional energy supply systems, the present business model opens up possibilities for a continuous improvement of the entire system. We expect that in the coming years corresponding technical developments will make the share of energy supply with renewable energy from currently approx. 70% to 80%-90% in the medium term economically viable and thus achievable.

[Authors: Mag. Franz Vogl & David Bauernfeind MSc, BauConsult Energy GmbH]



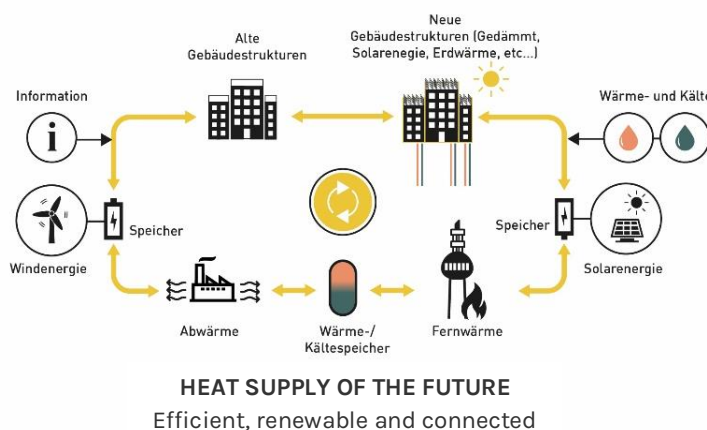
Further information:

[www.bauconsult.com](http://www.bauconsult.com)





In order to achieve the decarbonization target (to make Austria climate-neutral by 2040), energy space plans or climate protection areas are defined in the individual districts of Vienna. Eight out of 10 new buildings in Vienna will be located in a climate protection area by the end of 2020. Climate protection areas in which energy space plans are prescribed identify areas where it is possible to connect new buildings to district heating or to use another highly efficient alternative energy system. In these areas, no fossil energy may be used for space heating and hot water production.



In larger, contiguous new-build areas, the opportunities for implementing climate-friendly energy supply concepts are particularly favorable, as the entire infrastructure is newly built and the buildings can be suitably equipped and prepared for the future. Sustainable buildings with climate-friendly energy supply systems have the following convincing features:

They

- can absorb or store energy surpluses and peak loads.
- can be used for the energy network (electricity or district heating) and operated economically.
- use market or weather forecasts lasting several days for control purposes.
- take into account summer suitability/climate change adaptation (shading, greening, etc.).
- can use or store simultaneously occurring heat and cold in the area.
- are designed with realistic values for heating and cooling loads.
- reduce the losses of hot water distribution.
- use CO<sub>2</sub>-free on-site resources and heat loss.

[Authors: DI Stefan Sattler & DI Caroline Stainer, City of Vienna - Energy Space Planning]

Further information:

<https://www.wien.gv.at/stadtentwicklung/energie/pdf/fachkonzept-energieraumplanung.pdf>



## SMATRICS – Electric mobility at the ERSTE CAMPUS in Vienna



At Erste Campus, the headquarters of Erste Bank Group, charging infrastructure in the car parks was considered from the outset and implemented with SMATRICS as a 360-degree service provider.

The campus was realized according to economic as well as ecological and social sustainability aspects. It was therefore obvious that electric mobility and the corresponding charging infrastructure should not be missing in this concept. For the construction of the 36 charging stations on the Erste Campus, Erste Group therefore relied on the know-how of SMATRICS, the leading provider of charging solutions in Austria.

The Erste Group headquarters on the premises of the former Südbahnhof railway station is the workplace of around 5,500 employees. The approximately 600 parking spaces on site, which are used by both employees and customers, were equipped with 36 charging stations. At these stations, employees can charge their private and company cars, and the service is also available to all customers and SMATRICS customers in general.

The stations are products of SMATRICS PARTNER SERVICE, which means that access is either by means of a charging card or via the SMATRICS App. Billing is based on the conventional SMATRICS tariffs, each charging process is rewarded with a fixed amount to Erste Group. The charging stations are thus part of the largest charging network in Austria, and SMATRICS provides all customer administration and billing services.

The installation also included further development, a so-called white label solution, which enables own tariffs as well as access via Erste Group's own webapp. Comprehensive background operations remain the responsibility of SMATRICS, including station operation, hotline, cost center allocation for company cars and billing for all customers on behalf of Erste Group.

"Even during the planning of the Erste Campus, it was clear to us that sustainability is very important and therefore e-mobility will play a role. We want to be a modern partner for our customers. We want to offer our employees a future-oriented and sustainable workplace. Therefore, we decided to integrate SMATRICS charging stations at Erste Campus," explained Markus Posch, Head of Group Human Resources at Erste Group, on the occasion of the commissioning of the stations in January 2019.

The Erste Campus was audited by the Austrian Society for Sustainable Real Estate Management (ÖGNI) as part of the building certification process according to the DGNB system and was awarded the highest level, the platinum certificate.

[Author: Dipl. BW Birgit Wildburger, SMATRICS GmbH & Co KG]

### Further information:

<https://smatrics.com/news/ladestationen-erste-campus>



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## Ready for the challenges on the way to energy system transformation

The act4.energy innovation laboratory is an innovation initiative in southern Burgenland that establishes and operates experimental environments, thus creating a framework for innovation. It enables and supports research and innovation projects in the development and testing of new products, solutions and services to improve the use of renewable energies. The main focus is on the optimization of PV electricity for own consumption, the sector coupling of electricity, heat and transport as well as the promotion of e-mobility.

The aim of the innovation laboratory act4.energy is to provide and demonstrate practical solutions to the problem of the strongly fluctuating availability of renewable energies in a region. The solutions sought are primarily intended to create the necessary energy stability based on renewable energies. It is our claim to realize innovations and solutions in the Innovation Laboratory Region, that is 10 communities from Oberwart to Stegersbach in southern Burgenland, in an exemplary manner, which can then be adapted and duplicated throughout Austria and Europe.

The innovation lab's vision is a decentralized, 100% renewable energy system, which includes sector electricity, heating/cooling, mobility and industrial processes.

### **On the way to energy system transformation**

Dispensing with fossil fuels and switching to renewable primary energy sources poses a number of challenges. For example, coal-fired power plants cannot simply be replaced 1:1 with wind farms, as the wind does not necessarily blow strongly when the electricity grid has a peak demand. It is also not enough just to cover our current electricity consumption from renewable sources (this would only convert around 20% of our total energy consumption to renewables), but we must move away from burning fossil fuels in all sectors (heating/cooling, passenger and freight transport, agriculture, industrial processes, ...).

The good news is that we have more than enough renewable energy sources available. The sun and wind alone provide many times the world's energy requirements – even if they are only used in the most favorable locations.

### **What is the concrete approach to a new energy system?**

The restructuring of our energy system has to be considered in an overall context: electricity, heating, cooling, mobility, industrial processes – in future, all of these are to be supplied from climate-neutral, environmentally friendly, renewable energy sources, and supplied via distribution networks that are as decentralized as possible and largely immune to central sources of error, and marketed via predominantly digital business models.

However, there are still some barriers to be overcome on the way to this transformation. As a central guideline for projects and activities in the innovation laboratory, they have summarized these challenges on the way to the energy future in the "6 act4.energy Challenges".

Further information:  
<https://www.act4.energy/>





## The "6 act4.energy Challenges" of the energy system of the future

The 6 act4.energy – Challenges are the main challenges that are being addressed in our innovation laboratory on the way to a regional energy system based on renewable energy sources. These challenges are:

- **Volatility**, i.e. the fluctuations in the availability of renewable energy sources
- **Decentralization** of supply and consumption
- **Holistic across sectors**, industries and countries
- **User-friendliness for consumers**, producers and service providers
- **Economic efficiency for consumers**, producers and companies
- **Reliability** in supply and operation

## The innovation lab act4.energy

The innovation and research projects carried out in the act4.energy innovation laboratory contribute knowledge and partial solutions to these 6 challenges. Together, they form the pieces of the mosaic from which, step by step, the picture for a climate-neutral, ecologically sustainable, user-friendly and affordable energy revolution emerges.

However, research and innovation are only part of the way. The energy system transformation also requires that we all rethink our behavior in the consumption of energy and make use of the opportunities that are available to everyone to contribute to climate protection. The Innovation Laboratory offers everyone the opportunity to participate in various innovation projects and in this way, piece by piece, contribute to a sustainable, ecologically responsible energy system.

[Author: Dipl. DI Michael Niederkofler, act4.energy]



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## ECOCOACH – On the way to self-sufficient accommodation in Switzerland



A holistic sustainable energy concept with added value through energy efficiency in use and the provision of sustainable mobility energy fulfils a comprehensive package of requirements. The example of the Mättivor districts in Switzerland illustrates requirements and appropriate solutions.

The building constructor had clear requirements for the districts in terms of sustainability, but also comfort for the total of 100 residential units. The districts should be maximally regionally self-sufficient with energy from sustainable sources. The connection to the CO<sub>2</sub>-neutral district heating network and the integration of a photovoltaic system to cover the majority of the electrical energy consumption of 240,000 kWh per year were predefined requirements. Also expected were emergency power capability and charging points for 40% of the parking spaces. Active real-time energy management as well as digital measurement and billing of all electricity, water and heat consumption were expected. Parallel monitoring at the level of each residential unit rounded off the package of requirements in the energy system. The package of requirements was supplemented by user comfort specifications, which define the future standard from the client's perspective.

The classic smart home applications such as scenes, switched lights and sockets, controlled blinds and shading as well as individual heat control for each room were basic specifications. Individual smart home design per residential unit, remote maintenance and remote adaptation of the smart building elements were also part of the challenge profile. In the remote adaptation application, this means that if, for example, an existing switch is to operate other lamps, the installer can make this change online and thus externally. The installation process should also be optimized, faster and easier. A later potential integration of new technological solutions in the smart home system should also be guaranteed.

Finally, building automation and the energy system should be networked as a system via a controller so that users can monitor and control both energy and building technology with one app. The administration should have all data for analysis and billing available on a uniform platform.

### **A holistic system approach with cloud platform as the solution**

The solution finding resulted in a holistic solution that meets the requirements in a comprehensive sense.

A photovoltaic system with an output of 122 kWp and an electricity production of 119,000 kWh/year, coupled with a storage solution with 260 kWh, provides 40% self-sufficiency. For the second construction phase, the PV system will be extended to the façade, which will enable an increase in electrical self-sufficiency of up to 80%. At the same time, the storage facility will function as an emergency power solution for the entire districts.



20 (40 in the final stage of completion) electric charging stations are available, controlled jointly with all consumers by a holistic energy management system with optimization of consumption.

The district is connected to the regionally self-sufficient district heating network with suitable digital measuring points per accommodation unit. The temperatures are controlled room-specifically by building automation and Smart Home App. The residential units include a Smart Home solution for lighting, blinds, shading, access and charging station activation. The installed industry standard controller controls both the building automation with Smart Home and the energy flows. It orchestrates the measured variables and control commands, which are then processed on a cloud platform.

The cloud solution allows to reduce the programming effort and the individual app creation for the smart home solution by more than 80%, because the installer can perform these steps independently with a graphical environment. In addition, remote control, remote adaptation or remote maintenance are possible for all users individually activated by the homeowner.

The individual future installation of new technology is guaranteed by the industry standard used and a proprietary standardization solution. The backwards compatibility of the control units used guarantees investment security.

The administration can settle the entire service charge settlement through the installed, calibrated and digital meters. With direct import into the real estate software, this can be done at the click of a mouse, completely without meter reading on site or separate software solution (from spring 2020).

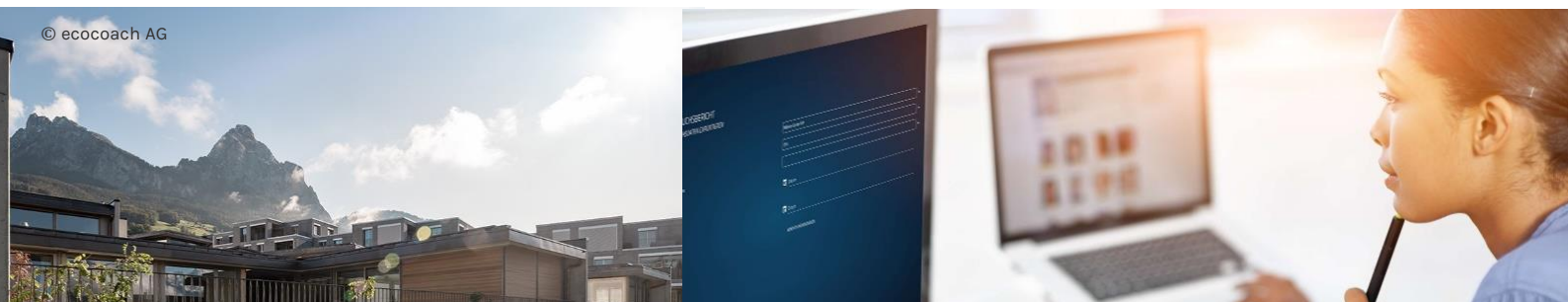
The end-to-end encryption of the cloud platform and hardware firewalls guarantees high data security.

A holistic solution ensures seamless interfaces and optimal integration, resulting in energy, cost and time efficiency, coupled with added value through convenience and charging solutions for e-mobility. The CO<sub>2</sub>-neutral “Quartier Mättivor” shows how this is already possible today.

**[Author: Dipl. Ing. Mattias Gienal, ecocoach AG]**

Further information:

<https://ecocoach.com/pdf/Mattivor.pdf>



## NEOOM – Intuitive energy management for sustainable housing estates



The combination of PV, electricity storage and intuitive energy management not only results in long-term cost savings (e.g. heating costs), but also in new ways of generating added value with a property. Near Vienna, 20 new apartments were built by Wien Süd, which should also appeal to young people due to affordable prices. In addition to a modern design, smart floor plans and many open spaces, the apartments are characterized above all by intuitive energy management. For example, electricity for heating is generated by photovoltaics on the roof and temporarily stored in an electricity storage unit for times when the incident sunlight is not sufficient. In this way, heating costs are always kept as low as possible. At the same time, this reduces the CO<sub>2</sub> footprint of the entire system. The flexible home storage tank neoom KJUUBE is used in this project, which can be ideally adapted to the different sizes of residential complexes, in this case with a total capacity of 35.6 kWh.

### All systems at a glance

With an average construction and renovation output of up to 1,500 residential units per year, Wien Süd is one of the leading non-profit property developers. In order to meet its own incentives for innovation and sustainability, Wien Süd installs photovoltaic and electricity storage systems in many new buildings and networks all locations and devices with the intuitive NTUITY energy management system. NTUITY makes it possible for the first time to centrally monitor and control several systems via one interface. Due to this platform, the operator always has an overview of all consumers and electricity producers at all locations. Technicians no longer have to be on site for every technical malfunction but can conveniently view what is going on via the interface and react correctly and quickly if necessary. Heating costs can also be recorded centrally, clearly and accurately by the software across all residential complexes. The software also ensures that, if possible, all energy generated on the roof is also consumed in the building.

The electricity from the PV system is only used for general electricity and to operate the heat pumps. The electricity storage unit stores energy especially when more PV electricity is produced than can be converted into heat, thus supplementing the thermal storage units. The combination of PV, storage and intelligent software increases the share of own electricity and at the same time reduces the ecological footprint. Since energy operators are interested in being able to store excess electricity in a sensible way, it could be common practice in the future for storage facilities to be charged overnight by the electricity provider at very low cost or even free of charge. This is one of many value-added opportunities offered by electricity storage.



The total investment will pay for itself in less than 11 years if existing subsidies are used.

[Author: neoom group gmbh]

#### Further information:

[neoom.com/kjuube](https://neoom.com/kjuube)  
[ntuity.io](https://ntuity.io)



## CONCLUSION

To summarize all of this information, one conclusion is evident - there has to be a rethinking, there has to be sector coupling (energy/heating/cooling/mobility) and all planning concepts have to be in terms of urban districts, communities or entire cities. The goal of being climate-neutral by 2050 is ambitious, but it is possible through cross-sectoral cooperation. A massive upgrade of alternative energy sources, such as photovoltaics, wind energy and geothermal energy, is required. Most of this energy supply will be decentralized and requires the appropriate storage facilities in order to be able to provide energy as well as heating and cooling all year round. Here it is up to governments to simplify this expansion, be it by removing bureaucratic hurdles or by granting tax exemptions for ecological investments. The legal basis for this is already in place.

Energy suppliers must manage the transition to 100% sustainable energy and adopt new business models. People who used to be mere consumers of energy are now also becoming producers and actively participating in the energy market. With their concepts, the new market participants can relieve the grid and shift the surplus loads even beyond property boundaries. Through the sensible networking of buildings, entire districts can become energy self-sufficient. With a combination of solar thermal and photovoltaic systems, heat storage and heat pumps, it is also possible to operate the buildings self-sufficient in terms of heat. Progressive digitalization makes it possible to measure and evaluate the relevant data and to react to possible fluctuations in order to ensure complete security of supply. Lighthouse projects show that these solutions are not dreams of the future but are already working.

On a larger scale, these concepts must also be applied to so-called energy communities or entire smart cities. Intensive cooperation between the real estate and energy industries is essential for success. Planners, developers, operators, investors as well as energy suppliers and network operators are responsible for the future end result. By means of integral, cross-sectoral planning, flexible, sustainable projects succeed. This requires thinking in long time frames - how will technologies change, what kind of mobility will there be? All these issues must be considered in advance when planning a property. It is important to always keep in mind - we plan real estate today for tomorrow!

The DGNB certificate of the ÖGNI is a flexible, constantly evolving system and provides the framework for innovations and makes them assessable. Whether it is energy supply, the use of synergies in the district, land consumption or the use of storage technologies - everything is covered and transparently presented in the ÖGNI certificate. By looking at the life cycle of a property, it quickly becomes clear that investments in renewable energies pay off and that sustainability is also economical. In this sense, the aim of the working group was to inform about the core issues, relevant stakeholders and implementation examples of the energy turnaround. The practical examples highlight various possibilities for achieving the goal of climate neutrality and show that the technology and engineering for this already exists. Now it is up to all of us to rethink and begin the energy system transformation towards a climate-neutral world.

*The purest form of madness is to leave everything as it is and hope that something will change.*  
Albert Einstein



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### Gender disclaimer:

Exclusively for the purpose of better readability, gender-specific spelling is not used. All personal designations in this brochure are therefore to be understood as gender neutral.



## ÖGNI – Austrian Sustainable Building Council

The ÖGNI - Austrian Sustainable Building Council - is an NGO (non-governmental organization) for the establishment of sustainability in the construction and real estate industry. The aim of the ÖGNI is to demonstrate the added value of building certification in order to create environmentally friendly and resource-saving buildings with high economic and social efficiency, which can be used flexibly over generations and have a positive effect on the health, well-being and performance of the users.

The ÖGNI was founded in 2009 and is a cooperation partner of the DGNB (German Sustainable Building Council), whose certification system was adopted, adapted to Austria and has been continuously developed since then. The ÖGNI is the only Austrian council that is an "established member" of the World GBC (World Green Building Councils) and strives to strengthen the European quality certificate at the international level.

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