



# Green Building

Technology  
Report

Vienna,  
July 2020

## Dear Readers,

Vienna is one of the most successful metropolises in the field of sustainable innovations. In all, around 9,200 companies in Vienna are active in the field of urban and environmental technologies. Over 90,000 people generate an annual turnover of approx. 40 billion euros, i.e. 16 percent of the total turnover of Viennese companies.

According to various studies, Vienna scores particularly highly on innovative strength, comprehensive support for startups and a strong focus on sustainability. Vienna also holds top positions in several "Smart City" rankings. The key objective of Smart City Vienna is to provide optimal life quality, while at the same time ensuring the greatest possible conservation of resources by 2050. The Smart City Wien Framework Strategy<sup>1</sup> is implementing this objective through many innovative individual projects. As a location, Vienna also wins approval with its research and technology-friendly climate, its geographical and cultural proximity to the eastern growth markets, the high quality of its infrastructure and educational system and, last but not least, the highest quality of life worldwide.

In order to make optimal use of the potential at this location, the Vienna Business Agency acts as an information and cooperation platform for Viennese technology developers. It connects companies with development partners and key customers from business, science and city administration and supports Viennese companies with targeted subsidies and a wide range of consulting and support services.

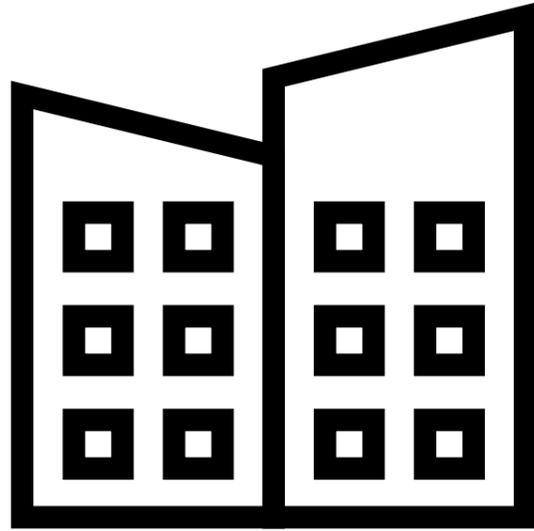
Target groups are companies from the fields of energy and environment, mobility and construction, as well as social innovations and assistive technologies.

This Technology Report provides an overview of a wide variety of trends and developments in the field of "green building", as well as a selection of companies that are active in this field in Vienna.

Your Vienna Business Agency team

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The construction business is one of the most resource-intensive sectors, and buildings account for approx. one third of global greenhouse gas emissions. Buildings are thus key to the transformation laid down in the Paris Agreement climate goals and the Sustainable Development Goals (SDG) of the UN Agenda 2030.

The term “green building” has been used worldwide to describe the concept of a building that, in its planning, construction or operation, reduces or eliminates negative effects on our climate and natural environment and may even have positive effects. Green buildings preserve valuable natural resources and improve our quality of life. Certification systems such as BREAM, LEED, DGNB or the Austrian providers ÖGNI, ASBC and klimaaktiv each define a “green building” in their own way.

Buildings and public spaces essentially define a city. In the case of Vienna, five historical periods can be identified that have shaped the city. Renaissance, Baroque, Rococo and Classicism-Biedermeier were followed by the Gründerzeit from 1848 to 1918, which even today, with its perimeter block development, determines the cityscape of several districts. Typical for the period after the First World War is the large, municipal housing estate with social facilities; 65,000 new apartments were built within only a decade. After 1945, it was necessary to build living space again quickly, and the buildings from this reconstruction period nowadays require extensive renovation, not least due to their inadequate thermal insulation. From around 1976 onwards, the quality requirements for buildings gradually became more stringent. In addition to building regulations, architectural competitions and funding criteria became increasingly important.

Today, about 90 percent of the approximately 170,000 buildings in Vienna are used for residential purposes.<sup>2</sup> In view of the predicted population growth, at least 75,000 additional

apartments will have to be built by 2030. Hardly any other major city in Europe is currently building more apartments per capita than Vienna. In 2018, 13,039 new apartments were completed in Vienna, 4,282 of which were built by non-profit building associations.<sup>3</sup>

This technology report offers an overview of how the major challenges of residential construction are being solved in Vienna and shows the special general conditions that apply to “green buildings” in Vienna. For decades, a great deal of effort has been put into the development of ground-breaking planning and control tools. Vienna wants to put itself on the global map and to show that excellent solutions such as the Smart City Vienna are being generated here for the people.

The aim is to achieve extensive decarbonisation, while ensuring affordable housing, a social mix, good architecture and ecological quality. This requires new buildings to be constructed in conformity with the nearly zero energy standard, existing buildings to be extensively renovated and the heat and energy supply of buildings to be gradually converted to non-fossil energy sources. In addition, the building concepts are to be adapted to enable a circular economy.

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<https://www.wien.gv.at/stadtentwicklung/studien/pdf/b008551.pdf>, page 73

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Statistics Austria

high standards and quality, as can be seen from the funding granted and the number of housing units built. Two out of three Viennese live in subsidised housing, and one in four in municipal housing.<sup>4</sup>

Whereas, in the old Gründerzeit apartment buildings, up to 85 percent of the building plots had been built up, resulting in dark apartments grouped around narrow atriums, the development density in the newer community building projects was 50 percent at most.<sup>5</sup> High-quality green and open spaces were also considered more and more important in dense multi-storey buildings. Due to the increased construction costs and land prices for residential construction, the high housing demand resulting from the population growth in Vienna, and the current objective to densify residential construction on inner-city and infrastructurally developed areas, green and open spaces are coming under increasing pressure today. Cooperative planning procedures are currently underway in various project areas. These new procedures offer a good opportunity to involve the various players (administration, planners, experts, citizens, developers, etc.) on a relatively equal basis at an early stage in the development of new urban districts.<sup>6</sup>

Today, the majority of us already live in urban areas, and by 2050 a further 2.5 billion people will move into cities. According to a recent study by the United Nations, the proportion of city dwellers will grow to around 70 percent.

In cities, buildings and outdoor space merge and form completely artificial living spaces. Urban density is both an opportunity and a challenge. Densely populated cities offer better conditions for both sustainable mobility and an efficient energy supply, and favourable conditions for productivity and innovation. The big challenge is to create the conditions for a high quality of life as well.

## 2.1 Everything buildings do

Apart from their primary purpose of creating protected, safe space for living or other purposes, buildings in an urban environment should fulfil a variety of other tasks, such as: helping to determine the identity of a district and facilitating interpersonal encounters by creating public and semi-public spaces. However, the built environment is also a new habitat for plants and animals and contact with nature is always a determining factor in the quality of life. Due to the increasing overheating of cities, the possibilities of using plants to improve the microclimate are in ever greater demand.

Publicly funded housing construction provides affordable housing and also fulfils an important function in the social and economic stabilisation of society. For almost one hundred years, Viennese social housing has been regarded as an exemplary model for social and health standards in housing provision in European cities. It is characterised by particularly

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[www.wien1x1.at/site/wirtschaftsstandort-wien-2018](http://www.wien1x1.at/site/wirtschaftsstandort-wien-2018)

5

[www.demokratiezentrum.org/fileadmin/media/pdf/matis\\_wohnbau.pdf](http://www.demokratiezentrum.org/fileadmin/media/pdf/matis_wohnbau.pdf)

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Cf. [www.wohnbauforschung.at/index.php?id=435](http://www.wohnbauforschung.at/index.php?id=435)

## 2.2 The energy revolution poses new challenges

The energy revolution has added new challenges: buildings are not only supposed to show an energy demand of “nearly zero”. According to this European agreement, the nearly zero energy standard has become a minimum requirement for new buildings. Based on a special interpretation of the European standard for “nearly zero energy buildings”, significantly lower heating demand limits apply to large buildings than to single-family houses in Austria. Thus, almost passive-house standards apply to thermal insulation for large new buildings.

In the case of the remaining energy demand, the relations shift. The preparation of hot water and, increasingly, also the energy for cooling are gaining importance. According to the Building Directive, this energy demand is to be covered locally by renewable energies. The use of solar energy as well as environmental heat in various forms is suitable for this purpose. Increasingly, the surfaces of buildings are being used to produce energy. Regarding the design and use of roof surfaces, the current challenge is to reconcile different requirements with one another: greening and rainwater retention, leisure and social contact, energy production and space for technical installations.

Heat pumps are being used for the increased use of environmental heat and waste heat, which means that the electricity demand of the building sector is markedly increasing. The expansion of electricity generation from renewable sources is underway and is set to significantly intensify. However, this type of electricity production depends on the weather. Thus, the building sector will have to face the next challenge. Therefore, flexible customers who don't necessarily need a lot of electricity at the precise time when everyone else switches on their system will be in demand. This will be possible if, above all, the storage effect is actively used and the loads can thus be shifted by a few hours. This grid serviceability is part of reorienting the buildings towards intelligent energy consumers and producers in power grids that are developing into smart grids.

These new possibilities of integration into networks also exist for heating networks, and there are currently great expectations regarding neighbourhood synergies throughout Europe. The primary aim of renewable energy communities is to enable household customers to actively participate in the transformation of the energy system. Prosumers produce, consume and sell renewable energy at a preferential local tariff. The legal provisions for this are defined in Article 22 of the Renewable Energy Directive. In addition to electricity, members of a renewable energy community should also be able to produce and share heating and cooling. In one of the first Energy Communities in Europe, Viertel Zwei, Wien Energie is testing an innovative project that shows how self-produced surplus energy can be bought, sold or stored locally. Using new technologies such as block chain, this can be done fully automatically via platforms.

## 2.3 Interaction in an urban network

This positive interaction also affects residential buildings and businesses. Gone are the days when separating the functions of living and working was a major goal. Today, most companies work without affecting their surroundings in a particularly detrimental way, and synergies can be used to ensure that. These can be short working distances, and using company waste heat for heating and hot water is becoming an increasingly attractive option. As there are much lower heating temperatures and new concepts such as energy networks with heat pumps in place nowadays, there are also markedly more favourable overall conditions for this kind of utilisation than before.

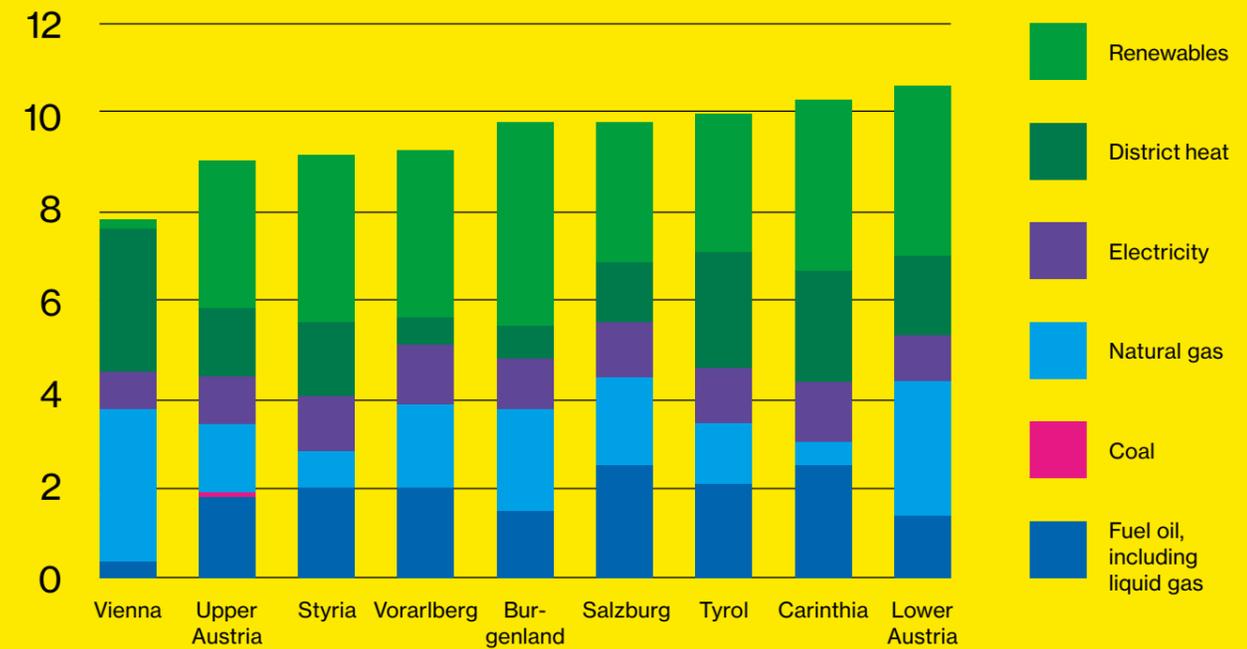
Buildings in an urban network also play a new role in traffic. Garage parking space is still a determining factor in building planning, but developments in the world's metropolises show that mobility in cities is undergoing fundamental change. With e-mobility, buildings are also taking on the function of filling stations, and possibly also of swarm storage facilities. Namely when the e-mobiles are charged and possibly also discharged via an intelligent charging management system.

These framework conditions of the large city show their effects through performance indicators.

- In a nation-wide comparison, Vienna emits the fewest greenhouse gases in Austria – both in a comparison of emissions per capita and per euro of economic output.
- Vienna has the fewest cars per capita – and their numbers continue to decline, in contrast to all other provinces and almost all provincial capitals.
- Vienna's buildings have the lowest per capita energy consumption and also the lowest CO<sub>2</sub> emissions per capita.
- Vienna boasts the lowest land consumption per capita.

## Vienna's buildings have the lowest per capita energy consumption

Energy consumption in 1,000 kWh per capita, year 2016



Final energy consumption for heating and hot water in buildings, per capita, 2016  
Source: cf. [www.urbaninnovation.at/tools/uploads/full/40383.jpg](http://www.urbaninnovation.at/tools/uploads/full/40383.jpg)

Regarding these indicators, it should be noted that urban density is an essential prerequisite for favourable values, compared to more rural regions. Distances are shorter, public transport is well developed and efficient, compact groups of houses and apartments can be connected to heating networks and lose significantly less heat than freestanding, smaller units. In compact settlement structures, construction takes place with a far lower input of energy. In contrast, the use of biomass in buildings in urban areas should not be promoted for reasons of air pollution control and logistics. With respect to the usable floor space, there are fewer usable roof and exterior surfaces available for the use of solar energy in multi-storey buildings than in detached houses. A comprehensive transformation process towards a decarbonised energy system requires the successful interaction of all players. Here, everyone – whether in the city or in the countryside – does what he or she can contribute best, in a “smart” division of labour. In Vienna, green building concepts can thereby rely on solid foundations.

### 3. Vienna's plans for an energy-efficient, green city of the future

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The three major energy goals are:

1. Reduction of greenhouse gas emissions per capita by 80 percent by 2050 in Vienna (compared to 1990). Interim goal: reduction of CO<sub>2</sub> emissions per capita by at least 35 percent by 2030 in Vienna (compared to 1990).
2. Increase of energy efficiency and reduction of final energy consumption per capita in Vienna by 40 % by 2050 (compared to 2005). The primary energy input per capita will decrease from 3,000 watts to 2,000 watts.
3. In 2030, over 20 percent and in 2050, 50 percent of Vienna's gross final energy consumption will come from renewable sources

This decision of the Smart City Vienna Framework Strategy resulted in the following objectives in the area of buildings:<sup>7</sup>

- Final energy consumption for heating, cooling and hot water in buildings will drop by one percent and the associated CO<sub>2</sub> emissions by two percent per capita and year.
- As of 2025, the heat consumption demand of new buildings will basically be met by renewable energy or district heating.
- Buildings will be used for greening and solar energy harvesting.
- As of 2030, location- and use-oriented planning and construction for maximum conservation of resources will be the standard in the construction of new buildings and renovation work.
- In 2050, 80 percent of the components and materials of both demolished buildings and major conversions will be reused or recycled.

This target orientation of the Smart City Strategy for the building sector must be seen in the context of sustainable development. This requires that effects in the future as well as in other places should be included, and the system boundaries for a coherent optimisation further extended. Such optimisation is not yet mandatory, but building evaluation systems do offer criteria and proof options. Sustainable qualities can also score high in the property developer competitions introduced in Vienna.

For decades, Vienna has been working with great commitment on planning and control tools that are groundbreaking for the process of future development. A hierarchically structured set of tools, consisting of strategy levels and subordinate fields of action, is designed in line with a vision of the model city of the future.

Control tools:

- Smart City Vienna – Framework Strategy 2050
- The centrepiece of Viennese energy policy: The Energy Framework Strategy 2030
- The Municipal Energy Efficiency Programme 2030 (SEP 2030)
- The Urban Development Plan 2025
- The technical concept of energy spatial planning: energy in urban planning processes
- The City of Vienna's Climate Protection Programme – KliP Wien
- The City of Vienna's Economy and Innovation Strategy

The strategic superstructure is formed by the Energy Framework Strategy 2030, the top level of which is the Smart City Vienna Framework Strategy 2050. The Smart City Strategy's priorities are the conservation of resources, a holistic approach, a high, socially balanced quality of life and the productive use of innovations and new technologies, which are to be implemented in a wide variety of fields. A total of 38 concrete goals to be achieved by 2025, 2030 or 2050 have been defined.

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<https://www.wien.gv.at/stadtentwicklung/studien/pdf/b008551.pdf>, page 73ff

Solar panels on the Technology Centre Seestadt © Vienna Business Agency/David Bohmann



Important basic principles:

- Consideration of the life cycle and life cycle costs as decision criteria. Outlay and impact of maintenance and repair are considered, including for dismantling and disposal.
- Coordination of service life requirements with regard to the planned service life
- Orientation towards circular economy (materials and products): conversion potential, dismantlability, reuse, recyclability, waste avoidance, mass balance, short distances
- Effects of production processes, even if they take place in other parts of the world, are considered (if data are available).
- The focus on urban development, design, technical and functional quality

This sets essential requirements for the buildings that are constructed from now on. The purpose of all these requirements is to improve the sustainability of the building sector and should be regarded as an investment in the future.



Seeparkquartier (Lake Park District), © Schreinerkastler\_web2016

### 3.1 Using Vienna's strengths as a business location

Vienna is an internationally outstanding business location and plays a connecting role in the economic and social relations between Western and Eastern Europe. The per-capita economic output ranks 18th out of 281 EU regions; productivity is above average; about half of all foreign companies settling in Austria come to Vienna. A quarter of the total Austrian added value is generated in the federal capital. In addition to private-sector companies, public-sector enterprises are also important forces in shaping Vienna. For example, the company Wiener Wohnen manages, renovates and operates Vienna's municipal housing estates. These include around 220,000 municipal apartments.<sup>8</sup>

The City of Vienna's economic and innovation strategy focuses on those topic areas in which Vienna has already proved to have strengths as a business location, and which offer answers to the major challenges of the coming years. One of the key topics is "Smart solutions for the urban environment of the 21st century".<sup>9</sup>

Two factors, among others, have proven to be worthwhile for the development of the building sector to date: firstly, the climate protection plans (KliP) already started to be developed in 1990, and secondly, the Viennese economy has been involved in the transformation process from the very beginning.

### 3.2 Solutions contributed by the City of Vienna

The internationally used term "green building" takes on an additional, specifically Viennese dimension due to the great importance, in an international comparison, of subsidised social housing and ecological procurement activities.

In the subsidised housing sector in Vienna, developer competitions and the Property Advisory Board are proven tools for quality assurance. A central task of wohnfonds\_wien is to purchase suitable properties for subsidised housing. All housing projects that want to claim subsidies are evaluated in a developer competition or by the Property Advisory Board. If a property is owned by wohnfonds\_wien, a developer competition will be organised in any case. If a developer owns the property, a developer competition is called for if there are more than 500 residential units; smaller projects under 500 residential units are reviewed by the Property Advisory Board. [www.wohnfonds.wien.at](http://www.wohnfonds.wien.at)

<sup>8</sup>  
[www.wien.gv.at/wirtschaft/standort/pdf/wien2030-wirtschaft-innovation.pdf](http://www.wien.gv.at/wirtschaft/standort/pdf/wien2030-wirtschaft-innovation.pdf)

<sup>9</sup>  
[www.wien.gv.at/wirtschaft/standort/pdf/wien2030-wirtschaft-innovation.pdf](http://www.wien.gv.at/wirtschaft/standort/pdf/wien2030-wirtschaft-innovation.pdf)

The Property Advisory Board examines each project according to the criteria of the “4-pillar model”. The assessment focuses on the overall quality and balance of the four quality pillars: economy – social sustainability – architecture – ecology.

## Criteria of the “4-pillar model”

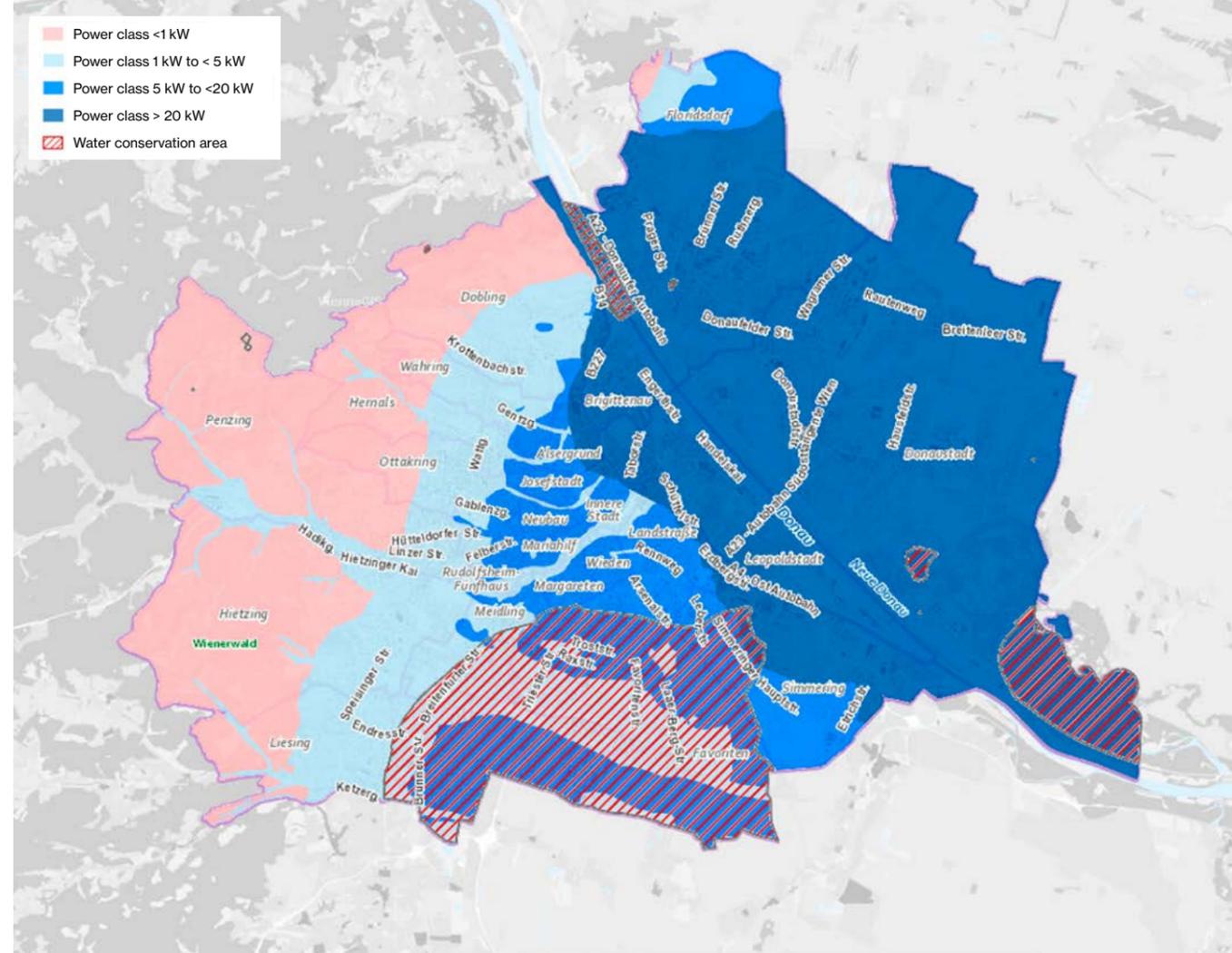
<b>ECONOMY</b>	<ul style="list-style-type: none"> <li>● Property costs</li> <li>● Total construction cost</li> <li>● User cost and contractual conditions</li> <li>● Relevant costs of the construction equipment</li> </ul>
<b>SOCIAL SUSTAINABILITY</b>	<ul style="list-style-type: none"> <li>● Suitability for everyday use</li> <li>● Cost reduction through planning</li> <li>● Living in a community</li> <li>● Housing for changing needs</li> </ul>
<b>ARCHITECTURE</b>	<ul style="list-style-type: none"> <li>● City structure</li> <li>● Building structure</li> <li>● Residential unit structure</li> <li>● Design</li> </ul>
<b>ECOLOGY</b>	<ul style="list-style-type: none"> <li>● Climate and resource-friendly construction</li> <li>● Healthy and environmentally friendly housing</li> <li>● Quality in green and open spaces with an effect on the cityscape</li> <li>● Differentiated utilisation offers in green and open spaces</li> </ul>

Ecological procurement is binding for buildings of the City of Vienna. ÖkoKauf Wien is part of a European strategy, the implementation of the voluntary instrument Green Public Procurement (GPP) for the City of Vienna. GPP is defined in the EU as a process “whereby public bodies seek to procure goods, services and work with a reduced environmental impact throughout their life cycle compared to goods, services and work with the same function that would otherwise be procured”. In the interest of climate protection, the City of Vienna launched the ÖkoKauf Wien programme in 1998. For building construction there are guidelines and criteria catalogues for products of building construction, building services and lighting, interior design as well as for construction site environmental logistics, the contents of which can be included in the tender texts. These detailed, elaborated ecological requirements are generally and freely available outside the administrative department: <https://www.wien.gv.at/umweltschutz/oekokauf/ergebnisse.htm>

The city provides the basis for the use of sustainable energy sources. In order to supply developers, companies, experts, authorities and planners with a quick overview of locally available energy potentials, the municipal department MA 20 (Energy Planning) has, in cooperation with various partners, drawn up a thematic city map for energy. This digital

cadastre is freely available and provides information on solar, geothermal, wind and waste heat potential as well as green roof potential, among other things. Ready-to-print maps and plans have been compiled in the Environmental Atlas: [www.smartcity.wien.gv.at/site/themenstadtplan-energie](http://www.smartcity.wien.gv.at/site/themenstadtplan-energie) [www.wien.gv.at/umweltschutz/umweltgut/umweltatlas.html](http://www.wien.gv.at/umweltschutz/umweltgut/umweltatlas.html) [www.urbaninnovation.at/de/Projects/Infografiken-Energie](http://www.urbaninnovation.at/de/Projects/Infografiken-Energie)

Vienna's cadastre for geothermal potential  
Source: [www.wien.gv.at/stadtentwicklung/energie/themenstadtplan/erdwaerme/](http://www.wien.gv.at/stadtentwicklung/energie/themenstadtplan/erdwaerme/)



The basic requirements applicable to buildings in the EU are defined in the EU Construction Products Regulation (No. 305/2011): Mechanical strength and stability, fire protection, hygiene, health and environmental protection, safety and barrier-free accessibility, sound insulation, energy saving and thermal insulation, sustainable use of natural resources. While the first six topical fields have been enshrined in national law through the building regulations, with six OIB (Austrian Institute of Construction Engineering) directives, a directive on sustainability has yet to be adopted.

Nevertheless, ever more investors regard the sustainability of real estate as a criterion. Building certifications have been developed worldwide and are enjoying increasing demand. In any case, these are systems that are commissioned on a voluntary basis. In Austria, mainly the following assessment systems are currently offered (please note: links provided).

- klimaaktiv, the building assessment introduced at the initiative of the Federal Ministry for Climate Protection, is a self-declaration with a plausibility check for residential and other types of buildings, new construction and renovations, in which the focus is on energy criteria. There is a separate assessment tool for settlement development.
- TQB (Total Quality Building) – ASBC (Austrian Sustainable Building Council), is a comprehensive building evaluation system, compatible with klimaaktiv in the field of energy. It has been applied, amongst others, in Seestadt Aspern (Lakeside Town of Aspern), where the quality of approx. 30 new building of the most varied types of use is assured with this evaluation system.

- DGNB (German Sustainable Building Council), is represented in Austria by ÖGNI (Austrian Society for Sustainable Real Estate). These organisations aspire to attach equal importance to all aspects of sustainable building. With the DGNB system and the blueCARD, ÖGNI certifies sustainable buildings and city districts.
- IBO Ökopass, a building pass especially designed for residential complexes. Its aim is to provide proof of the quality of building biology and building ecology. It is based on the results and assessments using planning documents, calculations, measurements and building inspections, which are documented in a comprehensive assessment report.
- EU Green Building, is an EU programme to increase the energy efficiency of buildings and contains only one energy criterion – i.e. that the nationally highest permissible consumption targets are cut by 25 percent (in Austria: OIB Directive 6 and the building regulations of the respective federal states). It's not the building itself that receives the award or is certified, but the respective contracting entities. Residential buildings are not assessed, but the award is given to the contracting entity for exemplary energy efficiency measures.
- BREEAM, for extensive projects, infrastructure and buildings. Assessment in 11 categories; the rating is awarded by certified consultants (U.K.).
- LEED, for buildings and their settlement areas; it rates the efficiency of resources (U.S.A.).

The systems differ widely, due to their origin, their different focuses, their market presence and the costs incurred for certification. The building declaration process supports the definition of objectives and provides an optimisation system. With the selected requirements, the scope of services can be defined in terms of high ordering quality. With the required documentation, the qualities achieved are well documented. The purpose of the award is to show that the evaluated building has proven qualities that exceed the usual level in the relevant points.

Klimaaktiv is currently the best known building standard in Austria. As per spring 2020, the klimaaktiv data base includes approx. 900 buildings in Austria which have been planned and built according to the klimaaktiv criteria. All winners of the Architecture and Sustainability Award are also part of the data base. [www.klimaaktiv-gebaut.at](http://www.klimaaktiv-gebaut.at)

The ASBC project documentation comprises approx. 200 assessed projects: [www.oegnb.net/zertifizierte\\_projekte.htm](http://www.oegnb.net/zertifizierte_projekte.htm)

As opposed to self-declaration, ÖGNI auditors register projects for certification, supervise the projects and submit the evidence necessary for the conformity check, which is coordinated by the ÖGNI. Certified projects: [www.ogni.at/projekte](http://www.ogni.at/projekte)

Since 2001, more than 300 residential estates have been assessed in accordance with the IBO ÖKOPASS: [www.ibo.at/gebaeudebewertung/ibo-oekopass](http://www.ibo.at/gebaeudebewertung/ibo-oekopass)

With a Smart Readiness Indicator (SRI), the EU Building Directive provides for a new, additional assessment in the future, aimed at showing to what extent a building is prepared for a largely decarbonised, renewable energy system. All in all, buildings offer huge potential for this type of management (demand side management) and for the storage of energy in the form of heat. New tariff models, such as Smartflex from Energie AG Vertrieb and LINZ STROM Vertrieb, or 'hourly' from aWATTar, offer cost advantages for flexible consumer behaviour. The introduction of SRI is currently in preparation, with plans to extend the existing energy certificate. A proposal for implementation in Austria has been submitted. [www.nachhaltigwirtschaften.at/de/sdz/projekte/sri-austria.php](http://www.nachhaltigwirtschaften.at/de/sdz/projekte/sri-austria.php)

## Smart Building



## Measure the technological readiness of your building



Smart Readiness Indicator, source: cf. © VITO, 2019.  
[www.buildup.eu/en/events/smart-readiness-indicator-buildings-stakeholder-meeting](http://www.buildup.eu/en/events/smart-readiness-indicator-buildings-stakeholder-meeting)

Green buildings increase the number of points in certification systems, © pixabay

## 4.1 Energy-related building standards

### ○ Nearly zero energy buildings:

The minimum requirements for new buildings and large refurbishments are oriented towards the EU-wide nearly zero energy standards (nearly zero energy building, nZEB). The national Austrian requirements are laid down in the OIB (Austrian Institute of Construction Engineering) directive 6.

### ○ Passive house:

The original definition is "A passive house is a building in which thermal comfort (ISO 7730) can be guaranteed solely by reheating or re-cooling the fresh air volume flow required for adequate air quality (DIN 1946), without the additional use of recirculated air". However, heating via a ventilation system is not a mandatory requirement. The low heating demand can also be met via surface heating systems (floor, ceiling component activation), for example.

### ○ Energy-plus building:

A building whose annual primary energy consumption is lower than the renewable energy produced on-site, taking into account maximum energy efficiency. "On-site" is defined as within the boundaries of the settlement or building, or in the immediate vicinity. Like the zero-energy house and the plus-energy variations, it is a balance model.

building renovation creates long-term value and, in particular, provides local jobs and added value. The renovation of Vienna's building stock is now to be intensified. Within the framework of the EU project Renobooster, the city is preparing new offers and a central contact point for owners of residential buildings.<sup>10</sup>

Innovative solutions are also found in the project reports of the model renovation funding campaign of the Climate and Energy Fund since 2013:  
[www.klimafonds.gv.at/report/mustersanierung-2013](http://www.klimafonds.gv.at/report/mustersanierung-2013)

## 4.2 Renovation

Even though the term Green Building is primarily associated with new construction, it should be remembered that the existing building stock does not meet the requirements of a decarbonised energy system. However, the renovation of the building fabric is also decisive for the quality of life and living comfort in both summer and winter. Renovation, in this context, means creating a "healthy" state: the building should – taking into account the specific features of the edifice – meet today's requirements. Energy efficiency is thus an essential prerequisite for the energy turnaround. By upgrading buildings to the state of the art, they can save considerable amounts of energy, generate and also store energy on site, and thus significantly reduce their CO<sub>2</sub> emissions. At the same time,

As a logical next step, an attempt was made to also reduce the environmental impact associated with the construction and maintenance of buildings. The technical prerequisites as well as evaluation tools for the purpose of suitable life cycle assessments were created. For a simplified assessment of ecological material quality, the Eco Index 3 (OI3) has become generally accepted in Austria. This is a partial ecological balance assessment that evaluates three parameters: the demand for non-renewable primary energy, total as (part of) the energy used for production, the global warming potential (GWP) – the proportion of global warming caused by greenhouse gases as a result of product manufacture, and the acidification potential (AP) – the regionally effective acidification of soils, forests and water bodies.<sup>12</sup> Showcase projects, such as the social housing project “Holz-Passivhaus Mühlweg” in Vienna Floridsdorf or the “Holzhochhaus” (wooden high-rise), have shown how the use of renewable building materials, particularly wood, can be extended.

With the increase in hot days, the summer suitability of buildings is becoming more and more important. According to building regulations, residential buildings must be planned in such a way that no mechanical cooling is required, but in practice more and more apartments are cooled, as has been the case with office buildings for some time now. Criteria for this can be found in the criteria systems of building certificates. Today, “glass architecture” without shading is no longer regarded as trend-setting. However, building component activation has proven to be an interesting option, whereby rooms can be conditioned not only in winter but also in summer, with low energy consumption and small temperature differences. In addition, there is a growing interest in providing shade with plants and improving the microclimate a little through their evaporation of moisture.

The development of green building concepts can be illustrated by means of a short history of their development and the small selection of projects presented in the next chapter.

The world's first passive house in Darmstadt-Kranichstein is now 25 years old. In Vienna, residential complexes have been built in the passive house standard since 2005. In 2006, the largest passive house in the world was opened: the Roschégasse residential complex in Vienna's 11th district. As a beacon technology, the “Passive House” building standard has fundamentally changed our understanding of building and living. The results of sustainability monitoring for selected passive housing estates in Vienna have been researched by the NaMAP project.<sup>11</sup>

The issue of domestic ventilation is still seen as very controversial today. Whereas, in the passive house, heat recovery from the exhaust air is part of the energy concept, ensuring sufficient air exchange in any building today is a challenge – especially in view of the fact that it is hardly possible to control user behaviour. According to building regulations, buildings must be constructed to be so airtight that the remaining leak points are usually insufficient to ensure permanent protection against moisture and mould. Nevertheless, ventilation systems for controlled domestic ventilation are not currently installed as the standard in Austria.

11

[www.wohnbauforschung.at/index.php?id=392](http://www.wohnbauforschung.at/index.php?id=392)

12

[www.ibo.at/fileadmin/ibo/materialoekologie/OI3\\_Berechnungsleitfaden\\_V4.0\\_20181025.pdf](http://www.ibo.at/fileadmin/ibo/materialoekologie/OI3_Berechnungsleitfaden_V4.0_20181025.pdf)

Great emphasis has long been placed on indoor health in Vienna. Particularly in subsidised housing, services for consulting and implementation control during construction are very frequently used for the selection of building materials and building chemicals. With a prudent selection of materials and the recommended implementation check (chemicals management), it is also possible to score points in the voluntary building standards. Support in product selection is provided by the freely available database “baubook”, which also includes construction-related products with various environmental labels: [www.baubook.info](http://www.baubook.info)

The realisation that the place of residence and the existing infrastructure have a decisive influence on the mobility behaviour and mobility needs of residents has led to “green buildings” also providing appropriate services. These include the number and location of car parking spaces and bicycle storage areas, charging management for e-vehicles, and increasingly also sharing services for various vehicles. Pedestrian friendliness and the accessibility of public transport are also essential. The “Mobility of the Future” programme launched in 2012 promotes technological, organisational and social innovations in the mobility sector:

[mobilitaetderzukunft.at/de](http://mobilitaetderzukunft.at/de)

The questions as to how to ensure the provision of affordable housing is currently the subject of particularly intense debates throughout Europe. Already in the year 2006 it was possible to demonstrate, based on the example of a passive house building with 39 housing units in Utendorf-gasse, Vienna 1140, that the application of passive house technology is also possible under the cost conditions of social housing. One promising solution approach is the state-of-the-art implementation of serial construction – which is still manifest today in the buildings of the post-war period, when housing was needed quickly. However, in Vienna these cannot be compared to numerous other satellite cities, with their prefabricated, concrete slab-type buildings. Today it's all about the “standardisation of diversity”: the standardisation of products with cost-effective production and consistent quality and the standardisation of concepts and the prefabrication process. In the context of the International Building Exhibition (IBA) reference has already been made to some projects: temporary housing in Floridsdorf, residential buildings in Seestadt Aspern (Lakeside Town of Aspern) and, currently, the housing project in Berresgasse, where a new urban quarter with around 3,000 mainly subsidised apartments is being built in the Donaustadt district by 2022.

This continuous development has been significantly supported by research programmes. The “Building of Tomorrow” programme ran from 1999 to 2012, with 450 research and development projects financed with a funding budget of 63 million euros. Based on the solar low-energy construction method and the passive house concept, as well as on approaches using ecological building materials and renewable raw materials in construction, new groundbreaking concepts and technologies were developed and implemented in 62 showcase projects. From 2013 onwards, the topical areas of “Building of the Future” will be expanded and aspects of the urban energy system will be continued within the framework of the “City of the Future” research and technology programme. The aim of the “City of the Future” programme is to initiate a transformation process beyond the system boundary of buildings, towards a sustainable, future-oriented city. The focus is on innovative technologies and concepts for energy generation, distribution, conversion and storage, the implementation of plus-energy neighbourhoods, but also consumption optimisation in buildings and building complexes as well as technologies and efficiency for new construction and renovation. The results of the Research, Technology and Development (RTD) projects from the previous tenders within the framework of “City of the Future” are available: [www.nachhaltig-wirtschaften.at/de/sdz/projekte](http://www.nachhaltig-wirtschaften.at/de/sdz/projekte)

The results of the wohnfonds wien developer competitions completed since 1995 are also documented in detail: [www.wohnfonds.wien.at/website/article/nav/140](http://www.wohnfonds.wien.at/website/article/nav/140)

The housing estate at Mühlgrundgasse in Vienna's 22nd district, with 160 residential units, shows how buildings can be conditioned in the future. This has earned the project the reputation of being a "game changer", an important building element for the city of the future. A new and unusual feature is the first-time use of thermal component activation (TBA) for heating and cooling in social housing – primarily with wind energy. The technology is impressively simple: the concrete is "activated" via integrated pipe systems in which hot or cold water flows, depending on the heating or cooling purpose. The large mass of the component simultaneously acts as buffer storage, with the temperature flow taking place over the entire surface. The size of this transfer surface requires a lower flow temperature during heating than with smaller heat delivery systems, the best conditions for the most efficient use of heat pumps. With brine-to-water heat pumps in conjunction with 30 geothermal probes, each 150 metres deep, heating or cooling can be provided as required, with the additional use of an inter-seasonal geothermal heat storage tank. A further positive effect is that the heat pumps are operated with the aid of a wind power load management system, whereby at times when there is a surplus of wind energy in the grid, this is stored in concrete in the form of heat.

The building project is located in the fast and "smart" growing eastern part of Vienna, which extends as far as the Seestadt Aspern (Lakeside Town Aspern) as a unique testing ground for the redesign of urban space. The buildings themselves will be constructed in accordance with the low-energy house standard, with a heating requirement of 24–28 kWh/m<sup>2</sup>a. [www.mgg22.at](http://www.mgg22.at)

In this chapter, selected, successfully implemented showcase examples will be used to illustrate how innovative technologies help new concepts to take off. What is also reflected here is an increasingly holistic approach that can be found in the development of building-centred concepts, ranging from the passive house to the comprehensive strategies in the Smart City concept. At the same time, it is also intended to show how multifaceted and versatile the approach to a Green Building can be and what results business-oriented research and development in Vienna has yielded.

## 6.1 Building component activation as a cornerstone of the city of the future

"The MGG22 project helps us to effectively use the necessary existing concrete components of a building as storage mass with a simple solution. In addition, we use renewable energy when it is available in 'abundance'."

Harald Kuster, expert for component activation, Managing Director Future is now, Kuster Energielösungen GmbH



## 6.2 The virtual power plant – GreenHouse student residence

This example shows the effect the combined use of different, partly new, technologies can have on the overall performance of a building and the resulting quality for its residents and the urban community. This is also reflected in the following certifications and ratings: Passive House Plus (PHI certified), 1000 climate-active points, 905 ASBC points, awarded by the ASBC for its sustainability!

The GreenHouse student residence offers 313 living units with a net floor space of 14,600 square metres and is built according to the Passive House Plus standard. The heating and hot water supply is provided by district heating. The photovoltaic system is located on the roof of the dormitory. It is equipped with 738 high-performance modules and has an output of 222 kilowatt peak (kWp). The annual production is 218,000 kWh. It covers the entire electrical requirements of the residence in full sunlight. This includes the 313 residential units, the electrical hot water supply, lighting and other general consumers of the building.

“The more decentralised the power generation, the more networked the entire system must be. By 2030 alone, an additional 30 TWh of renewable energy is to be fed into the grid. This can lead to fluctuations. To ensure the continued stability of the power grid, all components are needed – from the generation plants, consumers, storage facilities, to entire buildings. This is because in an energy system characterised by ever greater volatility and numerous decentralised plants, the building sector is a key component for a successful energy turnaround. The solutions tested in ASCR are taking our energy system into the future and have enormous potential.”

Wien Energie

Aspern Smart City Research (ASCR) has implemented an intelligent Building Energy Management System (BEMS). The building consumes, controls and trades its energy fully automatically – and it flexibly steps in to stabilise the power grid. In addition to optimising internal consumption, research is therefore being conducted into how buildings can offer their flexibility to support the local medium and low-voltage grid and respectively act as active participants on the electricity market. With the virtual power plant based on this principle, commercial customers can already sell surplus electricity as control energy, generate additional revenues and contribute to grid stability. Such energy pool managers can also intelligently coordinate tens of thousands of private solar systems and heat pumps.

## 6.3 Plus-energy office tower – University of Technology high-rise at Getreidemarkt

“The conversion of the old TU tower block into the world’s first plus-energy office tower shows what can be achieved with the right energy-saving measures. Even though we did not use any above-average complex technologies for the building, we were able to achieve this extreme reduction in energy consumption through the meticulous analysis and optimisation of over 9,300 individual components. The project is characterised by its replicability, thus proving its value for the future.”

Helmut Schöberl,  
Expert in energy-efficient buildings,  
Managing Director of Schöberl & Pöll  
GmbH

Plus-energy office tower at Getreidemarkt, © Schöberl & Pöll GmbH



The former Chemistry block of the Vienna University of Technology, with a net floor space of 13,500 square metres on eleven floors, was converted into Austria’s largest plus-energy office building in the course of a general renovation and at the same time became a showcase building unique throughout the world. It’s remarkable that the plus-energy standard was achieved here with an existing high-rise building from the 1970s – with primary energy, on site.

This was made possible on the basis of a passive house shell, supplemented by highly energy-efficient building technology. This includes thermal component activation in the form of activated screed for heating and cooling, a ventilation system with minimal pressure losses (with no heating and cooling registers), core ventilation for automated night ventilation and cooling energy savings.

The key areas for energy generation are the façade with the largest building-integrated photovoltaic system in Austria to date (230.6 kWp), the PV roof system with 97.8 kWp and the waste heat recovery from the server room for component activation, through which a large part of the heating energy requirement can be covered. Even the energy recovery from the operation of the lifts contributes towards achieving the PlusEnergy Standard. This is also made possible by the fact that this building contains innumerable innovations that perfectly illustrate what “state of the art” means in terms of maximum achievable energy efficiency!

The quality offered by this building is also evident from the 983 points that it achieved in the TQB building certificate of the Austrian Sustainable Building Council (ASBC).



Technology Centre, © Vienna Business Agency/David Bohmann

Vienna University of Economics and Business – Library &amp; Learning Centre, © Johannes Fechner

## 6.4 Technology Centre – the first building in Seestadt

The Technology Centre Seestadt is an office building for innovative companies developed by the Vienna Business Agency. The building provides offices, laboratories and production space for technology-oriented companies. During construction, forward-looking structural engineering options were implemented to achieve the highest standards of sustainability and user comfort. The technology centre is characterised by its highly energy-efficient construction in passive house standard and its low-emissions design. It was possible to significantly optimise the primary energy demand by integrating thermal building simulation, building ecology, daylight simulation and building physics (51 kWh/m<sup>2</sup>a). The modern façade fulfils various functions and serves the purpose of shading, greening and energy production. The energy supply of the technology centre is ensured by means of integrated photovoltaic elements and small wind turbines. Thanks to the combination of innovative elements, the building produces more energy than it consumes over the year.

The second part of the technology centre (TC2) was also built with modern architecture and open space concepts. Both building components exhibit the highest ecological standards and the greatest energy efficiency and have been certified with top ratings according to the guidelines of klimaaktiv and ASBC. The TC2 is the first building in Austria to receive natural sunlight via fibre optics.

Two thirds of the energy demand for heating and cooling is covered by the thermal use of groundwater. For this purpose, one of the largest plants for the thermal use of groundwater in Austria was constructed, with a maximum groundwater volume of up to 150 l/s (9,053 m<sup>3</sup>/d, 1,400,000 m<sup>3</sup>/a). In winter, three heating and cooling machines are used for heating via the groundwater and, in summer, for peak load coverage of the cooling energy demand. Supplemented by intelligent building services systems, the result is a new quality, offering an impressive level of comfort, safety and energy efficiency.

## 6.5 Heating and cooling from groundwater – the new Vienna University of Economics

Completed in 2013, the Vienna University of Economics and Business campus comprises 6 large building complexes on an area of approximately 90,000 square metres and offers space for 25,000 students and 1,500 employees. The heart of the campus is the Library & Learning Centre designed by Zaha Hadid.

The entire campus was constructed on the basis of a “green building” concept and was awarded the ÖGNI certificate of the Austrian Society for Sustainable Real Estate Management. Sustainable aspects were already taken into account at the planning stage: the aim was to minimise life-cycle costs, the high durability of the selected structures and materials as well as energy efficiency throughout the product cycle, the protection of the local and global environment, and the lowest emissions from materials, energy generation and infrastructure.

## 6.6 District heating from the wafer oven

“Like other metropolises in Europe, the city had come to accept a shrinking of production: it was almost considered a natural development,” says Gerhard Hirczi, Managing Director of the Vienna Business Agency. A few years ago, a big rethink and change of course set in: “Industry is an essential component of a stable business location.”

Manner was one of the first to venture this step and switched to vertical production in the big city. Vertical production achieves an efficiency in the production of bulk goods comparable to that of horizontally arranged production, while at the same time enabling the company to keep the traditional, centrally located production site in Vienna running. Since then, all baking ovens have been located on one floor, thus making it easy to use the waste heat as an energy source.

In autumn 2016, with the completed modernisation of the Manner production line, the full operation of the “wafer heating system” started: while hundreds of Manner wafers are produced, shift by shift, and baked in the wafer oven, a second process for district heating is running in the background. The hot exhaust air produced during the baking process is used. It’s collected via pipes and led to the roof via a ventilator. A heat exchanger converts the hot exhaust air into hot water.

The waste heat from the baking process is fed directly into the local district heating network over a length of 3.5 kilometres, and used for heating and hot water. For this purpose, Wien Energie installed district heating pipes, a heat exchanger and connections to the supply systems of Wien Energie on the Manner factory premises.

The thermal output is 1 megawatt, and the annual energy input around 5,600 MWh. This means that 600 households in the immediate vicinity of the wafer production sites in the Hernals and Ottakring districts can benefit from the waste heat. Manner also converts the excess waste heat from the production process into cold and uses this for cooling purposes.

The recycling of industrial waste heat is an essential component of a clean heat supply. Even factory buildings can become “green buildings” by acting as a heating plant capable of supplying an entire neighbourhood with the heat that would otherwise simply be uselessly dissipated. If renewable energy sources are used for the process heat, the district heating generated from them is additionally valorised.

## 6.7 Buildings in the materials cycle – urban mining in Seestadt

There are many starting points for the circular economy. Urban mining through mass balancing is one of them. Housing construction in the lakeside town of Aspern South recycled 1 million tonnes of material from its own construction activities. Almost all the excavated earth could be recycled on site. The in-situ concrete plant built there processed the gravel from the lake excavation and the construction pits. The civil engineering department used local sand gravel from preliminary excavations for road embankments, frost boxes and paved surfaces. This material extraction also shortened the time needed to construct the residential building. A special track was laid in the new construction logistics centre for cement delivery by rail. With this environmentally friendly construction process, the construction of the residential building saved over 100,000 heavy-duty truck journeys in the city area. All measures were implemented through contractual agreements among the 20 building contractors with cross-site tenders and contracts for construction work.<sup>13</sup>

## 6.8 Building with wood – a general overview

Building with wood usually takes place less on the building site and more in production halls for prefabricated building components. Walls, ceilings or even entire rooms made of wood are assembled in the factory, with precision and irrespective of the weather, transported to the construction site and immediately installed there. The buildings are erected in the shortest possible time. There are no drying phases as with reinforced concrete.

Wood is becoming increasingly established for load-bearing structures in building construction. It is a renewable raw material that has a favourable ecological balance over its entire life cycle and is also characterised by an overall lower primary energy requirement. The processing of trees to turn wood into a building material requires far less fossil energy than the production of steel, concrete, plastic, bricks or aluminium. It is much lighter than steel, while having the same load-bearing capacity, and has approximately the same compressive strength as concrete. Unlike the latter, however, it can also absorb tensile forces.

For fire protection in timber construction, a number of essential building regulations must be observed, and sound insulation also presents a challenge, especially in ceiling constructions. In order to be able to fully utilise the ecological advantages of wood, suitable solutions and combinations with other materials are also required for wood protection, e. g. materials for fire protection must be recyclable.

## 6.9 HoHo – the wooden high-rise

The HoHo Vienna is not only a beacon project for the Urban Lakeside Town of Aspern in terms of urban space, but has, as a wooden skyscraper, been an exceptional architectural project from the very beginning. The project is clearly breaking new ground in terms of construction. It has a core of reinforced concrete, to which is attached a timber composite construction consisting of four basic elements: composite slabs, wall elements, columns and beams. Around the reinforced concrete core, 75 percent of the construction above the ground floor is made from wood.

The construction system consisting of the prefabricated elements has a number of special features that have been specially developed to meet the stringent fire protection requirements. Due to their high degree of innovation, the knowledge thus gained can be used as a reference for subsequent projects.

The 24-storey building offers around 20,000 square metres of floor space for a mix of different businesses, including offices, restaurants, hotels, apartments as well as health, beauty and wellness areas and business floors. The HoHo Wien is one example of innovative projects that are being implemented in the Urban Lakeside Town as the “urban lab” of the Smart City Vienna.

As is customary in the Urban Lakeside Town, the high-rise building will be constructed according to the TQB rating system of the ASBC. The energy concept includes lifts with energy recovery, photovoltaic systems, air-water collectors for the pool, foundation absorbers and a decentralised ventilation system with conditioning. Intelligent building technology contributes to a considerable reduction in operating costs.

The HoHo stands for a new, groundbreaking overall concept: “Wood where possible, concrete where necessary”, a minimised construction period, thanks to the prefabricated elements, and rooms that are flexible and use-neutral in the long term.

## 6.10 Pop-Up Dorms – the modular student residence

The dormitory, built according to the passive house standard, consists of a total of ten prefabricated “room cells” (16.8 x 5.5 m), residential modules in timber frame construction, which are joined together on site to form a two-storey dormitory with an atrium.

The 75 square metre living modules each comprise four student rooms, two bathrooms and a small eat-in kitchen. Thanks to 36-centimetre thick insulated exterior walls and an integrated air-heating pump, each module achieves passive-house quality. There is also a photovoltaic system on the roof for power supply. The architects attach great importance to the fact that these are not “containers”, but room cells in a prefabricated wood construction.

Since the mobile building can also be moved, the land on which the dormitory stands did not have to be bought, but only rented. On a plot of land of 3,587 square metres, a built-up area of 744 square metres has been used; the gross floor space is 1,218 square metres. The student residence is designed for a technical service life of 40 years. Each individual residential module is designed to theoretically survive five moves.

The Pop-up Dorms could set a trend, especially since this unique building, winner of a competition with 40 entries, demonstrates that it is possible to build sustainably, quickly and affordably.

## 6.11 The “Vienna UHI strategy plan”

The phenomenon of Urban Heat Islands (UHI) – i.e. significantly higher temperatures in densely built-up areas – will increase even further as a result of global climate change, unless urban development measures are taken to at least cushion this development. The consequences of climate change are already making themselves felt in Vienna: whereas, between 1961 and 1990, there were still an average of 9.6 heat days per year with over 30 degrees Celsius, this number had already risen to an average of 19 heat days by 2018.

The cooling degree number – the equivalent of the heating degree day number in terms of energy demand – was, for example, at +135 percent, more than twice as high in 2018 than in an average year.

According to climate forecasts, Vienna can expect more summer heat in the future – in individual years there will be up to 100 hot days with temperatures above 30°C, which would correspond to a plus of 55% compared to the average value of the years 1981–2010. Greenery on buildings reduces the perceived temperature in hot weather by up to 13°C and thus counteracts “urban heat islands”.

The Vienna Urban Heat Island Strategic Plan (UHI STRAT) was developed under the leadership of the Vienna Municipal Department for Environmental Protection (MA 22), together with scientific experts and numerous departments of the City of Vienna, and describes in detail different possibilities for cooling down the urban heat islands. It contains precise information on the effectiveness of the individual measures regarding the climate in the city and in the neighbourhood. In addition, the strategic plan provides information on the advantages and possible constraints in the implementation of measures, as well as the expected costs of construction and maintenance.

## 6.12 Vertical Farming – Food production in the urban environment

The concept of the vertical farm is seen as a contribution to the resilience of the city of the future. There are already several startup companies throughout Europe that have successfully implemented this concept and occupied this market niche. Vienna is planning to follow suit in the near future and therefore a research project was conducted to investigate the basics for a new building typology – the vertical farm – by means of simulation, at the level of detail of a conceptual preliminary design. For this purpose, a catalogue of cultivated plants has been developed and thus a year-round crop rotation determined for the Vertical Farm. Requirement profiles for building technology and building automation have been developed. The overall energy balance, i.e. results of resource consumption, including grey energy, has delivered promising results. The exploratory project, which is funded by the research promotion company FFG, envisages the Lakeside Town Aspern as a possible location for the first built prototype.

For technical and economic reasons, it is not possible to grow all crops on such farms, but on the other hand, up to twelve harvests per year are possible for some crops! The city of the future will therefore be able to produce a small part of its food requirements on a sustainable basis in a newly defined “green building”, with the most modern, energy-efficient technologies and – this is perhaps the most important effect – at the same time allow people to directly experience the thriving growth of our foods.



Initiative 50 Green Houses, © GRUENSTATTGRAU

## 6.13 Vertical gardening – 50 Green Houses

No widely applicable, inexpensive, all-in-one solution has yet been found for the implementation of green façades in existing buildings. The “retrofitting” of existing façades has also been made more difficult by long-drawn-out handling and approval procedures within building associations and the administration. The “50 Green Houses” project is designed to remedy this situation.

On 50 existing buildings in the target area Innerfavoriten, greening projects are being realised by means of a low-tech plant trough solution with climbing aids. These help to protect against overheating in summer and improve the comfort and quality of life in the densely built-up city.

The two main results of the project:

1. The green façade module BeRTA, a simple, cost-effective, broadly implementable plant trough solution with climbing aids and a maintenance concept, which is specially designed for existing buildings.
2. The online submission of applications, as well as an innovative, web-based participation tool to involve and support the city administration, owners and residents. All coordination processes necessary for the greening process will be simplified by the project in the future.

The green façade module BeRTA allows street-side façades to be “greened” quickly and cost-effectively. The name stands for the components of the green façade module in German: greening, climbing aid, trough – all-in-one. The special thing about BeRTA is its modular design: The components are coordinated with each other, are adapted to the respective building by professionals and can be individually extended. The module is designed in such a way that the ongoing maintenance effort is kept to a minimum. Based on the findings from the project, a basic, replicable business model is being developed for “50 green houses” that can be transferred to other urban areas and cities.



Renovation of a listed building on Kaiserstrasse, © Schöberl &amp; Pöll GmbH



Courtyard of the Stadthalle Boutique Hotel, © Boutique Hotel Stadthalle

## 6.14 The historical Gründerzeit has a future – the Kaiserstrasse 7 project

This award-winning model project proves that outstanding, pioneering renovation results can also be achieved in the existing stock of Gründerzeit listed buildings. It represents the successful combination of the requirements of monument protection with those of an optimal total thermal-energy renovation project, which is also aimed at producing an architecturally attractive result in every respect.

Besides a significant increase in the standard of the building, the usable floor space has been extended from 1935 square metres to 2750 square metres through an attic conversion. The use of passive house components in the high-quality refurbishment also came into play here with the installation of interior wooden windows, which meant that the outer casements of the Vienna box-type windows could be retained in the listed façade. Under these conditions, effective thermal insulation could only be achieved by internal insulation. In order to minimise not only transmission heat losses but also ventilation heat losses, central ventilation units with heat recovery have been used in all living rooms and common rooms. The innovative solutions adapted to the special conditions are intended to serve as a basis for future refurbishment projects of Gründerzeit houses and listed buildings and make an attractive contribution to the evaluation and standardisation of thermal refurbishment measures.

[www.nachhaltigwirtschaften.at](http://www.nachhaltigwirtschaften.at)

However, the complex building technology remains hidden from the visitor. The building complex is characterised by a combination of several technologies for energy-efficient construction. A 94-square-metre photovoltaic system supplies electricity. 130 square metres of thermal solar collectors are used for the production of hot water and for heating. A groundwater heat pump is also used. All in all, the energy balance is zero, as energy production and consumption are in balance throughout the year. The hotel has received numerous awards, including the Green Hotelier Award 2015 for Europe and the City of Vienna's Environmental Award, organised by ÖkoBusiness Wien.

## 6.15 Zero-energy balance – The Stadthalle Boutique Hotel

This “zero-energy balance” hotel is a building complex comprising 79 hotel rooms, which was realised in several stages. The first step was to transform a lovingly renovated building dating back to the turn of the 19th/20th century into a low-energy building. On the plot of land of the purchased neighbouring building, an annex has been built to passive-house standard with triple-glazed windows and controlled ventilation with heat recovery. On entering the inner courtyard of this building, the kind of “green building” concept that underlies this showcase project becomes evident: roses and lavender blossom on the flat roof, climbing plants climb up the façade, interrupted only by shiny black and blue solar panels.

## 6.16 The Viennese Campus Model – space for new educational quality

In the “Viennese Campus Model”, kindergarten, school and leisure pedagogy are combined at one location; the boundaries between pedagogical operation and leisure activities become fluid. Children of different ages use different rooms together, can play together and learn from each other. For this purpose, the City of Vienna launched an EU-wide, open, 2-stage realisation competition in 2015. With the Friedrich Fexer Education Campus in Attems-gasse in the Donaustadt district, the first location went into operation in 2017, followed in 2019 by the Berresgasse Education Campus, likewise in the Donaustadt district, where around 1,100 children can be looked after and taught throughout the day.

Based on the campus projects already implemented, the “Campus Plus” model has been developed, according to which the other seven locations are being developed. The individual educational institutions are to be linked in an even more close-knit network. An additional innovation in the “Campus Plus” model is the so-called “district function”, which aims to involve external educational partners more closely in leisure activities or afternoon care. Music schools of the City of Vienna, mass sports providers and youth centres will be integrated into the new campus locations. Their services are also to be open to neighbouring residents. Multiple uses are to be implemented in as many areas as possible.

**BILDUNGSCAMPUS Aspern Nord as a pioneering project**  
An educational campus of the City of Vienna is being planned on Building Lot H3 in the Urban Lakeside Town of Aspern. It will be planned and built according to the educational concept Campus Plus. The education campus is also to become a pioneering project in terms of energy-efficient solutions in architecture and building services engineering. For this reason, a future-oriented energy concept has been developed, which is especially designed for the use of renewable energy and its storage in the building through component activation. With a photovoltaic system and a comfort ventilation system with heat recovery, the primary energy requirement has been calculated at 73 kWh/m<sup>2</sup>GFAa, with a heating requirement of 21 kWh/m<sup>2</sup>GFAa. Comprehensive product management, PVC-free floors and windows and measurements of the indoor air quality ensure further ecological qualities. The TQB assessment resulted in 902 ASBC quality points.<sup>14</sup>

## 6.17 Individual responsibility in multi-storey residential housing – Passive House JAspern

The Passive House JAspern in the Urban Lakeside Town is a group project in which the owners have jointly and independently made all the decisions. JAspern follows the master plan of the city and the Wien 3420 Aspern Development AG, whose aim was to enable building groups in the Urban Lakeside Town, so that people in the city can actively contribute to the creation of living space – according to the motto “We are all city”.

One result has been the optimised, flexible floor plan design of the residential units, which allows changes of use. This was made possible by a point-supported ceiling and the façade grid. Column grids on the façade even allow the windows to be moved within a certain order, thus ensuring maximum variability in the floor plan. In this way, this cross-generational sustainability concept can be realised.

The building has been built in solid construction and has seven floors with a gross floor space of 3204 square metres. It is worth noting that this component project is also characterised by its high energy standard as a passive house. The heating requirement is 14.8 kWh/m<sup>2</sup>ERAa according to the Passive House Project Planning Package (PHPP). A ventilation system provides fresh air, while heat recovery contributes to efficient energy use. In the central ventilation unit, the fresh air is preheated, after going through a filter stage, by a brine foundation absorber system and further heated to 16°C to 20°C by the waste heat of the exhaust air (heat recovery at least 85 percent). Only during very cold periods must the residual energy requirement be covered by district heating.

Passive house JAspern, source: POS architekten, photo © Vedritza Mayr



High urban ecology qualities are achieved through urban gardening and a high proportion of intensively greened roof areas; there are community terraces with raised planting beds on the 1st and 6th floors, for which rainwater is collected and used. Pedestrians and cyclists will find good conditions; for the interior, the product management during construction and verifiably good indoor air quality are further examples of the high standard here.

This innovative socio-cultural approach to community living, as well as the ecological building and open space concept, show an increasing expansion of the spectrum that sets new standards for the concept of the “green building” – entirely in keeping with the Viennese “Smart City”, which focuses on inclusion.

[www.klimaaktiv.at/bauen-sanieren/gebaeude-in-oesterreich/odm\\_2015-06.html](https://www.klimaaktiv.at/bauen-sanieren/gebaeude-in-oesterreich/odm_2015-06.html)

The objective of the Vienna Business Agency is the continuous development of international competitiveness by supporting both Vienna-based companies and their innovative strengths, and the sustainable modernization of the city as a business location. To achieve this, the Agency provides free consultations to all entrepreneurs in Vienna on the topics of business creation, business location or expansion, business support and financing. Furthermore, networking contacts in the Viennese economy are also made available.

The Vienna Business Agency supports and helps businesses complete their research and development projects with both individual consulting and monetary funding. Depending on requirements, they will receive information about sponsorships, financing opportunities, possible development partners, research service providers, or research infrastructure, according to their needs.

The Vienna Business Agency sees itself as a network of the Viennese Green Tech & Social Tech industry and supports businesses with consultations, as well with distribution and networking among themselves. Events and workshops on topics from the sustainability sector are held regularly.

Additionally, the Vienna Business Agency helps with company relocations or internationalization services. Assistance is provided to business founders and young entrepreneurs in the start-up area. Free workshops and training sessions on topics of everyday business are offered as well as small, affordable office spaces.

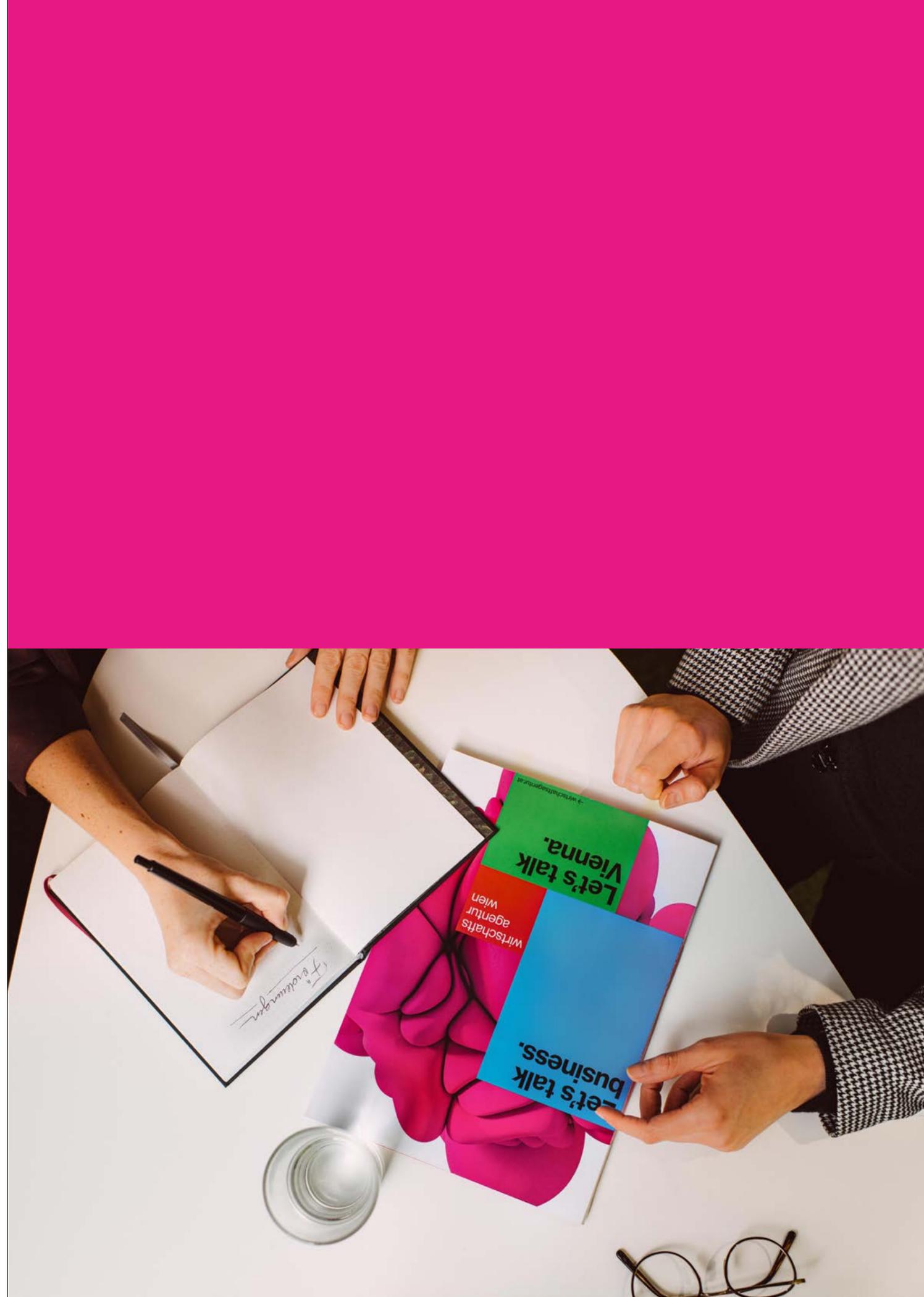
Founders Labs<sup>15</sup> support aspiring entrepreneurs and founders with a two-month, part-time program to help them get started.

All funding programs of the Vienna Business Agency can be found here:

[viennabusinessagency.at/funding/programs](https://viennabusinessagency.at/funding/programs)

15

<https://viennabusinessagency.at/startup-and-grow/founders-lab-future-technologies/>





Construction work in the Lakeside Town of Aspern, © Vienna Business Agency/David Bohmann

In the alphabetical list<sup>16</sup> on the following pages, we offer you an overview of selected companies from Vienna that offer services in the sustainable construction sector.

## Companies in the field of Green Building

COMPANY	DESCRIPTION	WEBSITE
17&4 ORGANISATIONS-BERATUNG GMBH	Independent private consulting and research company for sustainable development, founded in 1992; organisational consulting for project development and sustainable processes, professional development; main topics: resource and material efficiency, sustainable construction, energy, mobility, climate protection, sustainable urban development and participation.	<a href="http://www.17und4.at">www.17und4.at</a>
1STLEVELSOLAR GMBH	1stLevelSolar offers sophisticated photovoltaic solutions in all sizes for private households as well as companies, and relies on competent support, up-to-date products and reasonable prices. With SunDrops, 1stLevelSolar GmbH developed a mobile solar power plant with a variety of functions: among other things, a power generator with battery storage, a pumping system for agriculture and a drinking water treatment system with a capacity of 1000 litres/hour.	<a href="http://www.sundrops.at">www.sundrops.at</a>
AAP.ARCHITEKTEN ZT-GMBH	The focus is on energy-efficient and sustainable construction. The involvement of future users is an important part of the work. Construction tasks are supervised from the first draft to handing over the keys.	<a href="http://www.aap.or.at">www.aap.or.at</a>
AIT – AUSTRIAN INSTITUTE OF TECHNOLOGY	The AIT Austrian Institute of Technology is Austria's largest non-university research institution and is considered a specialist in the central infrastructure issues of the future. Around 1,300 employees conduct research throughout Austria – especially at its main facilities in Vienna Tech Gate, Vienna TECHbase, Seibersdorf, Neustadt, Tulln, Ranshofen and Graz. The energy-relevant focus areas include complex energy systems, battery technologies, photovoltaics, smart and resilient cities and smart grids.	<a href="http://www.ait.ac.at">www.ait.ac.at</a>

<sup>16</sup>

This list makes no claim to completeness

COMPANY	DESCRIPTION	WEBSITE
AKP ARCHITEKTEN KRONREIF-TRIMMEL & PARTNER ZT GMBH	The architectural office "Kronreif & Partner ZT GmbH" was founded over 25 years ago by architect Franz Kronreif. In 2012, architect Günther Trimmel took over the management of "akp Architekten Kronreif-Trimmel & Partner ZT GmbH". The successful projects include highly energy-efficient renovations. The project Mariahilferstrasse 182, 1150 Vienna was awarded the ETHOUSE Award of the ARGE Qualitätsgruppe Wärmedämmsysteme (Eng: "Working team quality group for thermal insulation systems").	<a href="http://www.architekten.or.at">www.architekten.or.at</a>
ALLPLAN GMBH	ALLPLAN GmbH was founded in Vienna in 1967 and has since developed from a planning office for heating, ventilation and air-conditioning technology to an international consulting company in the fields of technical building equipment, as well as energy and environmental management. The company is now active worldwide in the energy and environment sector.	<a href="http://www.allplan.at">www.allplan.at</a>
ARCHITEKTURBÜRO REINBERG ZT GMBH	The office has existed since 1980 as an independent planning office, since 1985 as a civil engineering office and since 2006 as Ziviltechniker GmbH. The architectural office focuses on ecological passive houses and plus-energy buildings. The team has experience in almost all building areas. More than 100 projects have so far been realised, all of which have a high ecological standard.	<a href="http://www.reinberg.net">www.reinberg.net</a>
ASPERN SMART CITY RESEARCH GMBH & CO KG (ASCR)	The Research Association was founded in 2013 by Siemens, Wien Energie, Wiener Netze and the City of Vienna (Vienna Business Agency and Vienna 3420). It develops technical solutions for the energy future – in real life in the newly built Lakeside Town of Aspern. Among other things, the focus is on forward-looking building automation and the use of the energy flexibility of buildings, also on the energy market – all this with the involvement of "smart users".	<a href="http://www.ascr.at">www.ascr.at</a>
ATELIER AMBROZY	Energy-optimised architecture in wood is the main focus of the studio; the range of services includes planning and renovation as well as, increasingly, corporate consulting before and during construction, private construction consulting as well as research, lecturing and teaching activities. Editor of planning manuals and other publications.	<a href="http://www.ambrozy.at">www.ambrozy.at</a>

COMPANY	DESCRIPTION	WEBSITE
AUSTRIA SOLAR	The association Austria Solar brings together all the reputable suppliers of solar thermal systems. In total, the association represents the interests of over 220 companies in the solar sector, an industry with almost 3,500 employees.	<a href="http://www.solarwaerme.at">www.solarwaerme.at</a>
BAUXUND FORSCHUNG UND BERATUNG GMBH	A technical office for Technical Chemistry specialising in environmental and health issues in the construction sector. Over the last 15 years, bauX has successfully implemented "chemicals and product management" in more than 800 construction projects in large-scale building construction throughout Austria, and has shown that it is possible to drastically reduce the use of organic solvents/VOCs and to thus achieve a corresponding reduction of indoor air pollution.	<a href="http://www.bauxund.at">www.bauxund.at</a>
E7 ENERGY INNOVATION & ENGINEERING	Research institute and engineering office for energy and environmental technology for energy efficiency, renewable energy and climate protection. An interdisciplinary team from the fields of technology, economics and ecology, which seeks the challenge of energy innovation to accelerate the energy turnaround. A special asset of e7 energy innovation & engineering is the company's independence from interest groups, federal and state governments.	<a href="http://www.e-sieben.at">www.e-sieben.at</a>
ENERGY COUNSELING CENTRES	At the energy counselling centres in Vienna you can find out everything about energy-efficient building and living, about energy-saving household appliances and about energy-conscious user behaviour: Wien Energie-Welt Spittelau, "die umweltberatung", EB-Plus – ARGE Energieberatung & Umweltbildung, AEE NÖ-Wien, Association for Consumer Information, OekoBusiness Wien – business consulting.	<a href="http://www.wien.gv.at/stadtentwicklung/energie/wissen/kontakte/index.html">www.wien.gv.at/ stadtentwicklung/energie/ wissen/kontakte/index.html</a>
ENERGY CENTER URBAN INNOVATION VIENNA	Urban Innovation Vienna (UIV) is a company of Wien Holding and supports the City of Vienna in the area of Smart City Vienna and the topical fields of energy, ICT and Urban Future. UIV emerged from TINA Vienna and Europaforum in 2017. The Energy Centre fulfils the role of an independent competence centre for energy and supports the City of Vienna in achieving its ambitious energy and climate protection goals. The focus is on advising the city, its departments and companies.	<a href="http://www.urbaninnovation.at">www.urbaninnovation.at</a>

COMPANY	DESCRIPTION	WEBSITE
ERNEUERBARE ENERGIE ÖSTERREICH (RENEWABLE ENERGY AUSTRIA)	The Dachverband Erneuerbare Energie Österreich (EEÖ) is the association of the most important interest groups in the field of renewable energy. The central objective of EEÖ is to convert the energy supply in Austria to renewable energy sources in the medium term and to create long-term framework conditions for the expansion of renewable energy sources.	<a href="http://www.erneuerbare-energie.at">www.erneuerbare-energie.at</a>
ETHUS GBMH	ETHUS is a start-up in the field of energy efficiency. In 2015, the company developed the first mobile app for trading in energy efficiency measures and successfully placed it on the market. Since 2016, the company has also been working together with companies from the energy sector to implement innovative concepts and solutions for the digitisation of the energy industry, for example how the integration of decentralised generation plants and smart home systems can be made attractive and tangible for the user.	<a href="http://www.ethus.at">www.ethus.at</a>
FH TECHNIKUM WIEN UNIVERSITY OF APPLIED SCIENCES DEPARTMENT OF RENEWABLE ENERGY	The Institute for Renewable Energy implements research and consulting projects in the future-oriented field of renewable energies. These projects guarantee teaching in an international context based on current research results. Its international positioning and connection to global research and development trends is assured through active participation in various research groups of the International Energy Agency and the EU technology platforms.	<a href="http://www.technikum-wien.at/ueber-uns/institute/institut-fuer-erneuerbare-energie">www.technikum-wien.at/ueber-uns/institute/institut-fuer-erneuerbare-energie</a>
GBV GEMEINNÜTZIGE BAUTRÄGER VEREINIGUNG (NON-PROFIT BUILDERS' ASSOCIATION)	The umbrella organisation of the non-profit housing industry functions both as a cooperative auditing association and as a lobby. As a lobby group, the association is responsible for legislative initiatives, the evaluation of draft laws, participation in committees and working groups, public relations, training and further education, as well as for providing information and advice to member companies. The statutory auditing association fulfils an extensive auditing mandate. This is active consumer protection, as is offered exclusively by the non-profit housing construction sector.	<a href="http://www.gbv.at">www.gbv.at</a>

COMPANY	DESCRIPTION	WEBSITE
GRAT – GRUPPE ANGE-PASSTE TECHNOLOGIE (ADAPTED TECHNOLOGY GROUP, VIENNA UNIVERSITY OF TECHNOLOGY)	The Angepasste Technologie Group (Adapted Technology Group, GrAT) is a research centre at the Vienna University of Technology. In national and international research and demonstration projects, the subjects Adapted Technology, Sustainable Development and Life Cycle Approach are developed and taught. Its main focus is on renewable raw materials, product-service systems, sustainable construction, resource and energy efficiency in buildings, and technology design and propagation. The aim is to adapt technologies to human needs and resources and not vice versa.	<a href="http://www.grat.at">www.grat.at</a>
GRÜNSTATTGRAU FORSCHUNGS- UND INNOVATIONS GMBH	The competence centre for green building promotes innovation and implementation for the green, smart city of the future. GRÜNSTATTGRAU is an interface between network partners from public authorities, industry and research. In the long term, quality assurance is promoted and new awareness of the range of services offered by green buildings in the context of climate change and energy is created.	<a href="http://www.gruenstattgrau.at">www.gruenstattgrau.at</a>
IBA WIEN NEW SOCIAL HOUSING	IBA Vienna regards itself as a process and platform with a broad-based involvement of the key players – in addition to planning and implementation, building developers and financing, research and teaching, as well as politics and administration, those key players are, above all, the people of Vienna.	<a href="http://www.iba-wien.at">www.iba-wien.at</a>
IBO – ÖSTERREICHISCHES INSTITUT FÜR BAUBIOLOGIE UND ÖKOLOGIE (VEREIN) UND IBO – ÖSTERREICHISCHES INSTITUT FÜR BAUEN UND ÖKOLOGIE GMBH	IBO is an independent scientific association that researches the interactions between human beings, buildings and the environment. Its central task is to develop and promote the principles of ecological architecture. Special fields: material ecology, building evaluation, building physics, measurements, research. IBO GmbH is the service company of the IBO association founded in 1980; baubook GmbH is operated by the Energy Institute Vorarlberg and IBO GmbH.	<a href="http://www.ibo.at">www.ibo.at</a>
IG ARCHITEKTUR (ARCHITECTS' INTEREST GROUP)	IG Architektur is an Austrian-wide architects' interest group. It is a trendsetting platform for the discussion of questions concerning architecture and architectural policy. IG Architektur has over 300 members, many of whom participate in the activities of the association.	<a href="http://www.ig-architektur.at">www.ig-architektur.at</a>

COMPANY	DESCRIPTION	WEBSITE
INNOVATIVE GEBÄUDE ÖSTERREICH (INNOVATIVE BUILDINGS AUSTRIA)	The platform innovative gebäude© is an independent interest group for the propagation of progressive and sustainable building standards in Austria. The members are companies from various sectors of the construction industry, which have set themselves the goal of implementing innovative and sustainable buildings at the highest level.	<a href="http://www.innovativegebaeude.at">www.innovativegebaeude.at</a>
JIRA ZT & SV GMBH	JIRA ZT & SV GmbH is a civil engineer & expert office for civil engineering, building physics, acoustics & noise protection. The team specialises in building physics planning and the supervision of small to large-scale projects. Managing Director DI Jira is also a certified thermographer (Level 3) and registered energy auditor.	<a href="http://www.jira.at">www.jira.at</a>
CHAMBER OF ARCHITECTS AND ENGINEERING CONSULTANTS FOR VIENNA, LOWER AUSTRIA AND BURGENLAND	The statutory chamber has the task of representing the professional, economic and social interests of architects and engineering consultants. In doing so, the zt: akademie gmbh, with its headquarters in Vienna, fulfils the statutory mandate for further education in accordance with the Chamber of Civil Engineers Act.	<a href="http://www.wien.arching.at">www.wien.arching.at</a>
KLIMA- UND ENERGIE-FONDS (CLIMATE AND ENERGY FUND)	The Climate and Energy Fund of the Republic of Austria regards itself as an impulse generator and innovative force for climate-relevant and sustainable energy and mobility technologies. It supports ideas, concepts and projects in the fields of research and development, market penetration and awareness raising. With a funding budget of over one billion euros, some 130,000 projects have been made possible to date.	<a href="http://www.klimafonds.gv.at">www.klimafonds.gv.at</a>
KLIMAAKTIV	klimaaktiv is the climate protection initiative of the Federal Ministry for Climate Action (BMK). With the development and provision of quality standards such as the klimaaktiv building standards, and with advice, information and a large network of partners, klimaaktiv supplements the existing climate protection subsidies and regulations.	<a href="http://www.klimaaktiv.at">www.klimaaktiv.at</a>
LLYNX ELECTRONIC GMBH	llynx sees itself as a competent and reliable partner for the planning, development and production of your electronics, lighting control and sensor technology. The llynx product range includes operating, control and regulation equipment for light and lighting purposes as well as sensor technology.	<a href="http://www.llynx.at">www.llynx.at</a>

COMPANY	DESCRIPTION	WEBSITE
LUKAS LANG BUILDING TECHNOLOGIES GMBH	With Lukas Lang Building Technologies, a construction method has been developed with which buildings can be individually planned and constructed from industrially prefabricated components. Constructed buildings can be extended, changed or dismantled at any time without any reduction in their value. An efficient construction method for single and multi-family homes, housing estates, kindergartens, hotels, office buildings, staff accommodation, market halls and event buildings and much more. The first 100% industrial production of building components enables the most economical construction costs and maximum quality assurance in the production and construction process.	<a href="http://www.lukaslang.com">www.lukaslang.com</a>
MUNICIPAL DEPARTMENT 22, ENVIRONMENTAL PROTECTION (MA22)	Green building can contribute to preserving biodiversity: conservation measures for rare species and habitats are mandatory by law. In Vienna's urban area, certain interventions in nature are prohibited or subject to approval, depending on the protection category of the area.	<a href="http://www.wien.gv.at/umweltschutz/naturschutz/biotop/netzwerk.html">www.wien.gv.at/umweltschutz/naturschutz/biotop/netzwerk.html</a>
MYWARM GMBH	myWarm GmbH is an innovative developer of energy efficiency solutions for holistic, metrologically controlled and directly verifiable optimisation. The myWarm®   pure-efficiency solution is the first milestone in a development roadmap which aims to achieve usage-dependent, self-optimising operation, including integrated consumption monitoring for every room.	<a href="http://www.mywarm.at">www.mywarm.at</a>
NONCONFORM ZT GMBH	nonconform is first and foremost an architectural office that sees its task primarily in promoting the sustainable development and revitalisation of buildings, public spaces and infrastructures. With the nonconform ideenwerkstatt and the nonconform stadthaus, they are leaving the beaten track in the interests of sustainable action, and revitalising spaces and squares with participatory planning, creating open-use urban buildings.	<a href="http://www.nonconform.at">www.nonconform.at</a>
ÖGLA AUSTRIAN SOCIETY FOR LANDSCAPE ARCHITECTURE	About 40 of the offices in Austria are represented by the Austrian Society for Landscape Architecture and Planning (ÖGLA) within the framework of office membership. The fields of activity of landscape architecture include the planning of outdoor facilities for private and public buildings, roof gardens, façade greening, sports, play and leisure facilities.	<a href="http://www.oegla.at">www.oegla.at</a>

COMPANY	DESCRIPTION	WEBSITE
ÖGNB AUSTRIAN SUSTAINABLE BUILDING COUNCIL (ASBC)	The ASBC sees itself as an umbrella for all those companies, institutions and also individuals who are interested in a higher qualification of the Austrian building industry in the context of sustainable building: Building evaluation systems, which are further developed under the umbrella of the ASBC, were from the very beginning developed as an "open standard" and made freely available to interested persons, companies and institutions. Furthermore, as an open source developer, the ASBC wants to consciously counteract the trend towards expensive labels.	<a href="http://www.oegnb.net">www.oegnb.net</a>
ÖGNI – AUSTRIAN SOCIETY FOR SUSTAINABLE REAL ESTATE MANAGEMENT	The ÖGNI is an NGO for the establishment of sustainability in the construction and real estate industry. Its aim is to demonstrate the added value of building certification. ÖGNI was founded in 2009 and is a cooperation partner of the DGNB (German Sustainable Building Council), has adopted its certification system and adapted it to Austria.	<a href="http://www.ogni.at">www.ogni.at</a>
ÖGUT	The Austrian Society for Environment and Technology is a competence centre and platform for sustainable development. With its professional range of services, ÖGUT links about 110 organisations and institutions from the fields of business, administration, science and the environment.	<a href="http://www.oegut.at">www.oegut.at</a>
AUSTRIAN ENERGY AGENCY	The Austrian Energy Agency is a competence centre for energy and advises decision-makers in politics, business and administration on a scientific basis.	<a href="http://www.energyagency.at">www.energyagency.at</a>
ÖSTERREICHISCHE FORSCHUNGS-FÖRDERUNGSGESELLSCHAFT (FFG)	The Austrian Research Promotion Agency is the national funding institution for business-related research and development in Austria.	<a href="http://www.ffg.at/content/das-nationale-angebot-f-r-die-energie-und-umweltforschung">www.ffg.at/content/das-nationale-angebot-f-r-die-energie-und-umweltforschung</a>
PHOTOVOLTAIC AUSTRIA	The Federal Association of Photovoltaic Austria is an industry-wide, non-partisan lobby group that focuses on improving the general conditions for photovoltaics in Austria.	<a href="http://www.pvaustria.at">www.pvaustria.at</a>

COMPANY	DESCRIPTION	WEBSITE
POS ARCHITEKTEN ZT GMBH	In terms of sustainable architecture, POS architekten pursue a holistic approach. Their competence and focus is on planning and realising holistically sustainable building concepts. They are planned by an integral planning team and show a high degree of innovation. Through intensive research activities in the field of applied building research, POS architekten have developed great expertise in planning sustainable buildings.	<a href="http://www.pos-architecture.com">www.pos-architecture.com</a>
PROHOLZ AUSTRIA WORKING COMMUNITY OF THE AUSTRIAN WOOD INDUSTRY	proHolz Austria is the marketing institution of the Austrian forestry and wood industry. The aim is to communicate the ecological, economic and constructional advantages of wood as a material and building material and to encourage its increased use. One of the services offered is a catalogue of wood and wood-based materials, building materials, components and component joints for timber construction that have been tested and/or approved in terms of building physics and ecology: dataholz.eu	<a href="http://www.proholz.at">www.proholz.at</a>
PULSWERK GMBH	pulswerk was founded in 2012 by the Austrian Institute of Ecology. The Institute of Ecology conducts research for the sustainable development of our society. pulswerk advises companies and politicians on the planning and implementation of sustainable solutions. Development of a comprehensive system for quality assurance and building evaluation for the urban development area Lakeside Town of Aspern on the basis of the ASBC evaluation tool.	<a href="http://www.pulswerk.at">www.pulswerk.at</a>
RATAPLAN-ARCHITEKTUR ZT GMBH	RATAPLAN is the joint office of the architects Rudolf Fritz, Susanne Höhndorf, Gerhard Huber, Martina Schöberl and Friedel Winkler. The team's basic principles include clear pathways for open architecture that requires farsightedness. Its competences include façade greening, conversions and extensions in passive house standard, co-determination projects and much more.	<a href="http://www.rataplan.at">www.rataplan.at</a>
RAUM & KOMMUNIKATION GBMH	raum & kommunikation is an interdisciplinary planning office with a focus on innovative residential construction projects, urban development planning and new urban mobility solutions. High social, ecological and economic standards determine the approach taken by raum & kommunikation; the human being always remains the most important measure of their work. The services cover many levels: from research and political consulting to planning at city and neighbourhood level, from process support and process control to implementation in exemplary construction projects.	<a href="http://www.raum-komm.at">www.raum-komm.at</a>

COMPANY	DESCRIPTION	WEBSITE
RESSOURCEN SAVING GMBH	The Ecoturbino® is a patented precision part – a small turbine that saves 36 percent of hot water by reducing its diameter and at the same time sucks in air (with the same volume as the hot water saved) through a bypass hole and mixes it in. The Ecoturbino not only reduces water consumption, but also energy consumption.	<a href="http://www.ecoturbino.com">www.ecoturbino.com</a>
RÜDIGER LAINER + PARTNER ARCHITEKTEN ZT GMBH	The office RLP Rüdiger Lainer + Partner has been working in the fields of architecture, urban development and general planning for more than 30 years. As a general planner, RLP takes on the entire conception, planning and coordination of all tasks in the construction process with all actors involved until the building is commissioned. This includes helping to optimise function, costs, ecology, life cycle costs and urban environment – a preparation for the decision-making process that saves the client time and cost.	<a href="http://www.lainer.at">www.lainer.at</a>
SCHÖBERL & PÖLL GMBH	Schöberl & Pöll GmbH is a large building physics office and has made it its mission to promote highly energy-efficient buildings. The company focuses on building physics planning, research and the further development of buildings with the highest energy efficiency, such as passive houses, zero-energy houses, plus-energy buildings and energy self-sufficient buildings. The office has supervised the majority of passive house projects worldwide, specialises in multi-storey passive house construction and promotes the development and dissemination of PlusEnergy buildings.	<a href="http://www.schoeberlpoell.at">www.schoeberlpoell.at</a>
SEENSY	Seensy not only informs the user – like other monitoring systems – of their energy consumption, but also helps to identify and understand inefficiencies (= savings potentials), offers concrete solutions and thus enables savings of up to 50 percent. By merging different sources of information from internal and external contexts in real time, Seensy learns the behaviour patterns of buildings, people, processes and business models, identifies inefficiencies and enables simulations to achieve optimal solutions/savings.	<a href="http://www.seensy.me">www.seensy.me</a>
SIROCCO LUFT-UND UMWELTECHNIK GMBH	SIROCCO Luft und Umwelttechnik GmbH has been a leader in the field of industrial ventilation technology for over 100 years. The traditional core area is the production of industrial fans and heat exchangers.	<a href="http://www.sirocco.at">www.sirocco.at</a>

COMPANY	DESCRIPTION	WEBSITE
SOLABOLIC GMBH	SOLABOLIC is developing the next generation of parabolic trough collectors, which have the potential to significantly increase the economic efficiency of solar thermal power generation. Its unique, patented design ensures the necessary optical precision in windy conditions and eliminates the inefficiency of large collectors. At the same time, it also reduces material usage, production costs, maintenance costs and delivery costs.	<a href="http://www.solabolic.com">www.solabolic.com</a>
SPUMIX DÄMMSTOFFE GMBH	In scientific cooperation with the Vienna University of Technology, Spumix develops completely new insulation materials based on microporous foam ceramics. The innovative production process results in extremely low raw densities and, at the same time, high strength. The fibre- and organic-free products have an excellent thermal insulation effect.	<a href="http://www.spumix.com">www.spumix.com</a>
FUNDING BY THE CITY OF VIENNA MUNICIPAL DEPARTMENTS MA 25 AND MA 50	The Municipal Departments for Technical and Financial Assessment in Matters of Housing Construction and Promotion, Specialised Urban Renewal (MA 25) and for Housing Subsidies and the Arbitration Board for Legal Housing Matters (MA 50) handle energy-relevant subsidies in housing construction.	<a href="http://www.wien.gv.at/wohnen/wohnbautechnik/foerdern/index.html">www.wien.gv.at/wohnen/wohnbautechnik/foerdern/index.html</a> <a href="http://www.um-haeuser-besser.at">http://www.um-haeuser-besser.at</a>
CITY OF VIENNA EXECUTIVE OFFICE FOR THE CO-ORDINATION OF CLIMATE PROTECTION MEASURES	The Municipal Chief Executive Office (MD) Office for the Coordination of Climate Protection Measures coordinates activities in the areas of the climate protection plan, awareness raising, climate change adaptation and climate research.	<a href="http://www.wien.gv.at/umwelt/klimaschutz">www.wien.gv.at/umwelt/klimaschutz</a>
CITY OF VIENNA MUNICIPAL DEPARTMENT ENERGY PLANNING (MA 20)	The tasks of MA 20 Energy Planning include the coordination and further development of energy-relevant concepts and energy strategies, the coordination and further development of spatial energy planning in accordance with the Urban Development Plan 2025, controlling with regard to the achievement of the objectives and recommendation of relevant measures, the design and granting of energy-relevant subsidies, the energy-economic assessment of projects in official procedures and the development of pilot projects, particularly in coordination with municipal companies.	<a href="http://www.wien.gv.at/stadtentwicklung/energie">www.wien.gv.at/stadtentwicklung/energie</a>

COMPANY	DESCRIPTION	WEBSITE
SWIMSOL GMBH	Swimsol GmbH offers the planning and installation of photovoltaic systems on roofs. These activities primarily serve to build competence and awareness in the markets where floating solar systems are to be offered. The target areas are tropical islands and coastal cities where diesel generators are used to generate electricity and where the electricity production costs exceed € 0.20 per kWh.	<a href="http://www.swimsol.com">www.swimsol.com</a>
TATWORT NACHHALTIGE PROJEKTE GMBH	The current service portfolio and the core competencies of tatwort – Nachhaltige Projekte (sustainable projects) combine communication and participation expertise and professional project management with content expertise in the fields of renewable energies, environment, water, climate protection, sustainable consumption and efficient use of resources. The company solves complex interdisciplinary problems across all sectors and innovatively in consortia consisting of experts in business, science and administration.	<a href="http://www.tatwort.at">www.tatwort.at</a>
TEAMGMI INGENIEURBÜRO GMBH	The teamgmi has been working as a team of engineers in planning in the field of energy optimisation of buildings for 20 years. The teamgmi has supervised numerous projects in Liechtenstein, Switzerland, Germany and Austria and is involved in various applied building research projects.	<a href="https://teamgmi.com/">https://teamgmi.com/</a>
TECHNOLOGIE-PLATTFORM PHOTOVOLTAIK AUSTRIA (TECHNOLOGY PLATFORM PHOTO-VOLTAICS AUSTRIA)	The association "Technologieplattform Photovoltaik Austria" (TPPV) was founded in May 2012 as a joint initiative of Austrian manufacturing companies in the field of photovoltaics and relevant Austrian research institutions. Innovation and research for the Austrian photovoltaics industry are to be optimised in order to achieve a greater proportion of Austrian added value in the global photovoltaics market.	<a href="http://www.tppv.at">www.tppv.at</a>
VIENNA UNIVERSITY OF TECHNOLOGY ENERGY ECONOMICS GROUP (EEG)	The Energy Economics Group (EEG) at the Vienna University of Technology researches and teaches in the fields of energy markets, climate change, renewable energy, energy modelling and sustainable systems.	<a href="http://www.eeg.tuwien.ac.at">www.eeg.tuwien.ac.at</a>
VIENNA UNIVERSITY OF TECHNOLOGY RESEARCH FOCUS ENERGY & ENVIRONMENT	With more than 30,000 students and around 4,800 employees, the Vienna University of Technology is Austria's largest research and educational institution in the scientific and technical field. In order to promote interdisciplinary cooperation, the Research Centre "Energy and Environment" was established, which links the existing in-house research initiatives.	<a href="http://www.energiewelten.tuwien.ac.at">www.energiewelten.tuwien.ac.at</a>

COMPANY	DESCRIPTION	WEBSITE
VERTICAL FARM INSTITUTE	Vertical Farming enables the year-round, sustainable cultivation of food on the smallest possible area by means of vertical cultivation methods and by using natural energy resources. The vertical farm institute is researching and planning the future of food together with regional and international partners.	<a href="http://www.verticalfarminstitute.org">www.verticalfarminstitute.org</a>
WIEN 3420 AG	The central contact for the Urban Lakeside Town (Seestadt). Wien 3420 aspern Development AG is developing a city where over 20,000 people will live and thousands of people will work by 2028. Together with its partners, the development company coordinates urban development and the expansion of the infrastructure in the Urban Lakeside Town. The multidisciplinary team contributes a wide range of experience and is a sparring partner for investors, developers and companies.	<a href="http://www.aspern-seestadt.at/ueber_uns/wien_3420_ag">www.aspern-seestadt.at/ueber_uns/wien_3420_ag</a>
WIEN ENERGIE GMBH	Wien Energie GmbH is an energy company that is part of Wiener Stadtwerke. Wien Energie is the largest energy supplier in Austria. Wien Energie is active in the supply of electricity, natural gas and heat to around 2 million customers, 230,000 commercial and industrial facilities and 4,500 agricultural businesses in the greater Vienna area.	<a href="http://www.wienenergie.at">www.wienenergie.at</a>
VIENNA ENVIRONMENTAL OMBUDSMAN	The aim of the Environmental Ombudsman (WUA) is to protect the interests of environmental conservation on behalf of the people of Vienna and thus contribute to improving the environmental situation in Vienna. The Ombudsman's main focus is on nature conservation and urban ecology. They provide information and proposals for solutions regarding tree protection, light pollution and bird collisions with glass surfaces.	<a href="http://www.wua-wien.at">www.wua-wien.at</a>
WIENER WOHNBAU-FORSCHUNG (VIENNA HOUSING RESEARCH PROGRAMME)	The research programme of the Housing, Residential Construction and Urban Renewal Executive Group of the City of Vienna supports current developments in the field of housing, residential construction and urban renewal. Accordingly, since 2011 research projects within four defined focal points have been commissioned: affordable housing; technical, ecological and social qualities and standards in new construction; technical, ecological and social qualities and standards in rehabilitation; social mixing, integration and participation.	<a href="http://www.wohnbauforschung.at">www.wohnbauforschung.at</a>

COMPANY	DESCRIPTION	WEBSITE
WIENER WOHNEN	The enterprise Stadt Wien – Wiener Wohnen administers, renovates and manages Vienna's municipal housing estates. This includes around 220,000 municipal apartments (of which around 1,400 are service apartments for janitors and 7,500 apartments under third-party management), 5,129 restaurants and more than 47,000 garage and parking spaces. This makes Wiener Wohnen the largest municipal property management company in Europe.	<a href="http://www.wienerwohnen.at">www.wienerwohnen.at</a>
WOHNFONDS WIEN	The wohnfonds_wien is a non-profit organisation and acts as a coordinating body between developers, house owners and municipal departments (especially funding agencies). The highest decision-making body is the board of trustees of wohnfonds_wien, in which various interest groups and the City of Vienna are represented. wohnfonds_wien was founded in 1984 after a decision by the Vienna City Council and was named the "Vienna Land Provision and Urban Renewal Fund" (Wiener Bodenbereitstellungs- und Stadterneuerungsfonds).	<a href="http://www.wohnfonds.wien.at">www.wohnfonds.wien.at</a>
XYLEM TECHNOLOGIES	XYLEM Technologies bietet Unternehmen, Beratern sowie Städten und Gemeinden innovative Lösungen für das Energie- und Risikomanagement an. Zu den Softwarelösungen gehört u. a. ECOCITIES, das Betreiber von Gebäudegruppen – wie Unternehmen, Gemeinden, Städte, Hausverwaltungen – bei der Entscheidung unterstützt, wie Budget am effizientesten eingesetzt werden kann, um das Immobilienportfolio auf bestimmte politische, ökonomische und ökologische Zielsetzungen auszurichten (z. B.: Reduktion von Kosten und CO <sub>2</sub> ).	<a href="http://www.xylem-technologies.com">www.xylem-technologies.com</a>
ZENTRUM FÜR GLOBALEN WANDEL & NACHHALTIGKEIT (CENTRE FOR GLOBAL CHANGE AND SUSTAINABILITY)	The Centre for Global Change and Sustainability promotes networking, exchange and cooperation in the fields of climate, global change and sustainability – both internally (among institutes and departments of the University of Natural Resources and Life Sciences BOKU) and externally (at a local, national and international level). The aim is to promote institutional sustainability at the University of Natural Resources and Life Sciences and to act as a point of contact to promote and support sustainable projects, initiatives and people know-how, expertise, contacts, visibility and foresight.	<a href="http://www.globalchange.boku.ac.at">www.globalchange.boku.ac.at</a>





Technology reports are available on the following topics:

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