energy innovation austria

2/2023

Current developments and examples of sustainable energy technologies

klima+ energie fonds

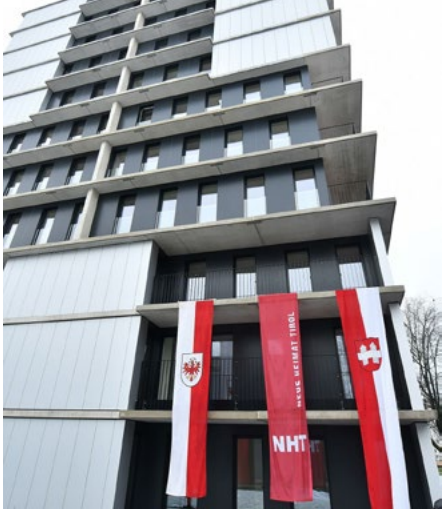
Federal Ministry
Republic of Austria
Climate Action, Environment, Energy, Mobility, Innovation and Technology

Climate-friendly buildings

Monitoring sustainable construction methods in Austria

Innovative strategies for buildings and residential areas are geared towards significantly reducing a building's consumption of energy and resources as well as its carbon emissions while also creating an affordable and comfortable place for residents to live that gives them a good quality of life. A look at how showcase projects are running day-to-day reveals what potential and opportunities for optimisation are on offer here.

Sonnengarten Limberg residential complex, photo: Hilebrand



St. Paulus apartment block, photo: NEUE HEIMAT TIROL Gemeinnützige WohnungsGmbH

Building sustainably

on the path towards climate neutrality

Significant amounts of energy and resources are necessary to build, live in, renovate and deconstruct buildings. A high share of energy consumption and climate-damaging emissions around the world can be traced back to the building sector, with construction and buildings responsible for 38% of global carbon emissions.[1]

Numerous innovative developments in the field of sustainable building have been researched, trialled and put into practice in Austria in recent years. Pioneering strategies for buildings and residental areas are aimed at reducing the amount of energy and materials used, switching to renewable energy carriers, employing environmentally friendly construction materials and improving indoor comfort and quality of life – all at a comparable cost to a conventional construction method.

Building sustainably means considering the entire life cycle of a building and drastically reducing climate-damaging emissions in all phases – from construction and use of the building through to recycling. Grey energy and process-related greenhouse gas emissions from the materials used, play a key role here. Another aspect is reusing and recycling the construction materials used once a building has reached the end of its life to serve the circular economy. In the future, buildings should also be planned and equipped so as to be able to generate renewable energy themselves or store energy as part of an integrated local system.

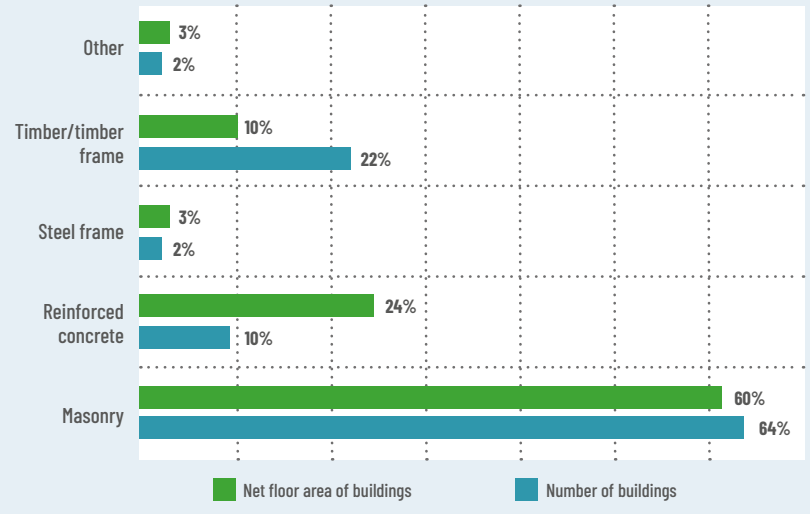
[1] "2020 Global Status Report for Buildings and Construction" by the UN Environment Programme, globalabc.org/sites/default/files/inline-files/2020%20Buildings%20GSR_FULL%20REPORT.pdf

MARKET ANALYSIS OF SUSTAINABLE CONSTRUCTION IN AUSTRIA

A recent study commissioned by the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (project management: pulswerk GmbH) conducted a market survey of newbuilds in Austria from 2010 to 2021 and analysed the relevance of innovative construction technologies for climate protection. Austria's stock of buildings has increased by around 20% over these years, with 311,100 newbuilds – representing a total net floor area of 130 million square metres – constructed since 2010. Of these, 64% are of masonry construction, 22% are made of timber and 10% use reinforced concrete. In terms of the net floor area created, by contrast, the market share paints a somewhat different picture: here, masonry construction accounts for 60%, with reinforced concrete in second place at 24% and timber last with 10%. Although renewable energy systems became much more common in newbuilds over the period studied, some 14% of the new buildings are still heated by fossil fuels.

nachhaltigwirtschaften.at/de/sdz/projekte/bautechnologien-klimaschutz.php

Market share covering all new buildings constructed since 2010 by construction method
Calculations: pulswerk GmbH 2021; source of data: Statistics Austria, Buildings and Dwellings Register (GWR), 2021



Itzling care home, block 4, photo: City of Salzburg, Georg Pirchner

Timber passive house on Mühlweg, 1210 Vienna, photo: Bruno Klomfar

ASSESSING SUSTAINABILITY ASPECTS

The study focused on analysing three construction methods that are relevant to climate protection: timber construction, reinforced-concrete buildings fitted with thermally activated building systems, and those built using a (semi-)monolithic brick construction method. These construction methods were recorded and documented in a standard grid together with their respective strengths and weaknesses and the potential that they offer for achieving climate neutrality. The following aspects were evaluated: energy efficiency, climate protection, nature conservation, the circular economy, economic efficiency, and social worth and acceptance. As well as the quantitative distribution of the various construction methods, statements on building size classes, forms of use and regional distribution at federal state level, the study also compared the construction methods against the energy supply systems installed.

All construction methods possess key qualities that can make a significant contribution to sustainability and climate protection. Put simply, timber construction's biggest strength lies in the fact that it emits the least greenhouse gas emissions in the form of "grey energy". Many of its elements can also be prefabricated.

Buildings with thermally activated building systems score highly with their concepts for heating and cooling and are the best at supplying buildings with renewable energy in summer and winter. The (semi-)monolithic brick construction method produces straightforward, durable walls with very good insulating properties that take little time and effort to deconstruct compared to conventional heat insulation. The experts believe that the development of hybrid construction systems that harness the strengths of all three methods harbours significant potential for both newbuilds and renovation.

MONITORING TRIAL BUILDINGS IN AUSTRIA

Austria has seen a large number of state-of-the-art, energy-efficient newbuilds erected and existing buildings renovated using sustainable methods over the past few years. Model buildings have been evaluated under real-life conditions to ensure that planned energy efficiency performance targets can be met and the desired sustainability characteristics implemented and to identify areas where further improvements can be made. This issue presents selected results from some of these monitoring projects.

EXAMPLE OF A SWOT ANALYSIS: TIMBER CONSTRUCTION

STRENGTHS
- Renewable raw material
- Forests act as carbon sinks
- National and EU-wide investments in expansion and innovation
- Highly skilled workers
- Strong construction product exports

WEAKNESSES
- Fairly dependent on imported raw materials
- Fire prevention regulations and legal restrictions
- Particularly exposed to the shortage of skilled labour
- Doubts over the scalability of the segment

OPPORTUNITIES
- Expanding sustainable forestry in Austria
- High degree of prefabrication leading to short construction times
- Multi-storey timber house construction

RISKS
- Switching species: conifers are likely to have to be replaced by deciduous trees – is the timber industry prepared?
- Quantities of damaged timber
- Impact of climate change on raw material stores
- Ability of buildings to withstand summer conditions

Wohnprojekt Wien, photo: Wohnprojekt Wien

DELIGHT

Energy consumption and user comfort in eleven innovative buildings

Monitoring systems enable a building's energy performance and comfort to be analysed, and potential for optimising its running to be identified. It is often the case that in practice the real-life operation turns out differently from the original plans, pushing running costs up and the building's environmental performance down. A monitoring system helps to cut energy costs, conserve resources and improve the residential comfort. It also has a positive impact on the service life and maintenance requirements of the individual installations, allowing running costs to be reduced even further. Although many newbuilds have the facilities to offer continuous monitoring of their operation, there have only been few attempts to date, to take and evaluate measurements in this way.

In the DeLight (Demo light Impact-Monitoring)[1] project, the energy consumption and comfort of eleven innovative buildings in Austria were extensively analysed under real-life conditions. They included buildings used by the services sector (offices, educational institutions, sports facilities, nursing homes and hospitals) as well as large residential buildings constructed to different energy efficiency standards: passive houses, positive energy buildings, low-tech buildings and highly efficient renovation projects.

MONITORING METHODS

Over a period of one year, the amount of energy required to supply and distribute heating, hot water and cooling, as well as electricity consumption (including renewable energy generated on site by PV systems and solar thermal energy) were recorded in all the buildings based on a detailed measurement concept. Three comfort parameters – temperature, relative humidity and CO_2 concentration in the ambient air – were measured in selected reference rooms. Professional, web-based hardware and software solutions were used to record and validate the measurements. The actual consumption figures were compared against the forecasts, and any differences identified were analysed. The project team also picked a particular area to focus on for each property, which was studied in detail with the help of the monitoring data. The owners and operators of the buildings were also able to use the monitoring platform while the project was running, in order to acquaint themselves with the benefits of an automated monitoring tool.

From top to bottom: St. Paulus Kindergarten, photo: NEUE HEIMAT TIROL Gemeinnützige Wohnungs GmbH; Graz BA1 trade fair district, photo: Gem. Wohn- u. Siedlungsgenossenschaft Ennstal reg. Gen.m.b.H.; Itzling care home, block 4, photo: City of Salzburg, Marko Herold; Kinder- und Herzzentrum Innsbruck, photo: Gerhard Berger; St. Josef Hospital, wing 10, photo: Mladen Velic



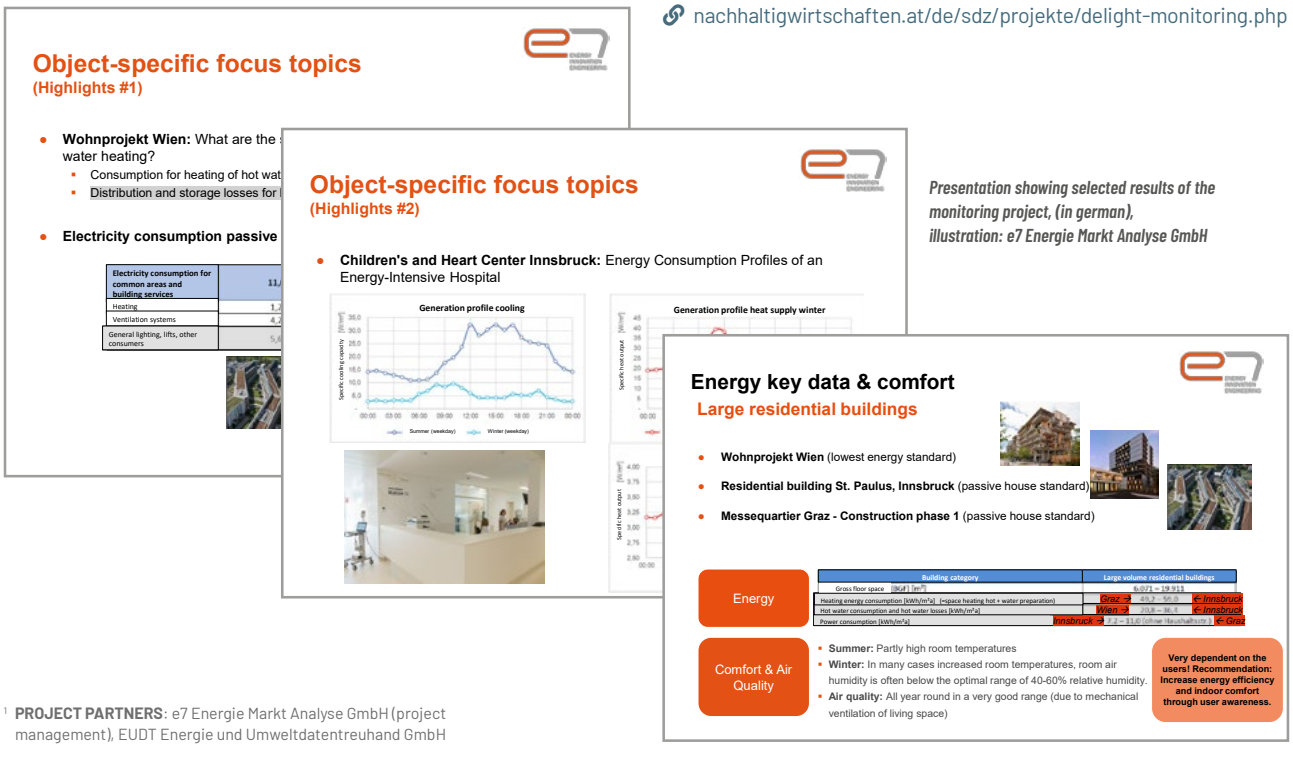


From L to R: Kirchdorf district administrator's office, photo: e7 Energie Markt Analyse GmbH; Jägermayrhof education centre, photo: Upper Austria Chamber of Employers and Employees; Liefering sports hall, photo: City of Salzburg/Johannes Killer; St. Paulus apartment block, photo: NEUE HEIMAT TIROL Gemeinnützige WohnungsGmbH; BIG corporate headquarters, photo: e7 Energie Markt Analyse GmbH

POTENTIAL FOR FURTHER IMPROVEMENT AND RECOMMENDATIONS

The project team were able to use the results of their monitoring to demonstrate potential starting points for improvements in building operations and devise tangible measures together with the buildings' owners and operators. Potential for optimisation with scope for reproducibility was identified in a number of areas, including the supply of heating and hot water, cooling, ventilation and air conditioning technology. Raising awareness amongst users also plays a key role in increasing energy efficiency and indoor comfort. The recommendations were summarised for the various target groups (building planners, constructors and operators) in a clear, easy-to-understand presentation. The project demonstrates that the monitoring of energy and comfort parameters is an ideal tool for keeping an eye on the day-to-day operation of buildings. Future large-scale newbuilds and renovation projects should incorporate at least a basic level of monitoring infrastructure so that the data recorded during the operation of the buildings can be evaluated at regular intervals.

nachhaltigwirtschaften.at/de/sdz/projekte/delight-monitoring.php



Presentation showing selected results of the monitoring project, (in german), illustration: e7 Energie Markt Analyse GmbH

[1] **PROJECT PARTNERS**: e7 Energie Markt Analyse GmbH (project management), EUDT Energie und Umweltdatentreuhand GmbH

Two flagship projects: Langenegg (left) and passive house renovation of Am Sportplatz 4 (right), photos: Caroline Begle, Eckart Drössler

The long-term evaluation

of 100 flagship buildings in Austria

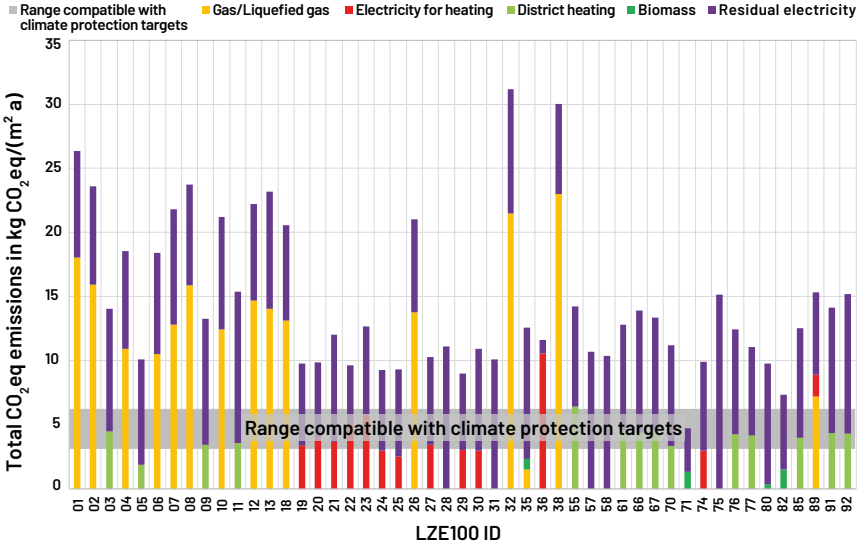
The "LZE 100 Leuchtturmobjekte"[1] project recorded and statistically evaluated energy consumption figures from over 100 representative high-efficiency buildings used for a variety of purposes over an operating time of between three and twenty-five years and compared them with the equivalent values for identical building types with a conventional level of energy consumption. The project thus makes an important contribution to an impartial debate over whether energy demand figures for high-efficiency buildings that have been calculated in advance can actually be achieved in their day-to-day operation.

Drawing on the data collected from real life, the extensive monitoring study demonstrates the savings potential offered by buildings that have been optimised for energy efficiency compared with other new buildings, renovation projects and existing buildings used for the same purpose. The data also were used to calculate the actual greenhouse gas emissions generated from running the buildings.

SELECTED RESULTS

>> Energy used for heating/hot water in multi-family homes
For the "multi-family home" building category, the analyses revealed that large multi-family homes of all ages have an average specific final energy consumption of between around 105 kWh per m^2 of living area (Wohnnutzfläche) per year (m^2_{WNF}a) for buildings heated by district heating and around 140 kWh/(m^2_{WNF}a) for those heated by oil- or gas-fired boilers. The specific final energy consumption for room heating and hot water in newbuilds is roughly 85 kWh/(m^2_{WNF}a) on average.

The multi-family homes with gas-fired heating and the best energy optimisation measures achieve specific final energy consumption values for heating and hot water of between 42 and 44 kWh/(m^2_{WNF}a), while the equivalent figure for multi-family homes with district heating ranges from 50 to 53 kWh/(m^2_{WNF}a).



Total emissions in CO_2eq by usable area, broken down by energy carrier – apartment blocks

The chart shows the emissions in CO_2eq for all types of apartment block by living area, broken down by energy carrier; the analysis uses the annual conversion factors specified in Austrian Institute of Construction Engineering (OIB) Guideline 6 (2019). "Residual electricity" comprises all final energy consumption (for heating and hot water, auxiliary electricity, general electricity and household electricity) minus the electricity used for PV systems. The emissions in CO_2eq generated by buildings heated by natural gas are several times higher than the levels that would be compatible with climate protection targets (grey area).
Image: Energy Institute Vorarlberg

“In practice, high-efficiency new buildings and renovation projects on different types can result in much lower energy consumption using readily available components and concepts than the statutory minimum requirements dictate. Buildings with an envelope whose quality meets the minimum technical construction requirements will miss the climate targets, even if they’re fitted with a renewable heat source. Building efficiency and renewable heat sources need to be combined if the building sector is to be compatible with our climate protection goals.”

Photo: Markus Gmeiner

THOMAS ROSSKOPF-NACHBAUR
ENERGY-EFFICIENT CONSTRUCTION, ENERGY INSTITUTE VORARLBERG

KEY FINDINGS FROM THE MONITORING PROJECT:

- High-efficiency buildings do work in practice.
- A high level of efficiency can be planned and makes economic sense.
- The current minimum level of requirements for new buildings is too low to meet climate targets.
- The best energy carriers for new buildings are heat pumps and local/district heating.
- Large-scale PV systems are close to becoming cost-effective.
- The analysis of the real energy consumption of buildings is just beginning.

Haller project, Feldkirch, photo: Caroline Begle

New high-efficiency multi-family homes thus consume around 40–50% less energy than new buildings constructed in line with the current minimum requirements. Leading the field are multi-family homes heated by heat pumps, which boast specific final energy consumption values of 12–13 kWh/(m^2_{WNF}a) for heating and hot water.

>> Estimating greenhouse gas emissions

Regardless of what energy carrier is used for heating and hot water, significant reductions in the consumption of auxiliary and household electricity can also be achieved in buildings that have been optimised for energy efficiency. The calculations show that many of the buildings studied, generate very low greenhouse gas emissions day to day. The best multi-family homes with heat pumps generate total emissions from all their energy applications of around 11 kg/(m^2_{WNF}a) based on an assessment using the current consumer electricity mix for Austria. Assuming the anticipated specific greenhouse gas emissions from consumer electricity for 2030, these buildings will be able to meet the relevant climate targets[2] (i.e. emissions of no more than 6 kg/(m^2_{WNF}a)). The same applies to the best buildings with heat pumps and for the best renovation projects.

OUTLOOK

The low consumption figures for the best buildings studied highlight how much potential there is for reducing consumption in new buildings and renovation projects. As well as the decarbonisation of the construction sector, key factors for achieving the target of making Austria climate neutral by 2040 also include lowering energy consumption in new buildings and improving the thermal upgrade rate and quality in the existing stock. Amongst other things, experts recommend a further tightening of the requirements for the building envelope in new buildings and renovation projects, an immediate ban on fossil fuels in new-builds, a binding timetable for removing fossil fuels from existing buildings and a clear focus on the renovation of buildings.

nachhaltigwirtschaften.at/de/sdz/projekte/lze-100-leuchtturmobjekte.php

Dafins A and B project, photo: Caroline Begle

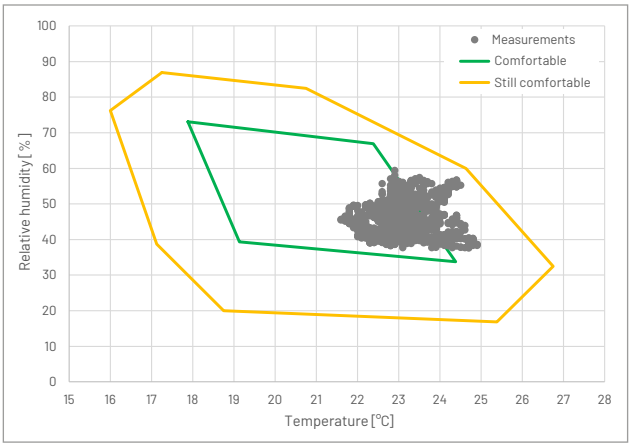
[1] **PROJECT PARTNERS**: LANG consulting – Günter Lang (project management), Energy Institute Vorarlberg

[2] energieinstitut.at/unternehmen/bauen-und-sanieren-fuer-profis/low-cost-nzeb-paris-kompatible-gebaeude/was-ist-ein-paris-kompatibles-gebaeude

Renovating social housing

Monitoring the Friedrich-Inhauser-Straße residential complex in Salzburg

Photo: www.vogl-perspektive.at



Assessment of comfort (as per Frank), source: SIR

A pioneering concept in social housing has been implemented with the renovation and redensification of a 1980s housing complex in Salzburg's Aigen district. The developer, Heimat Österreich, wanted to combine high standards of climate protection and quality of life while creating affordable places to live.[1] The project was supported with scientific expertise, and optimised solutions were developed within the scope of several research projects ("ZeCaRe I", "ZeCaRe II" and "ZECAMO – Sustainable Mobility in Practice").[2] Key objectives for all measures included keeping costs under control and giving ideal consideration to the social needs of the residents. The existing buildings within the complex were not merely renovated, they were also expanded. By adding floors it was possible to increase from the previous 75 units to the current 99 units. The overall concept also involved designing extensive open spaces for the housing estate and introducing an innovative mobility concept.

ZECARE MONITORING

The monitoring project that has recently been launched is focusing on evaluating the technical innovations (heat, electricity, water, buildings, etc.). As well as being communicated to stakeholders and residents of Friedrich-Inhauser-Straße, the results are also available for the planning of renovation projects in other districts. Another significant element in the project is process monitoring, which involves studying the previous, current and future workflows in the building of (subsidised) housing and, likewise, furnishing data that can be used in subsequent projects. The method analyses what strategies, concepts and measures will be needed so that the processes applied can be implemented in future district-level renovation projects. Findings into the areas of mobility and social aspects from previous projects will be incorporated and combined with the results of technical and process monitoring.

INITIAL RESULTS

Some calibration and coordination work with the energy supplier and the residents was required first of all in respect of the monitoring system installed so that the results would meet the strict privacy and data protection requirements. Three 14-day series of measurements of air quality (temperature, CO_2 content and relative humidity) were taken in individual households to serve as examples. The chart above shows the level of comfort in one of the households based on these measurements. This home achieves some very good figures thanks to the living space ventilation. Initial results on the use of the electric car sharing scheme have also been released: capacity utilisation has remained stable since autumn 2022 at over 30%. An increase in double-booking necessitated the addition of a second car, which was recently made available.

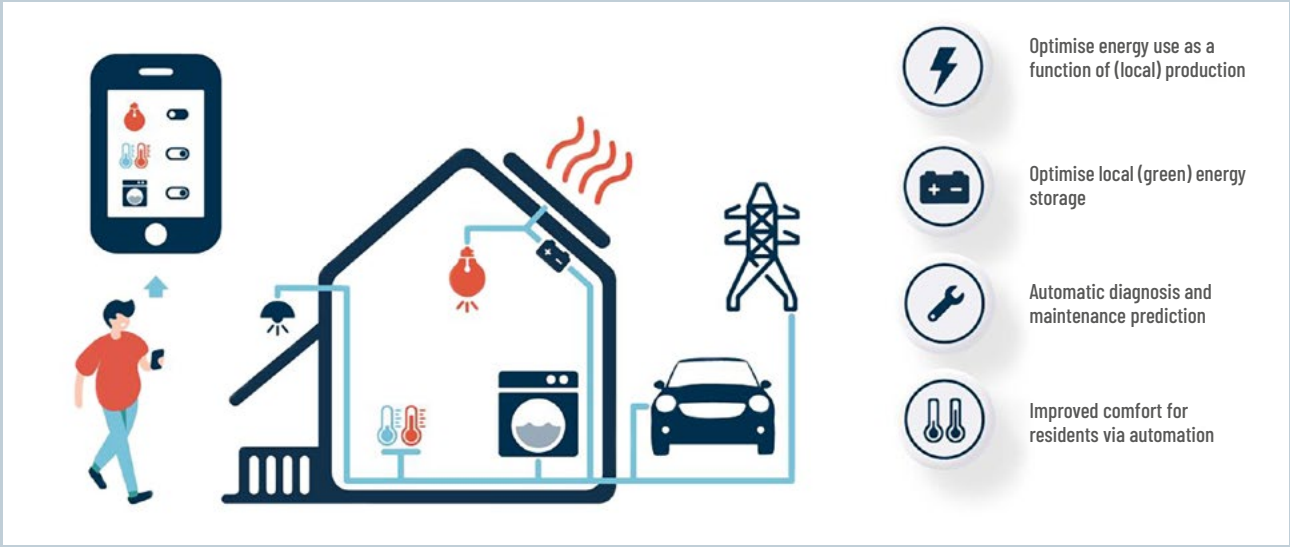
smartcities.at/projects/zecare-monitoring

[1] **See an article in EIA Issue 4/2022:** www.energy-innovation-austria.at/article/wir-inhauser-salzburg/?lang=en

[2] **PROJECT PARTNERS:** Salzburg Institute for Regional Planning and Housing (SIR); Heimat Österreich, Gemeinnützige Wohnungs- und Siedlungsgesellschaft mbH, municipality of Salzburg, MA 05 Regional Planning and Construction Authority, MA06 Building Directorate and MA03 Social Affairs, Stadt Land Berg, Rosemarie Fuchshofer, FH Salzburg University of Applied Sciences – Smart Buildings in Smart Cities, FAMILY OF POWER SCE mbH – a European Cooperative Society

SMART READINESS INDICATOR OF BUILDINGS

European and national activities



Some of the anticipated benefits of smart technologies in buildings, illustration: energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/smart-readiness-indicator/what-sri_en#sri-rating

Since 2018, the European "Energy Performance of Buildings Directive" has established a Smart Readiness Indicator (SRI) to assess the "smart-capability" of buildings. Next-generation buildings will be required to consume very little energy, cover the remaining energy demand from local renewable energy sources as far as possible and consume energy in line with local production. The control of these energy flows (coordinated with power grids and heating networks) will form a key element of buildings fit for the future. The SRI is intended to assess specific features and qualities of a building that are required for this kind of smart operation in a sustainable energy system. Both the requirements of the power grids and the needs of residents must be taken into account in this process.

DEVELOPING A UNIFORM METHODOLOGY

The SRI is designed to be simple, transparent and easy to understand and cheap and quick to calculate. Member states will be expected to incorporate it ideally in the energy performance certificate, initially on a voluntary basis. There are still many unanswered questions about how this indicator will actually work, and efforts are under way at both EU and national level to develop a uniform rating scheme. Experts from Austria are playing an active role on the EU's platform for developing the SRI further and in the Europe-wide test phase, which began in 2022.[1]

[1] energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/smart-readiness-indicator_en
[2] nachhaltigwirtschaften.at/de/sdz/projekte/sri-austria.php

SRI AUSTRIA

The process for devising national specifications for the SRI has already been investigated in several studies commissioned by the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK). The experts have successfully formulated some initial proposals for a smart readiness indicator for buildings in Austria in dialogue with their European counterparts and national stakeholders.[2] Various SRI approaches have also been analysed, and the "smart readiness" of buildings has been evaluated using a range of indicators.[3]

Another project led by AEE INTEC has recently been launched to trial smart technologies in buildings and support the SRI test phase in Austria.[4] Austrian experts from AEE INTEC, the University of Natural Resources and Life Sciences, SERA global and Blueprint Energy Solutions are also working on progressing the SRI in consultation with the OIB as part of several EU-LIFE projects[5] and, amongst other things, are developing an online tool for testing out the EU's SRI methodology.

[3] bmk.gv.at/themen/energie/publikationen/analytische-begleitung-SRI-testphase.html
aee-intec.at/sri-austria-analytische-begleitung-der-sri-testphase-in-oesterreich-p339
[4] A national-level project entitled "SRI Demo" has been launched in May 2023 for the "Flagships for Resilient Cities 2040" support programme as part of the Climate and Energy Fund's "Smart Cities" initiative
[5] Austrian experts are involved in three LIFE projects: sri2market.eu, www.easysri.eu/en, srienact.eu

Sonnengarten Limberg residential complex, photo: Hillebrand

Sonnengarten Limberg

Affordable housing and a good quality of life

The "Sonnengarten Limberg" in Zell am See is a forward-thinking construction project that combines affordable housing with a high standard of living and quality of life. The ambitious overall concept had some important objectives, including sustainability, conserving resources, energy efficiency, a virtually CO_2-free energy supply, innovative mobility services and a strong sense of community. The Habitat Wohnbau GmbH building project was delivered in close cooperation with Limberggarten GmbH, Zell am See town council, experts from the Salzburg Institute for Regional Planning and Housing (SIR) and sociologist Sarah Untner. The collaborative planning process was a key factor in the project's successful completion. The overall concept has already scooped multiple awards: the 2016 Environmental Award from the Austrian Society for Environment and Technology (ÖGUT), the 2018 VCÖ Mobility Prize, the 2019 Na-Wo Award and the award for being the first klimaaktiv district of 2019.

Built between 2017 and 2019, the housing estate in the Bruckberg district is accessible, car-free and prides itself on the short distances between all facilities. It has 77 subsidised rental flats, 61 eligible and 50 privately financed owner-occupied apartments, a kindergarten, a local store and a doctor's surgery. All residents get full use of numerous green spaces, leisure areas and shared spaces where they can come together and spend time. A housing coordination office serves as the first port of call for residents and manages the shared spaces.

COMPREHENSIVE MONITORING

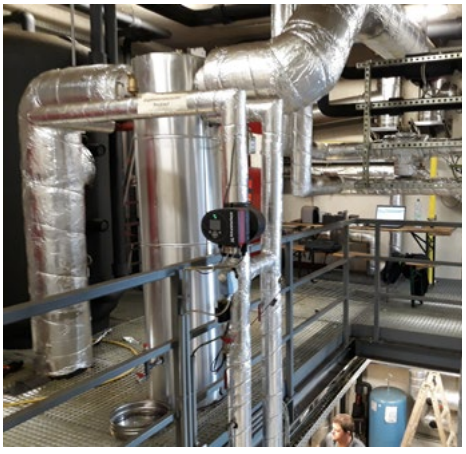
The question of whether the newly built estate would also meet its planned objectives in real life was answered in a two-year monitoring project (2020–2022) led by the SIR. The results were communicated to the various target groups (residents, planners, project developers and local authorities) and will be able to feed into the development of other sustainable construction projects. The data on energy consumption (heat and electricity), the power generated by the PV system, the amount of water used and the disposal of waste was recorded and evaluated as part of technical monitoring, while air quality measurements taken from various homes provided an insight into this factor too. Counting traffic entering the estate and using the cycle path and evaluating the use of carsharing supplied information on mobility patterns.

A SUSTAINABLE BUILDING CONCEPT

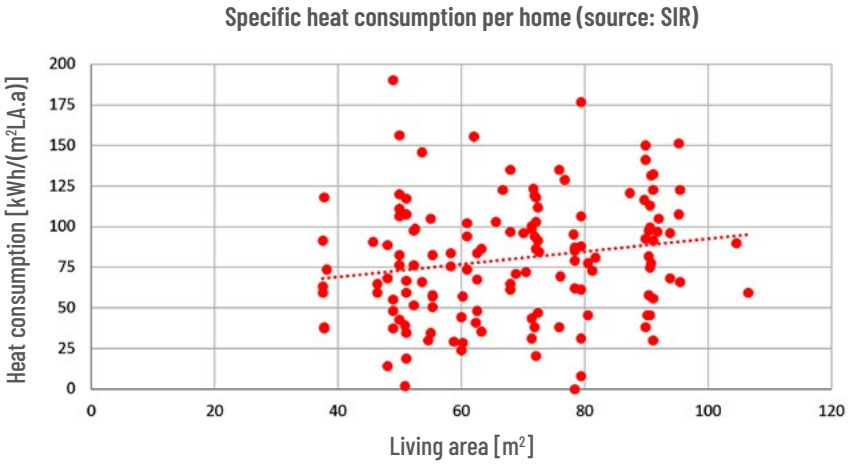
All residential buildings in the completed part of the project (blocks B, C, D, E, F and G) and the kindergarten were certified as meeting the "gold" klimaaktiv standard. The housing estate was built to an ultra-low energy standard and boasts a perfectly coordinated energy supply system. The monitoring revealed that the thermal building envelope, the heating system and the ventilation system are all working correctly and playing their part in ensuring a comfortable climate inside. In some cases, however, the results from day-to-day operation indicated some major deviations (due to user behaviour) from the forecast figures. Targeted information campaigns were therefore launched to raise residents' awareness of ways they could save energy.

Photovoltaic system with a total output of 140 kWp. The electricity generated during the daytime can be distributed between all residents by a dynamic calculation method and used immediately. Photo: SIR

Vehicles from the electric car sharing scheme, photo: SIR



The buildings are heated via a central heat generation and distribution system fired by biomass from the local area: specifically, a pellet-based system producing 350 kW with 22 kW of waste heat recovery. This generates an extra 63 MWh of energy a year, enough to heat ten homes. The pellet system provides up to 92% of the heat required. The waste heat produced in cooling the offices and ventilating 22 housing units is also utilised. An efficient gas condensing boiler with an output of 400 kW is on hand to cover peaks in demand. Photo: SIR



ALTERNATIVE MOBILITY OPTIONS

The estate possesses a large number of high-quality bike racks, and the local cycling infrastructure has also been brought up to date. Vehicles are banned from the complex itself, with all parking spaces being situated around the edge or inside the underground car park. The site also operates an electric car sharing scheme, with two vehicles available to use. The analyses indicate that the mobility infrastructure on the site is of a very high quality and has been well received. However, there is room for improvement in terms of public transport use, suggesting a need for more campaigns to raise people's awareness and increase their motivation.

POSITIVE FEEDBACK FROM RESIDENTS

The support given to the project by social planners was a key part of its overall concept, and a good quality of life and sense of community in the neighbourhood were its main aims. A housing satisfaction survey of residents was run in November 2021, which painted a very positive picture: 89% of respondents were satisfied or highly satisfied with their living situation, with no resident claiming to be dissatisfied.

smartcities.at/projects/monitoring-sglimberg-evaluierung-der-bereiche-energie-mobilitaet-und-soziales-in-den-ersten-zwei-jahren-nach-bezug

Photo: SIR

"The more energy-efficient the buildings are, the more impact their residents will have on energy consumption. So user-friendliness and good communication and information are essential if we are to make neighbourhoods genuinely sustainable."

INGE STRASSL
SALZBURG INSTITUTE FOR REGIONAL PLANNING AND HOUSING (SIR)

You can also visit us at:

www.energy-innovation-austria.at

INFORMATION

"Bautechnologien für den Klimaschutz" – Monitoring innovative building designs of particular relevance to climate protection efforts in Austria
pulswerk GmbH
Contact: Leander Brenneis
brenneis@pulswerk.at
www.pulswerk.at
nachhaltigwirtschaften.at/de/sdz/projekte/bautechnologien-klimaschutz.php

"DeLight Monitoring" – Demo light Impact Monitoring and measurement-based investigation of energy-efficient buildings
e7 Markt Analyse GmbH
Contact: Paul Lampersberger
paul.lampersberger@e-sieben.at
www.e-sieben.at

"LZE 100 Leuchtturmobjekte" – a long-term evaluation of energy consumption in 100 energy-efficient buildings in Austria
LANG consulting – Günter Lang
Contact: Günter Lang
g.lang@langconsulting.at
www.langconsulting.at
www.energieinstitut.at

"SRI – Smart Readiness Indicator" – a rating scheme for smart buildings
AEE – Institute for Sustainable Technologies (AEE INTEC)
Contact: Armin Knotzer
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www.aee-intec.at

"ZeCaRe Monitoring" – Monitoring the Friedrich-Inhauser-Straße residential complex in Salzburg
Salzburger Institut für Raumordnung und Wohnen GmbH
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