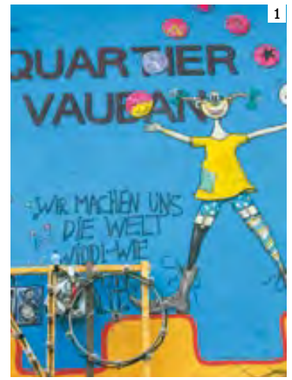
Sustainable living in the Vauban district of Freiburg

The Vauban Quarter

Vauban is the model eco-district of the city of Freiburg. In the past 15 years, residents, architects and housing cooperatives there have turned their ideas into a greener and more environmentally responsible urban dwelling reality. In doing so they have created a part of the city that attracts interest, media attention and experts from all over the world. And in April 2011, Vauban acquired another sustainability highlight: a modular combined heat and power plant supplied by MTU Onsite Energy.

In this model urban district, no house looks the same as another. But they do have one thing in common – they use very little energy and heat.



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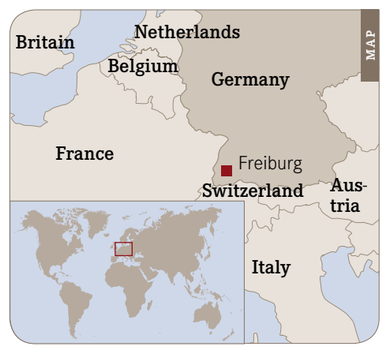
1 Pippi Longstocking's idea that "We are making the world the way we like it" is one that strikes a chord with many Vauban residents.
2 Vauban is like a world of its own within the city.



Elsa Gheziel-Neumann used to live in a tower block in Paris but now she and her husband and their son Xander have moved to Vauban – simply because there is a better quality of life there.

Andreas Delleske knows the Vauban better than anyone. He has lived in the first passive-energy apartment building since 1999.

The Vauban is home to many young families and students. The average age is just over 28.

"I didn't move to Freiburg, I moved to Vauban," says Elsa Gheziel-Neumann. She is playing with her son Xander on the wooden floor of her living room. It is comfortable in her terraced house, not too warm and not too cold. The view from the glazed southern aspect looks onto the cheerfully colored neighboring houses.

Vauban is an eco-district. But how can you tell it is? The first thing you notice in Vauban are the trees. Big, old trees – oaks and chestnuts – right in the middle of a modern development. All around them are colorful houses. Not one is the same as another, either in color or design. Here an oriel, there a balcony. Wood paneling on the ground floor, black slate tiles on the first floor. At first sight, Vauban gives the impression of a new, modern residential area. And that is what it is. But it only on taking a second look that you discover the small details that make Vauban a model for eco-housing design. Elsa Gheziel-Neumann lives on the solar estate. The houses there have photovoltaic solar panels covering their entire roof area and so produce more electricity than they actually need. The living spaces are arranged so as to make best use of the sun. In the winter they catch the sunlight and so gain extra warmth, while in the summer the roof blocks the sun and the living areas remain cool. "Last winter we only turned the heating on maybe seven or eight times," Elsa Gheziel-Neumann recalls.

Andreas Delleske is another of the district's residents. He knows Vauban better than anyone. He often takes groups of visitors on guided tours of Freiburg's model eco-district. They want to see how sustainable homes can be built today and what else can be done to help the environment. And they come from all over the world to find out. "The Asians are especially interested and enthusiastic," Andreas Delleske relates. Although he doesn't know every one of the 5,300 residents personally, he can tell you something about every house. And he knows what he is talking about because he lives in one of Vauban's typical homes himself. What is more, he is an energy efficiency consultant by profession.

MEMO

Where does the name Vauban come from?

Until 1992, the Vauban district of Freiburg was a barracks. After World War II, the French occupied the barracks and named it 'Vauban Barracks' after Sébastien Le Prestre de Vauban, a French general who built fortifications in the city. The name 'Vauban' was retained when the city authorities approved the development of a new municipal district on the site and the barracks became the 'Quartier Vauban'.

CHP modules as energy suppliers of the future

The city of Freiburg has adopted an energy standard for Vauban that requires all new-build homes to be at least low-energy rated and so only require small energy supplies. Some of the houses in Vauban are even energy-neutral or energy-surplus buildings that require no external energy supply or produce more than they need themselves. Simply by being constructed of wood and having their main aspect facing south, being very well insulated, having ventilation with heat recovery and triple-glazed windows, they satisfy the heat consumption requirements of less than 15 kilowatt-hours per square meter per annum.

The house in which Andreas Delleske lives – the first passive-energy apartment building – is made that way too. Like many other buildings here, it produces a proportion of its own electricity from solar panels on the roof. Additional power and heat comes from the basement. Because the housing cooperative has its own combined heat and power module. "For me, combined heat and power generation is the biggest lever we still have at our disposal," believes the energy consultant. In his view, no new apartment building should be built without connection to a CHP supply. Be that from their own micro-plant in the basement or a large-scale CHP plant supplying a whole district. Around 1,700 other homes in Vauban obtain their heat from a 14-kilometer district heating pipe from Vauban CHP plant supplied by MTU Onsite Energy.

An excellent CHP plant

In energy terms it is a real star performer. It has an overall energy efficiency of 96 percent – though it has only achieved those heights since the beginning of this year. Originally, the regional energy provider Badenova and its subsidiary Wärmeplus equipped the CHP plant with a woodchip boiler and a steam-engine/generator combination. "The steam engine soon ran out of puff," relates Project Leader Klaus Schipek of Badenova Wärmeplus. By 2010, the energy supplier had had enough of the constantly failing steam engine and looked for a different solution. The answer was soon found: a new energy concept based on a natural-gas modular CHP plant made by MTU Onsite Energy. The new natural-gas CHP module driven by an 8-cylinder Series 4000 engine produces around 850 kilowatts of electricity and 1,150 kilowatts of heat. Provid-

ing 7,200 hours of full-power duty a year, it covers the base-load demand for heat and more than 50 percent of the annual heat requirement. During high-demand periods, the wood-chip boiler and a gas and an oil peak-demand boiler assist the natural-gas engine by providing an additional 2.5 megawatts of output each. The electricity produced by the CHP plant and fed into the Badenova network is sufficient to supply the needs of all the homes in Vauban all year round. The CHP plant achieves the overall efficiency rating of 96 percent by combining the MTU energy module and its three auxiliary boilers in an intelligent overall system. Its sophisticated multiple heat recovery outperforms conventional cogeneration plants. Two exhaust heat exchangers cool the engine exhaust gases in two stages from around 500°C to 65°C and in so doing, they heat the water first to 67°C and then to 90°C. In addition, the heat given off by the generator and the engine is not simply allowed to escape into the atmosphere but captured and reused by a heat pump. So the generator room is cooled and the heat supplied to the district heating system at the same time. So that the engine can run at full power even when the heat demand is low, Badenova has also installed a stratified thermal store with a capacity of 100,000 liters. The next step in the sustainability process that Badenova Wärmeplus is offering its consumers is the changeover from natural gas to bio-natural gas. The MTU engine is already set up for it.

With its orange window frames, the CHP plant is located on the fringe of Vauban. As we pass by, Andreas Dellekse points out another typically Vaubanesque peculiarity that you would surely only find here: a chicken run directly behind the CHP plant. “One cockerel and four hens produce original Vauban eggs that the locals can buy for a few cents,” relates the energy consultant with a smile.

A green district

Andreas Delleske speaks calmly, like someone who knows his subject well and is certain of his knowledge. He is always waving or saying hello to someone. People here know each other. Then he points out something else that makes this part of town the eco-district. “There are only a few pointed rooves here,” he says, gesturing upwards. “Almost all of the houses have flat or single pitch rooves, and many of them are planted with vegetation” If you look closely you can almost distinguish some of the plants. The green roof retains as much 60 percent of the precipitation on the roof. And the rest of the water doesn’t just disappear into the drains, it trickles into special ditches or is stored in water butts. So the water stays within the district. Even more greenery is provided by the five green spaces between the housing developments. They were designed in workshops by the residents themselves. “There is a playground for small children, and one for bigger kids,” explains Delleske. There is even a pizza oven. “Grown-ups can find a place for themselves, too – here, for example. You can bake bread or pizza here one a month.”

On our tour of the district, Delleske walks on the road. It is quiet. Not totally silent but quieter than in other big cities. There are some children playing outside and now and again the tram swishes by. There is no footpath. “Why would you need one?” Delleske asks. And yet again another unusual feature strikes you at second glance. A large part of Vauban is traffic-free or traffic-calmed. Residents only drive to their houses to load and unload. At other times, their cars are parked in one of the car parks on the edge of the district. There is no virtually no traffic noise. “You don’t need a car here. I haven’t even got a driving license,” Delleske adds. He and Elsa Gheziel-Neumann do their shopping right here in the area. “I like the fact that everything is easily accessible on foot or by bicycle,” says Elsa. “Going shopping in the car is a nightmare to me!” And for anything else that requires travel further afield outside the district, there are regular bus or tram services.

> «For me, combined heat and power generation is the biggest lever we still have at our disposal.»
>
> Andreas Delleske, efficiency consultant

Elsa Gheziel-Neumann and Andreas Delleske are very happy living in Vauban. The geography graduate and energy-efficiency advisor live in modern, sustainable homes with their families. And you also have the feeling that everyone in Vauban is working towards the same goal – to live as sustainably as possible. “Not everyone has to live the way we do, only those who can and want to,” Delleske reassures, explaining that you didn’t have to move into a passive-energy house right away. It was enough to start on your own patch and take active steps by buying energy-saving appliances, using public transport or cycling.

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Vauban CHP plant has its own tenants: three hens.

The MTU 8V 4000 engine forms the heart of the CHP plant and supplies Vauban with heat and power the whole year round.

”Combined heat and power is the energy of the future“

In 2010, Freiburg was awarded the title “Climate Conservation Capital of Germany”. The Greencity Freiburg project cleverly markets everything to do with climate conservation in Freiburg. The Vauban quarter is only one of the projects by which the city in Germany’s southwestern corner has drawn attention to itself. Klaus Hoppe heads the Energy unit of the Environmental Protection Office in Freiburg. No building project gets past him without being thoroughly examined for energy economy and efficiency.

Mr. Hoppe, is the Vauban an exceptional case that the city makes use of for publicity or is it the future?
Hoppe: Taken overall, what has been achieved in Vauban is certainly something very special. It was achieved thanks to the far-sightedness of the local authorities and to the residents and their commitment. Without their participation, the area would not have developed in its present form. Purely in terms of energy efficiency, Vauban is without doubt a model district. We are making use of the experience gained from Vauban in our new development area.

What role do CHP plants play in energy planning as far as you are concerned?
Hoppe: At present we have about 180 CHP modules in Freiburg – and the number is rising. For me, combined heat and power is the energy of the future – for the next 15 years at least. But you also have to look at where CHP plants make sense and who is going to pay for them. I see the best opportunities in older developments.

Renewable building costs money. How do you get the local people to all support the same idea?
Hoppe: It’s partly the mentality of the Freiburg people. As long ago as the 1970s, well before there was a green movement, they demonstrated against a planned nuclear power station. Many people are actively engaged in energy issues and environmental protection. It is also evident in the fact that the city mayor is a member of the Green Party. It’s more a case of the population putting pressure on us to keep doing things. For many people, what we are doing at the moment still isn’t enough. And then we also have the expertise here at the Ecological Institute and the Fraunhofer Institute for Solar Energy Systems.

Where do you see Freiburg in 20 years?
Hoppe: Freiburg should continue on the path it has taken – seriously, but not dogmatically. I would like to see us playing an even more active role in energy as well as traffic issues in order to ensure that renewable energy is harnessed wherever it makes sense to use it.

Klaus Hoppe is Freiburg’s energy expert. No building project is passed without his say-so.

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