Solar Housing Estate Cologne-Wahn

This project concerns the realisation of a solar housing estate in the outskirts of Cologne. The project provides a chance to create a solar estate starting from the earliest stages of urban development. Solar planning aspects like the distance between buildings, shading and orientation of the main facades and roofs are included; the result should be an optimised structure of the area.

It is planned to establish a new solar housing estate close to the centre of Cologne but already in a rather rural area. Cologne-Wahn is a formerly independent village around the castle of Wahn. Now it is part of the City of Cologne. The area is situated between a train station and rail tracks on one side and the castle of Wahn on the other side. The Landowner of the area plans to create a solar housing estate with around 120 dwellings. A new quarter with its' own character will be established. The creation of the solar housing estate is connected to the overall target of the project, which aims to bring together families, single people and older people in a village way of life.

Pictures 1-2: Visualisation of competition contribution

Stakeholders Involved in the Development

In order to get a variety of ideas on the creation of a solar housing estate of this size, the landowner invited 8 well-known architects to prepare an urban plan consistent with solar requirements and including building types fitting the concept of solar housing. The project is part of a special program of the energy agency of North-Rhine-Westphalia stimulating the development of solar estates with a subsidy program. LINK TO TEXT AT END OF DOCUMENT.

The work was carried out in an official architectural competition. Prejudged by members of PV-Upscale, the solar qualifications of the designs were presented to a professional jury. This jury was composed of urban planners, architects and local politicians who choose the winner of the competition. The winning design should now be implemented through a private investor.

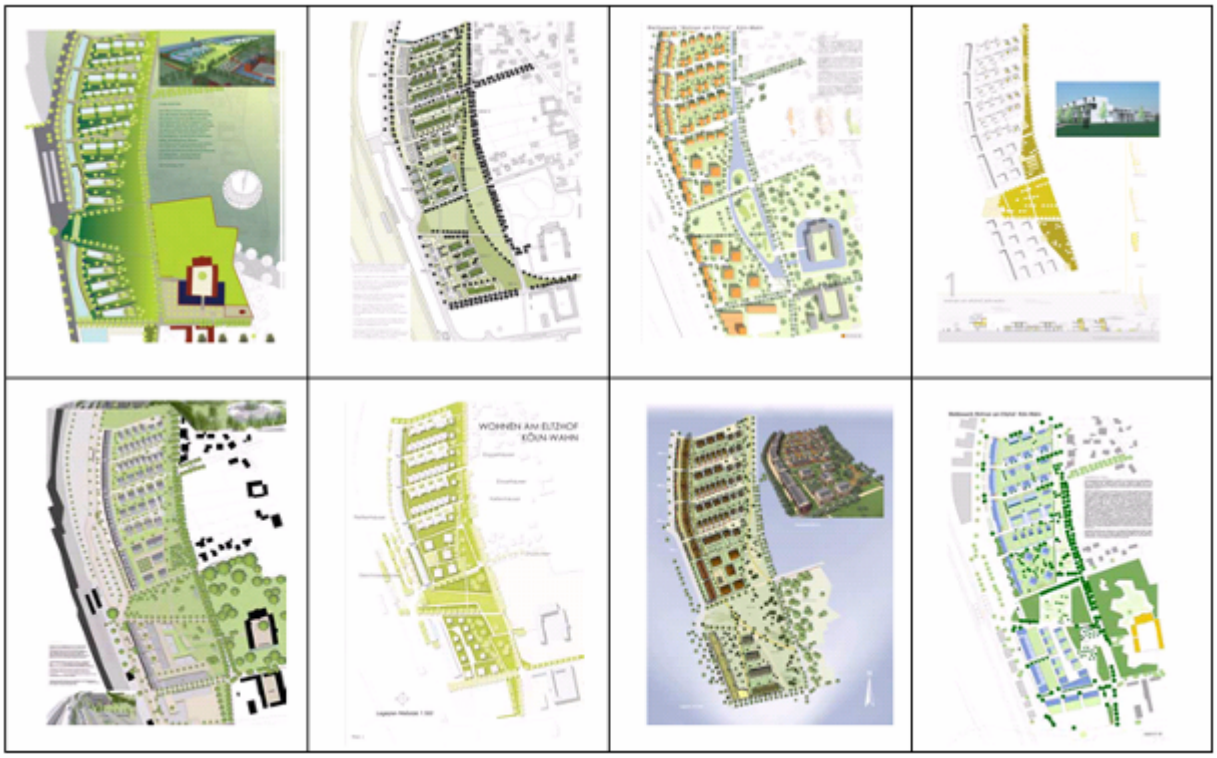
Development of an Urban Plan

A local plan for the area already existed but there was still scope for detailed solar planning. The western part of the area is close to the train tracks so the plans needed to include an acoustic barrier to protect the area from train noise. To provide this acoustic shelter, the buildings have to

be 14 m in height, which can lead to shading problems. For this reason a sufficient distance between the north/south orientated buildings is important.

Picture 3: Local plan

To satisfy all the demands of a solar estate, specifications for the urban planning were developed covering solarisation, solar area potential and solar systems per building type. Eight urban plans, including design proposals for the building types have been prepared. All the plans were assessed regarding the feasibility of the solar concept using a point system with different categories of evaluation for urban planning and architecture.

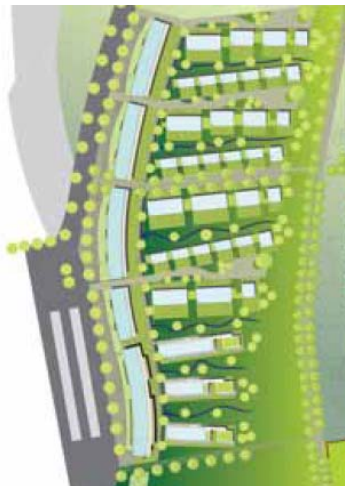


Pictures 4-11: Competition contributions

The targets for the area did not only cover issues relevant to energy, there were also requirements concerning housing density, probable costs, design and atmosphere and feasibility of implementation. All the submitted works have reached feasibility status as a solar estate, the plans are considered as preliminary drafts with possible further adaptation in the implementation phase.

Because of the variety of requirements other issues as well as the solar “points” were crucial for the final decision of the jury. The best design regarding the solar requirements was judged to be too expensive and not realisable. The proportion of glazing in the walls within this plan was very high and the necessary shading devices would increase the price significantly. Some other plans were disqualified due to the specific style of the building designs or the lack of an integrated concept for the entire area.

Finally the jury selected a winning plan which will be the basis for later implementation, shown below. The structure of the urban plan provides distance between the buildings. The different types of buildings are clearly arranged according to the orientation needs. For the north-south orientated buildings the entrance is on the northern side with the main façade orientated towards the south. The row buildings on the west-border open up towards the west with entrance terraces. On the top levels the orientation changes towards the east.



Picture 12: Urban plan

Picture 13: *Visualisation*

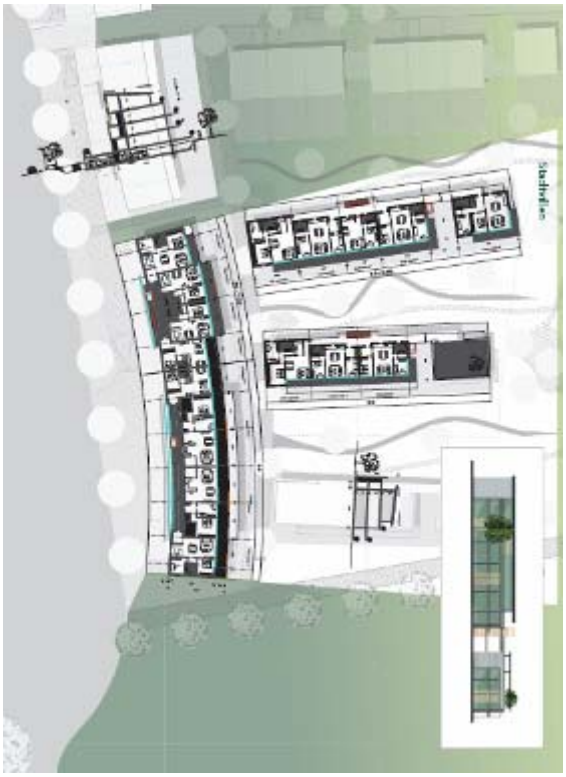
The roofs of the buildings are inclined to the south or east at 5 to 10 degrees. The roofs are designed for the installation of PV systems. The installation of 9 square meters of PV modules per dwelling (1 kWp) is a challenging target for the multi-family buildings. Additional solutions like integration of PV modules in the façade or the balustrade of the terraces are possible. For the one-family buildings the required area of PV can easily be integrated into the southerly orientated roofs.

Implementation

The project is currently in the first implementation phase with negotiations with possible future investors being carried out.

Additionally an energy supply concept for the complete area has been commissioned by the owner of the land in order to achieve the best solution. The strategy of assessing possible options

before the concrete start of the project will provide a firmer basis for planning for future investors. Solar thermal systems will contribute to the overall energy performance of the buildings and decisions to include them will hopefully be taken even if the buildings were initially designed for the application of PV systems.



Pictures 14-15: Building types

Barriers and Solutions

The main barrier expected in the implementation of the project is the acceptance of the solar concept by future investors and a willingness to pay for the extra costs involved. A very precise calculation regarding density, price and additional solar targets will answer the question concerning economic efficiency. The promotion of “Green Buildings” with solar applications such as PV systems can serve as a marketing tool but only if future owners are willing to invest more than they would need for a standard building.

A particular barrier for PV is that, solar power does not contribute to the energy performance of a building according to the calculation method applied under the current German energy saving directive (EnEV 07). This directive focuses on the thermal performance of a building so only solar heat is assessed as contributing to the energy performance of buildings. The installation of solar thermal systems would be an option to reduce the primary energy demand of the buildings.

The implementation of solar targets is still considered as an additional optional extra. The different stakeholders in the development and planning process each have their own specific priorities in building projects. An integrated holistic approach can only work if the persons

involved are basically familiar with solar urban planning or they are willing to accept the needs of solar architecture.

If preliminary development of the local plan follows solar requirements then subsequent planning is made easier. Changing a local plan later to allow for solar requirements is difficult to accomplish. It is important to inform people involved in the urban planning process about the effect they can have on later maintenance and energy supply costs. Otherwise the focus is only on the direct investment costs and does not support long term sustainability.

Recommendation

The development of a solar housing estate fitting in with an existing local plan and the associated risks concerning finance and sale of the houses are relevant to new build solar architecture. In this particular project the landowner took this risk and invested at the beginning in the creation of options for achieving a solar estate in the best possible way. The willingness to push a development into this direction is a prerequisite for the successful formation of this kind of project.

Sources of further information

Project Website - http://www.wohnen-am-eltzhof.de

Energy Agency North-Rhine Westphalia –
http://www.energieagentur.nrw.de/solarsiedlungen/page.asp?TopCatID=6197&RubrikID=6197

Energy Agency North-Rhine Westphalia/Project –
http://www.energieagentur.nrw.de/solarsiedlungen/page.asp?InfoID=5304&TopCatID=5535

Case Study prepared by:
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Link to:

50 Solar Housing Estates in North-Rhine Westphalia
In 1997 three North Rhine-Westphalian ministries (Economic Affairs, Housing and Construction, Science and Research) and the former NRW State Initiative on Future Energies (since the beginning of 2007 the new EnergyAgency.NRW) launched a campaign for the construction of 50 solar energy housing estates in North Rhine-Westphalia (NRW).

The requirements of the program stipulate the creation of low energy buildings with a maximum of 35 kWh/m²a heating demand, passive solar gains of 25 per cent of the heating demand achieved through south orientation and opening and the installation of an active solar system, either achieving:

- Production of hot water: The solar energy contribution is to be at least 60 % of the energy requirements OR
- Production of electricity by photovoltaics: At least 1 kWp per housing unit

The program provides benefits for PV and solar thermal systems and other renewable energy systems.
Many model projects are the result of this program: There were nearly 50 project proposals from communities, 47 of these projects attained the status of a "Solar energy housing estate".