

Sun for Aachen's schools

(Project information, status: Juli 2002)

Key Data / Brief Overview

1. Project Idea

The allocation of attractive areas (roofs, facades, other) on public buildings – priority being given to schools in Aachen – in which solar energy systems (PV-panels) could be mounted on. This is done in exchange for a small, one-time financial contribution to support awareness-building measures/projects in on the topics of renewable energies.

2. Goals

- Support of environmentally and climate neutral energy production in Aachen.
- Contribute to the continual development of solar technologies as a future oriented technology.
- Awareness-building and the closing information deficits about renewable energies.
- Linking schools as an important dissemination group for the spreading of knowledge about environmental friendly energy.
- Support of chosen participating projects (citizen's solar systems).

3. Numbers/Data

15 public buildings (14 schools, one community center).

19 Solar energy systems.

Total installed production: circa 360 kWp (Kilowatt peak = maximum production of the system).

Energy production of all systems; circa 290,000 kWh (covers the energy use of about 90 households).

Level of Solar Energy Production (Comparison between the system's level of energy production and the energy used by the schools) between 5% and 160%.

Initial investment amounts circa 2,3 Million uro, using as the basis an average cost of 6,000 – 6,500 uro per installed kWp.

4. Organisation/Partners

Anyone can participate: private individuals, solar installation services, businesses, company unions, school groups, etc.

Project coordinated through the Department of Environment.

Appointment for participation is conducted at the place under consideration, and includes public administration officials, system operators, installers, and supply companies.

5. Information

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Detailed Information

1. The Project's Idea from 1996

Supporting environmentally and climate neutral energy production has been one of the central areas of active environmental policy in Aachen for many years. As a health and spa city, ecological city of the future, partner with the Climate Alliance of European Cites and within the framework of Agenda 21 activities, the city of Aachen has devoted itself to these important societal duties.

With this backdrop, the administrative units for the environment, building development, schools, and real estate¹ have initiated an innovative project with this unconventional partnership. The project is called "Sun for Aachen's Schools."

The idea for the project began in 1996 within the Environmental Agency as support for the so-called "Aachen Models," a funding program for renewable energies in communities, introduced in 1995. The funding from the Aachen Model occurred through the supply companies offering an increased feedback payment for renewable energy production. In comparison to other cities, there was relatively high participation with circa 100 PV-systems realized by 1996. However, even though renters, building owners, private households, and financially disadvantaged individuals couldn't participate in the program, they were still subject to the changes in energy prices. This affected the financing of the fund-raising program. The pilot project "Sun for Aachen's Schools" was therefore developed.

What arose was that chosen roofs, facades or other areas on public building (Aachen's schools held priority) would be offered the opportunity to build Photovoltaic-Systems (PV-Systems) at no cost. The chosen rooftops must be in faultless condition for building and have optimal positioning, which allows a higher than average electricity output (average 800 kWh/kWp and more).

The city expanded the ability to participate to a wide range of the public and allowed even the market leaders for environmentally friendly energy to participate. For even though they own no rooftops of their own, they still wanted to continue the development of solar energy as part of their contribution to sustainable development. Everyone can participate: private individuals, solar installers, other business, company unions, school groups, etc. What is especially welcomed is the participation of interested parties from Aachen or those who have a connection to one of the schools or areas of town affected.

The solar energy produced by the PV-systems is fed into the public supply network and is compensated after the specification of the Aachen Model (today after the Renewable Energy Law, EEG). In exchange for the no-cost installation of the PV systems, the operators of the systems are contractually bound to act as a contact and spokesperson about the technology, operating data, etc. and to demonstrate publicly how the PV-Systems function within the framework of yearly school events/projects. Other types of cooperation with the schools from the investors are also allowed, after agreement from the administration (for example, hooking up the PV systems with the school computers, mounting of a display for operating data, production of instructional material, etc.).

The city's intention with this approach of environmental education with a future oriented accent, is to reach the younger generation, who are the most affected by the results of growing energy uses and the most important disseminators for spreading knowledge about environmentally friendly energies. A practical example is that the students are brought nearer to topics like climate protection, renewable energy forms, and their meaning for our future. Through these methods, the early stages of information deficits can be filled and awareness about accepting future oriented technologies can be strengthened.

2. General Goal Setting

As before, the important goals of "Sun for Aachen's Schools" for the city are:
Contribute to the continual development of solar technology by finding attractive areas.
Increase the relatively young Aachen Solar branch by encouraging investors to realize projects in Aachen and therefore increase the demand for solar technology.

¹ Now the Department of Environment, Department of Building Management (construction and electrical engineering), Department of Real Estate (Sales division/Renting and Leasing)

Remove information deficits and strengthen the acceptance of future-oriented technologies through awareness-building.

Reach out to students and teachers, as they are important disseminators for the spreading of knowledge about environmentally friendly energies.

Fund and support the foundation of participatory projects (citizen's solar systems).

3. Current Requirements as of 2000

The large number of successfully implemented PV-Projects in the past years has made Aachen a leader in solar cities. Within this framework, the project "Sun for Aachen's Schools" shows a highly effective demonstrative ability and provides continual interest within Aachen's population (private individuals, organizations, solar installers, etc.). In addition, the project has also found national attention and moved many communities to imitate it.

With the introduction of a national standard for feedback payments of solar energy (through the EEG), the community's 'Aachen Model' accomplished its role as a leader and was implemented at the end of 1999. The originally planned parallel project "Sun for Aachen's schools" will continue to generally support the development of renewable energies, creating long-term local measures and act as a contributor to global climate protection.

For this reason, the rendering of this project was reworked in several areas. For example, the contractual obligation of yearly demonstration events was given up, because the environmental education aspect of this project could no longer be satisfied. Faced with the rapid development in solar technologies, especially within the last 5 years, this specific type of demonstration activity was made obsolete. Findings from the area of environmental education have shown that over the long run, new and varied ways must be found and supported, so that awareness-building on subjects like climate protection and renewable energy are focused and fit the current developments in societal structures.

Since 2001, the PV-system operators are obligated, as a remuneration for the administrative work, to donate a one-time financial contribution, which will be used for awareness-building measures and projects in the areas of climate protection and renewable energies.

In order to have an equitable division of costs for the system operators, the financial contribution is oriented on the size of the PV-system. A contribution of 5 per Kilowatt peak of installed production (kWp/peak = peak output) seems to be appropriate, as it equals just about 1% of the average investments costs for systems up to 5 kWp. Contributions more than this would lead to a disproportionately high burden for the system operators and of even more concern, it would scare people away from participating in the project "Sun for Aachen's Schools."

4. Practical Implementation within the Administration

As the coordinating body within the administration for the project "Sun for Aachen's Schools," the Department of Environment developed a standard procedure with a sample contract and informational sheets. In the practical realm, it was shown that a responsible coordination was a urgently needed, in order to harmonize the diverse interests of the individual groups of participants (system operators, solar and/or electrical installers, energy suppliers) and the city services (department of schools, city planning, department of building management). This proved helpful in the coordinating and follow through of joint on-sight meetings.

5. Current Status of Project

Up until now, out of the following 15 public buildings, there have been 19 solar energy systems installed, reaching a total capacity of about 360 kWp, most are schools (Gymnasium, Gesamtschule, Realschule, Hauptschule, Grundschule): Couven-Gymnasium, Inda-Gymnasium, Gesamtschule Brand, Gesamtschule Moltkebahnhof, Hugo-Junkers-Realschule, Klaus-Hemmerle-Schule/Franzstrasse, Hauptschule Drimborn, Kleebachschule, Grundschule Birkstraße, Grundschule Saarstraße, Grundschule Oberforstbacher Straße, Grundschule Gerlachstraße, Grundschule Verlautenheide as well as the community organization, the One-World-House.

In relationship to the energy use, the systems meet the needs of each place from 5% to sometimes 160%, depending upon the location. At one of the first schools to participate in the initiative, the project was directed by the students themselves who founded their own school organization in order to realize the project. This organization planned and financed a 3,3 kWp system, which was installed on the south-façade of the Couven-Gymnasium. Besides the production of energy, this system offers an extra benefit: during the summer months, it acts as a type of shade, protecting the class rooms from overheating.

From the initiative of the One-World-House organization and within the framework of the project "Sun for Aachen's Schools," a 4kWp system was installed at the One-World-House (the center of several environmental organizations in Aachen). Through the public engagement of this institute (dissemination abilities of the environmental organizations) the spreading of information about topics concerning solar energy and climate protection are further supported.

If one looks at the local breadth of the very realistic yearly output from an average of 800 kWh per installed kWp, the total energy production from the school's PV systems amounts to about 290,000 kWh per year. When the current total production of all of Aachen's installed PV-Systems (about 1230 kWp by the end of 2001) are taken into consideration, then the public school's 360 kWp amounts to about a 30% contribution of Aachen's total production.

6. Citizen's Solar Systems at the Hugo-Junkers-Realschule

In addition to many active individual projects, including school groups, private individuals as well as joint ventures, the building of the first large 'citizen's' solar system on a school in Aachen began in the summer of 1998.

To realize this large project, the city offered the roof of the Hugo-Junkers-Realschule in the Bischofstraße at no cost. The energy produced with this system is fed into the supply net of the STAWAG (public utilities company) and is reimbursed upon the conditions of the Aachen Model.

The Department of Environment presented the offer for this project to different solar companies, who evaluated it in regards to the technology available, the costs of the necessary energy valuing, as well as the rendering of the citizen-participation model. This was supported by the department of building management, STAWAG, as well as independent experts. The administration placed emphasis on the least possible total costs as well as low risk for investors.

The system is able to produce a maximum capacity of about 63 kWp and was continually built as the participants came in, being completed August 1999.

The larger than 500 m² PV unit produces 50,000kWh of environmentally friendly solar electricity each year; this amount of electricity can supply about 15 3-person-households with a year's worth of energy. The school building is used for school and a sports hall, evening courses from the city and surrounding

area of Aachen are also taught. The average yearly use of energy in the school can be covered by 60% from the solar energy system. By maximizing energy efficiency, a further increase in the solar energy's contribution is possible. Together with the window and insulation renovation, which took place in 1998, the school building acts as a role model for ecological aspects for a project's total development.

Building, operation and control of the PV-System occurs through an organization which was created for this project, the Solar Roof 2000 Operating Cooperative of Aachen GmbH. Through the participation model, the citizens of Aachen are offered the opportunity to financially participate in the project, and therefore 'buy' a piece of the 'citizen's' solar system. The cooperative set participation at a minimum of 3,000 DM. With this price, smaller investors are able to participate too.

Next to the proper repayment, the combined capital is valued with 5% interest. The financing time scale is 20 years, therefore including the minimum lifetime of the system. Investors which donate 10,000 DM or more, receive an extra dividend during good, sunny years. Should the system produce more than 780 kWh per Kilowatt over its rated output in a year, the investor receives an extra 1 DM for each extra Kilowatt hour produced, above and beyond the 5% interest.

Supervision of the capital movement is taken care by Mr. Harry Lehmann, the director of Eurosolar Germany e.V and located in their office in Bonn. He is a long-time co-worker with the Wuppertal Institute and was won over to act as a trustee. He guarantees that the payments to the investors occur after building progress.

7. Demonstration System on the Newly Built, "Gesamtschule Moltkebahnhof"

On top of the building complex at the new Gesamtschule Moltkebahnhof, built in 2001, a further large PV-project was realized with demonstration funding from the state of North-Rhein Westphalia. The system, is made out of amorphous thin-film solar modules and has a maximum capacity around 115 KWp. To our knowledge, this project represents the largest solar project of its kind in Aachen and in the Euro-region. The building of a PV-system of this size on a school building is the only one of its kind in the country.

The planning and implementation of this project occurred through the Umweltkontor Renewable Energy AG in Erkelenz. Umweltkontor is known today as one of the largest project development organizations and service providers in the area of renewable energies. The installation work was conducted by the solar company Lebherz and Partner GmbH, Aachen.

Through the optimal location of the school, directly along the main connection point of the German railway system, between Cologne-Aachen and Aachen-Grussels/Paris/London, the city, operators, and country are the promoters of a special demonstration and disseminator capability.

At the beginning of 2002, the erection of a large show-board for the railway lines began, which shows the current production-status of the PV-system with an energy saving LCD. In this way, the demonstration effect of the system is reinforced. For this reason, the PV-system is especially well visible for the many train travellers upon this route and therefore also promotes future oriented technologies extra-regionally.

In addition, the data of the PV-system is displayed in the interior of the school building from an analogue display board. Furthermore, the school developed the ability to access the data from the system on the internet and therefore use it for instruction purposes.

The expected yearly solar energy production from the system is about 92,000 kilowatt-hours (kWh). With this amount of energy, a large portion of the school's energy use can be covered. The environmental alleviation is about 50 tons of carbon dioxide (CO₂).

The total investment of the system after operation costs comes to about 650,000 uro plus tax, equalling about 754,000 uro (this equals about 6,556 uro per kWp). It was funded under the framework of the REN-Funding Program from the state of North-Rhein Westphalia with circa 120,000 uro. The communities supply companies and the city utilities AG (STAWAG) supported the project with a contribution of circa 87,000 uro.

The operator will integrate the system in a project fund in the area of renewable energy. Through this, an investment offer for citizens is created.