

Mauenheim – The First Bio-Energy village of Baden-Württemberg

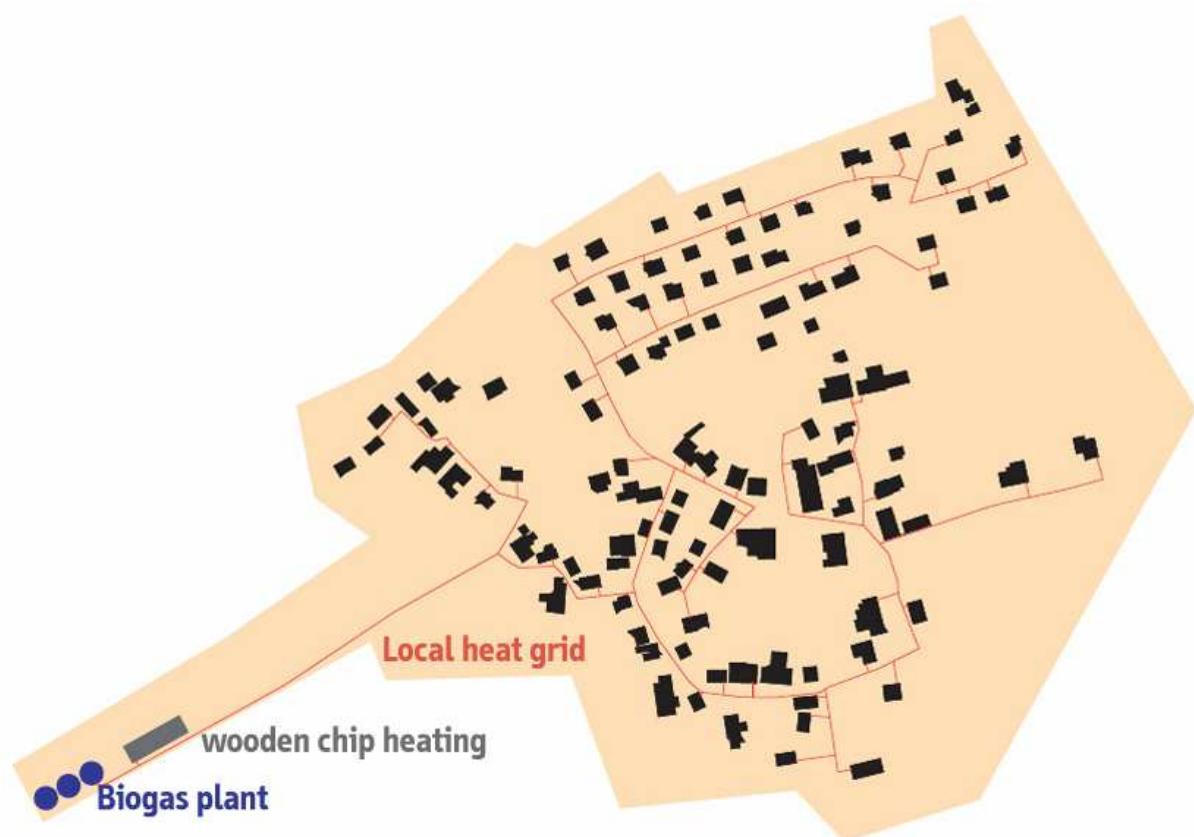


Biogas facility (in the building, woodchip heating system and solar power station)

Mauenheim – the First Bio-Energy village of Baden-Württemberg

Biogas, energy from woodchips, local hot water supply grid, photovoltaic:

Mauenheim is a tourist destination in the municipality of Immendingen, and the first village in Baden-Wuerttemberg meeting its electrical and hot water needs completely from local homes. Electrical generations from biogas combusted in the cogeneration unit as well as electrical power from several solar power (photovoltaic) stations are fed into the local electrical grid. In addition to the environmental advantages of renewable energy sources, the project also a high regional economical value: purchasing power stays local, as the value of energy stays in the community. Mauenheim has 430 inhabitants and 100 households.



Local hot water supply grid



Daily addition of locally grown energy crops into the biogas dry-inputs unit

Biogas System

On the edge of the town of Mauenheim, a company called KCH Biogas GmbH operates a biogas system producing approximately 4 million kWh (kilowatt-hours) of electricity annually. This corresponds to nine times the electrical requirements for the town of Mauenheim. The electrical cogeneration system (in which biogas is combusted to turn a generator to produce electricity) produces approximately 3.5 million kWh of surplus heat, roughly equal to 350,000l of fuel oil equivalents. This heat is used to supply domestic heating for homes and business. As a result, the operators of the biogas system can access a bonus electricity price for fully utilizing their surplus heat, a bonus of 2 cent / kWh (eurocent/kWh) in addition to the regular price their receive for their biogas electricity.

The biogas system is fed with approximately 6,500 tones / year of energy crops cultivated locally on 180 hectares. Corn, whole-plant corn silage, clover and alfalfa. The manure from a local 150 head cattle barn is also used in the biogas system.



Woodchip shelter (foreground) and central heating installation in the container (background)

The woodchip heating System

A Woodchip heating system of nearly 1 MW was installed to provide additional local heat. Having two heat sources which complement each is ideal, with the biogas system operating year-round on a nearly continuous basis providing daily hot water needs, and the energy from the woodchip system available in the winter for peak heat demands. The woodchips are sourced by agreement with the local Municipality of Immendingen from the local community forest.



Wood woodchips are delivered into the storage bunker

Local Hot Water Supply Grid

Unanimous agreement to proceed with the local hot water supply grid was secured in both the village of Mauenheim and in the local municipal council of Immendingen. Rights-of-way contracts to run the supply grid under the public roads was secured with the Municipality of Immendingen. The local hot water supply grid included approximately 4 km of trenches, and nearly 8km of conduit running through the old village center. The grid supplies the existing development area in the town, as well as future development areas. The vision to supply an entire community with heat from renewable energy sources thus became a reality within a few months. In each building connected to the grid, a heat transfer system with buffer tank was installed at the expense of the operator company. Using a calibrated heat flow sensor, the supplied hot water is provided to the building, and accounts are settled at the end of the year.



Local hot water supply line with T-fitting in the open ditch



Heat transfer system consisting of a buffer tank, pump, regulator, and heat flow meter.

Photovoltaic System

Through the involvement of the citizen-financed component of the project, a new 66 kW photovoltaic system was also established. The system provides over 60,000 kWh / year to the bio energy village. Together with an existing 260 kW of solar power capacity which supplied a quarter of Mauenheim's electrical use already, the solar systems alone produces nearly 4 times the town's electrical requirements.



Citizen-financed photovoltaic system in Mauenheim

Environmental and Climate Protection

The biogas system replaces conventional fuel types, resulting in a green house gas emissions reduction of 2,600 t CO₂e/year (based on the current German energy supply mix). Approximately 1,000 t CO₂e/year are saved by the use of the surplus heat of the biogas cogeneration unit and the woodchip heating system. The photovoltaic systems save a further 120t/year. Over the next 20 years, approximately 60,000 tones CO₂e/year will be saved, a considerable contribution to climate protection.

Costs of the Project and Citizen Participation

The biogas system, financed independently by the local owner KCH, cost approximately €1.4millions. "Solarcomplex" (a locally owned investment group) financed the woodchip heating system, the local hot water supply grid, the heat transfer systems in each building, and the testing facility, costing €1.6 million total. Solarcomplex became a limited partnership, allowing local citizens of Mauenheim to participate financially. The minimum investment stake was with €2,500, with actual participation anywhere from €2,500 to €50,000. Altogether €605,000 of citizen's capital was raised. A 5% return was forecast for these citizen investments. In addition, a loan was secured from the KfW Federal Green Energy Loan

System through a local savings bank. The State of Baden-Wuerttemberg also provided a grant of €136,000 from their Wood Energy Advancement Program.

The project duration is expected to be 20 years, while the technical components are hoped to continue to operate beyond this. Fuel expenditures are now spent locally, keeping purchasing power in the community. Currently, the citizens of Mauenheim save over 300,000 litres fuel oil. With the current price of oil price, this offsets a cost of approximately €200,000/year.

Status of the Project

The biogas system has been producing electricity since December 2005 and has supplied the hot waste supply grid since October 2006. The complete hot water supply grid is installed, connecting 66 buildings, including the local alpine resort, the city hall, the church hall, and many private residential buildings. The woodchip heating system feeds likewise in supplies the hot water supply grid, and the photovoltaic system is now connected to the electrical grid. The project is structurally complete. For the future, solarcomplex is planning similar bio energy bio villages in the community of Lippertsreute, in the region of Überlingen, Germany.

Project Partners

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Email Correspondence with Karl Greissing (Baden-Wuerttemberg) and Ben Mueller,
Executive Committee, Solarcomplex, May 27, 2008

Additional Project Details:

The project idea proceeded from the two farmers, Ralf Keller and Erich Henninger, who wanted to establish a biogas system, and from the outset the goal had using the surplus heat from the cogeneration unit. The farmers approached the company solarcomplex. The planning, public approvals, and delivery of the project happened then through solarcomplex.

The total investment amounted to nearly €1 million for the biogas system, financed by the operator company KCH (consisting of the two farmers and a third private investor). The details of financing within this group is private.

The remainder of the project (local hot water supply grid, the heat transfer systems, the woodchip heating system, and the testing facility) cost approximately €1.7million, financed by solarcomplex, solarcomplex GmbH (the locally created subsidiary with local investors), and KG Bioenergy Mauenheim. Other sources of funding include approximately €600,000 of citizen capital, and a loan from the federal KfW renewable energy loan program, an a grant from the State of Baden-Wuerttemberg's Wood Energy Advancement Program for €136,000. After repayment of the various loans, the renewable hot water supply grid will belong to the citizen who participated, who are predominantly from the local region. This model has been used before in the "Power Supply in Bürgerhand" project.

It should be noted that the ownership structure may actually change again, as the parent company is considering taking over the project. It appears that after the first full year of operation, that the predicted energy yields were not met. As a result, to avoid financial loss, the citizens have the opportunity to be bought out at no loss to their principal investments.

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