



IEA Bioenergy  
Technology Collaboration Programme

# Renewable heat supply in a bioenergy village

## Best Practices on flexible bioenergy

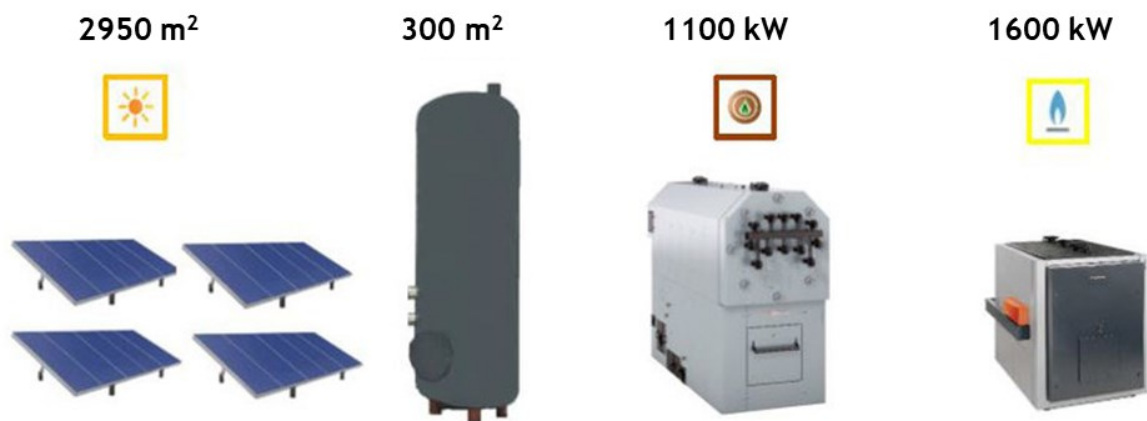
Mengsberg, Germany

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Author: Nora Lange

### Project description

The small village of Mengsberg has opted for a state-of-the-art hybrid solution consisting of an open-space solar thermal field, a wood chip boiler, and an on-demand and redundant biopropane boiler for fully renewable heat supply. Mengsberg's concept is based on the variant of a three-stage heat generation system with redundancy, so that a reliable heat supply to all connected buildings is guaranteed 365 days a year. This is an exemplary step towards minimising dependence on fossil fuels in rural areas.

The supply in summer as well as a part of the base load in the transitional period and in winter is covered by a **solar thermal field** with a gross collector area of 2,950 m<sup>2</sup> in connection with a **buffer storage** with a volume of 300 m<sup>3</sup>. The base load during the rest of the year is covered by a **wood chip boiler** with a capacity of 1,100 kW. For the peak load on very cold days and for redundancy coverage, a **bio-liquefied gas boiler** with an output of 1,600 kW is provided.



Source: Bioenergiegenossenschaft Mengsberg eG

Base information	
Link for more information	<a href="https://www.begmengersberg.de/">https://www.begmengersberg.de/</a>
Contact person, email	Michael Rudewig, begmengersberg@outlook.de
Location	Mengersberg, Germany
Owner/Operator	Bioenergiegenossenschaft Mengersberg eG, Care of the facility is a cooperative task
Technology supplier	Viessmann;
Facility planned since/Start of the project	2014
Construction year	2016-2018
Status	Concept Bioenergy village
Feedstock	Wood chips, biogas, solar
Products	Heat
Size	<ul style="list-style-type: none"> <li>• Solar thermal field with a gross collector area of 2,950 m<sup>2</sup></li> <li>• Buffer storage with a volume of 300 m<sup>3</sup></li> <li>• Wood chip boiler with a capacity of 1,100 kW</li> <li>• Bio-liquefied gas boiler with an output of 1,600 kW</li> <li>• 150 contractual customers (as of Dec 2019)</li> <li>• Total annual heat supply approx. 4.0 GWh</li> </ul>
Type of flexibility provided	Feedstock flexibility, heat supply with flexible output, peak load/back-up, flexibility through storage
Investment cost of the plant	€ 6 million (2016)

### Market opportunities

In a cooperative, citizens join together to gain economic benefits. This means they set up their own company and (as in the Mengersberg example) take the heat supply into their own hands.

In Germany, each cooperative is audited and monitored by a cooperative association. This way, members have confidence that their cooperative has a sound economic and financial concept right from the start. A cooperative is easy to set up, autonomous, and democratically organised. It is not subject to any economic constraints, as it only manages for citizens themselves. The supervisory board and the board of directors are made up of members. So everyone can be sure that only the members' interests are at the centre of the actions.

The Hessian municipality of Mengersberg, a district of Neustadt with 900 inhabitants, financed a feasibility study with funding from the European Union for rural development in 2014. After the study showed a positive economic viability of the renewable heat supply, a bioenergy cooperative was founded in autumn 2014. With the commissioning of the Viessmann Group in 2017, the Mengersbergers gave the go-ahead for the construction of an approximately 3,000 square metre solar thermal field, including a 300 m<sup>3</sup> buffer storage tank, together with a heating centre with a wood chip plant and a biopropane boiler.

## Technical and Commercial Details

The investment costs for the entire project in Mengersberg amount to about € 6 million. Public subsidies (KfW Bank) covered € 1.9 million, and the rest is covered by cooperative contributions. The city of Neustadt guarantees 80% of the loan amount, which would take over the facilities if necessary. Another € 600,000 were raised by Mengersbergers as a cooperative contribution.

The cooperative contribution of each participant of € 4,000 can be paid in three instalments. VR Bank Hessenland offers a low-interest and non-bureaucratic financing option especially for this purpose. The minimum purchase quantity per consumer is 10,000 kWh per year. Billing is done with calibrated heat meters, which are part of the installed technology.

About 20% of the heat demand is covered by solar energy, while the rest is produced by the wood chip plant. In addition, there is a biopropane boiler with 1,600 kW for extreme situations, which covers a maximum of 2 % of the heat demand.

The cooperative's new local heating network is about 9.3 km long. The cooperative is building the entire network, including the house connection pipes, the watertight house inlet, and the house transfer station, including the outdoor sensor. The other installations of the heating systems in the house is carried out by private craftsmen. According to the three-stage heating concept, the reliable supply of local heat is ensured by the wood chip system, the solar thermal field and via a bio-liquid gas burner. Peak demand periods are usually covered by the very large buffer storage tank. During long cold periods, the biogas boiler is switched on. In terms of quantity, such peaks account for less than 1-2% of the total annual demand.

The flow temperature in the house is up to 85 degrees; it can be set individually for domestic hot water preparation. The house transfer stations are part of the heating network and are built, paid for and maintained by the cooperative. Maintenance and repair costs are borne by the cooperative and carried out by the team itself.

A hot water storage tank (boiler) is not necessary in every case, as there are also house transfer stations with flow-through heat exchangers for fresh water - If the existing storage tank is in good condition (maintained, descaled) and also sufficiently large for the demand, it can continue to be used. This is the most common case. This is checked during the walk-through as part of the design planning. If the storage tank is old or too small, the best opportunity to renew it at the same time.

## Lessons to Learn

- The hybrid heating solution makes the system less dependent on fossil fuels, which are becoming increasingly expensive. The local heating network, on the other hand, is fed with low-cost heat from the solar thermal field and heat from wood chips.
- CO<sub>2</sub> emissions are reduced because the heat is generated almost exclusively from renewable sources.
- The spending for "heat" stay more in the region and no longer flow into the hands of the oil companies.
- Separate household scaleheating systems are no longer needed. The costs for maintenance and servicing by separate households are eliminated. Investments for modern condensing boilers or tank room renovation are no longer necessary. A cellar room is freed up in the house.
- Households do not need to worry about stricter exhaust gas standards for boilers in the future.
- The heat is available at all times. Households no longer have to buy oil, which is subject to constant price fluctuations. One can, but don't have to, put wood on the fire anymore; the preparatory work for the logs can be dispensed with.

- If there are other, even cheaper ways to generate heat in the future, they can be integrated flexibly into the existing grid.

#### Further links

[https://www.cjd-update.de/wp-content/uploads/2019/05/Projektskizze\\_Bioenergie\\_dorf\\_Mengsberg1.pdf](https://www.cjd-update.de/wp-content/uploads/2019/05/Projektskizze_Bioenergie_dorf_Mengsberg1.pdf)

<https://www.dbfz.de/projektseiten/smarte-bioenergie/beispieluebersicht/mengsberg/>



Mengsberg Energy Station. Source: Bioenergiegenossenschaft Mengsberg eG





Buffer storage for solar energy. Source: Bioenergiegenossenschaft Mengersberg eG



The boiler for firing wood chips.  
Source: Bioenergiegenossenschaft Mengersberg eG



House transfer station. Source: Bioenergiegenossenschaft Mengsberg eG



Routes of the pipelines in Mengsberg. Source: Bioenergiegenossenschaft Mengsberg eG/Viessmann