D.T3.3.1 PILOT CASE FACTSHEETS

English version

Version 1

02/2022

D.T3.3.1: Pilot case fact sheets

A.T3.3 Fostering the development of small renewable district heating networks

Issued by:	**Partner n°4 – Partner Solites**
Reviewed by:	**Partner n°1 – Partner AMBIT**
Version date:	**21.02.2022**
Version. Revision	**1.0**
Circulation	**PU - Public**

Document History

Date	Version	Description of Changes
01.02.2022	v 1.0	Document issued by PPn°4

Partners involved

PP n°1-11 - PP all

Interreg CENTRAL EUROPE

Priority:	2. Cooperating on low-carbon strategies in CENTRAL EUROPE
Specific objective:	2.2 To improve territorial based low-carbon energy planning strategies and policies supporting climate change mitigation
Acronym:	**ENTRAIN**
Title:	**Enhancing renewable heaT planning for improving the aiR quality of commuNities**
Index number:	CE1526
Lead Partner:	Ambiente Italia Ltd
Duration:	01.04.2019 31.03.2022

Pilot case fact sheet

Arta Terme (Italy)

Power plant revamping and densification of the network

Background

Arta Terme is a little alpine town in the northern part of FVG region, few km away from the border with Austria. Located at the bottom of the valley between 500 and 600 meters above sea level, the town experiences cold winters and mild summers. The town has a developed tourism sector, with a thermal centre, hotels and a nearby ski resort.

Key facts

County	Italy
City	Arta Terme
Inhabitants	ca. 2.000
Area	ca. 43 km^2

Description of the project

Analysis of current situation and comparison with QM requirements (linear heat density and distribution heat losses), and other plant operation criticalities.

The 5 MW biomass boiler fuels a cogeneration ORC cycle and a DH grid. It was built in 2008 in order to exploit the huge incentives on biomass for electricity generation, which consist of 280 euros/MWh and will finish in 2023. Problem is that without this subsidy the operation of the plant is not economically viable. The heat sale alone cannot sustain such a large plant, therefore different revamping options are evaluated.

The distribution network is structured in three different branches: two supplying urban areas and the thermal bath area buildings, for a total of about 9 km. The largest consumer is by far the thermal bath structure, which keeps the linear heat density of the whole grid above 900 kWh/m*a. The other two branches mainly serve private houses and hotels, and have a much lower linear heat density.

Distribution network over the town map

Arta Terme's plant is the largest plant on the regional territory, and it also works as logistic platform for woodchip storage for the other (smaller) 6 plants managed in the area by ESCOmontagna. There is no problem with the supply of local woodchip and with its quality.

It has to be mentioned the absence of a thermal storage for peak shaving and demand-production decoupling. Moreover, there is one single pumping station located at the power plant, and therefore no possibility to regulate separately the flows along each branch.

ESCOMONTAGNA PLANTS

Heat exchanger ID	Municipality	Network lenght [m]	Annual heat sale [kWh/a]	Heat Density [kWh/m*a]	Heat Density [MWh/m*a]	Evalutaion	Annual net value of heat sold	Net heat sales price average [€/MWh]
1	FORNI AVOLTRI	86	162.182	1888	1,888	👍	10.439,46 €	64,37 €
2	TREPPO LIGOSULLO	1.292	523.317	405	0,405	👎	32.662,04 €	62,41 €
3	AMPEZZO	295	510.460	1733	1,733	👍	35.018,19 €	68,60 €
4	PRATO CARNICO	1.055	334.207	317	0,317	👎	22.280,02 €	66,67 €
5	LAUCO	414	182.588	442	0,442	👎	10.879,09 €	59,58 €
6	VERZEGNIS	1.015	354.446	349	0,349	👎	30.465,58 €	85,95 €
7	ARTA TERME	9.009	8.292.800	921	0,921	👎	538.947,20 €	64,99 €
TOTALE		13.166	10.360.000	787	0,787	👎	680.691,59 €	65,70 €

ESCOmontagna plants and heat density evaluation

The plant is run also during the summer season at almost full power as its main revenue consists in the subsidy on electricity production. During this time of the year almost all the heat produced is unused and released in the environment, as the return water must be cooled before going back into the boiler. In this table a brief evaluation of the ESCOmontagna plants is reported, showing a systemic wrong approach for what concerns the planning phase of such grids.

Project phases and activities

APE FVG performed the densification analysis. The municipality of Arta Terme collected all the interested citizens and commercial activities interested in getting connected to the distribution network. APE FVG, considering the heat demand and distance of each interested user from the grid evaluated all the 208 requests and selected 173 users that have a beneficial impact on the linear heat density. This analysis was passed to the CM who despite having the funds

and the technical analysis still did not take a final decision and let the process start.

Besides that, the revamping pre-feasibility analysis was assigned to BIOS. 4 scenarios were analysed as possible configurations: A) status quo or current situation (CHP with ORC cycle), B) Optimized current configuration, C) status quo without ORC, D) Heat only revamping. For each configuration the techno-economic evaluation was carried out, considering also the revamping investment costs annualization. As no subsidy will be given after 2023, the safest, simplest and most convenient scenario is scenario D), where after 7 years of loan annuity the plant, if operated correctly, should guarantee a net +100k euros revenue.

Many of the RSAG and local trainings focused on the Carnia area, with the aim to raise a positive attitude towards biomass plants, explaining the mistakes of the past and introducing the idea of quality standards to guarantee the success of such plants.

Hopefully, depending on the efficiency of the CM, the official feasibility analysis should be assigned within the next few months, so that during summer 2022 or summer 2023 the revamping process can be carried out.

Climate protection and economic data

Currently, the operation of the plant results in a negative economic balance due to the numerous issues (leakages and breakdowns) of the ORC cycle. Despite the really high electricity subsidy, the low heat sales are not sufficient to sustain such a large plant.

All the economic data i.e. wood chip supply and consumption, costs of ash disposal, heat price, O&M costs etc, have been retrieved directly from the operator for BIOS, who elaborated a detailed economic balance of the plant. After that, 3 different revamping scenarios have been developed always by BIOS, each one with its own new expected economic balance.

For the revamping and densification project, the region has already given in 2021 about 10 million euros to the CM for “energy projects”. This should cover most of the interventions. Moreover, for the densification of the network, private citizens can access a 50% national subsidy for the connection intervention.

Lessons learned

The main lesson is that no public funds can anymore be given without the certainty that the investment will be environmentally and economically successful. A quality standard that overviews all the different phases of the project, from the pre-feasibility to the final optimization is necessary. The effort of APE FVG is to make QM mandatory in order to access public funds for future biomass plants and DH networks.
The main obstacles are the delays and interruptions and changes of perspectives of the local political views. In fact, even on a small territorial scale, mayors with opposites views and individual ideas can generate serious troubles for such a project. Bureaucracy adds to this time delays due to formal procedures on CM and regional level.

What is fundamental is that this project gets activated and a new plant takes over the existing (and hopefully densified) grid before the end of 2023.

Further information

Involved parties:

Carnia Mountain Community (CM) as owner of the plant:	Orlando Gonano (technical director), Ermes De Crignis (CM president), Patrizia Gridel (CM planning strategy), Coriglio Zanier (CM Energy&Environment), Luigi Cortolezzis (former CM Energy&Environment Council member)
Arta Terme Municipality as location of the plant:	Luigi Gonano (mayor)
ESCOmontagna as operator of the plant:	Sergio Buzzi (ESCOmontagna president) Michele Pertoldi (technical director)
APE FVG as regional sectorial agency:	Matteo Mazzolini, Samuele Giacometti, Francesco Locatelli, Vito Tisci
AEE Intec:	Harald Schrammel, Christian Ramerstorfer, Sabrina Metz
BIOS Bioenergiesysteme GmbH:	Alfred Hammerschmidt
Further information:	www.interreg-central.eu/ENTRAIN

Image credits

Page 1:	APE FVG
Page 2:	APE FVG elaborations of ESCOmontagna data and images

Pilot case fact sheet

Povoletto (Italy)

Shift from oil to biomass and small enlargement of the network

Background

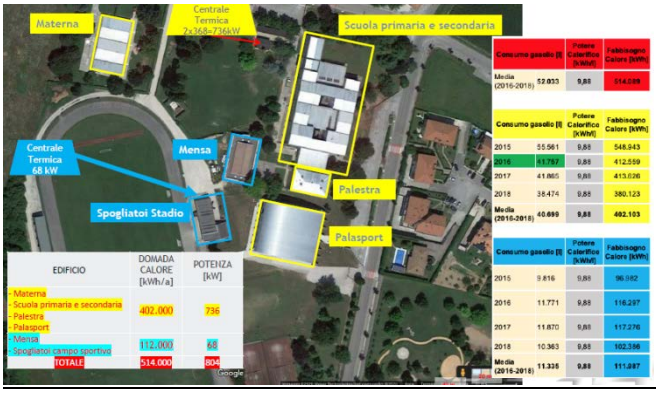
Povoletto is a small-medium municipality located about 10 km to the north-east of Udine, few km away from the Julian pre-alps and their wood resources. It is mainly a residential area with few industries.

Key facts

County	Italy
City	Povoletto
Inhabitants	ca. 5.400
Area	1.394 ha

Description of the project

Currently, a small DH network supplies to elementary and middle school, the school's gym, kindergarten and an indoor sports arena. All the mentioned buildings, as well as the network, are owned by the municipality of Povoletto. It is fuelled with two oil boilers of 368 kW each.



Interested area with current heating consumption of each building

Right next to these buildings, the municipality also owns the school canteen and a football pitch with its lockers. So besides replacing the fossil fuel with biomass, this revamping is a clear opportunity to connect these other two buildings. The oil consumption for multiple years was retrieved and analysed. This is a relatively stable heat demand with winter only operations, and there is basically no possibility that this demand actually changes in the coming 20 years. Overall, the expected linear heat density should be around 1700-1800 kWh/m^2.

The owner of the plant is the Municipality. Chiurlo (a commodity provider) won the tender to build and manage the plant and the network. Chiurlo designated Marchiori Energie, a local planning studio, to deliver the project.

Overall, the project is relatively small (will probably consist of two 125 kW biomass boilers), but it can be a good example of repowering, shift from fossil to renewable and optimization of an existing infrastructure. Moreover, it could be the first plant to follow QM standards and therefore represent a starting point for the spread of such approach.

It is expected that the shift will reduce emissions by 85% (from 134 tonnes to 21 tonnes of CO_2) and increase the hours of local jobs by 700% (from 65 hours to 510 hours per year).

Project phases and activities

Of the three pilot projects here reported, this one is the most advanced one. In fact, APE FVG started the cooperation with the involved partners when the tender was already active, and therefore the time scheduled was already defined. The tender closed in spring 2021, and during the summer the Municipality of Povoletto managed to overcome its political and bureaucratic delays. While the tender was open APE FVG performed a pre-feasibility analysis following the QM principles and delivered the study to the municipality. During autumn Marchiori Energie finalized the design of the project. In these circumstances, APE FVG shared with the designers the most important QM principles about sizing of components, operations, heat losses and function of the heat storage.

During winter 2021-22 the plant will be operating to supply heat to the schools. The work will be carried out during summer 2022. This way, it will be possible to accurately monitor winter 2022-23 and then to study a possible optimization strategy.

Thanks to ENTRAIN, APE FVG had the opportunity to give a free consultancy and share the expertise acquired within ENTRAIN with the Municipality and the designers to discuss the most important details of the project.

Climate protection and economic data

Since the Municipality made an open tender for the repowering and the management of the plant for the next 15 years, there are no economic issues. In fact, Chiurlo will pay entirely for the project and then recover its expenses with the heat sales over the next 15 years. Moreover, the heat price was already defined in the tender, so that both parties are sure to have a long-term and profitable cooperation.

Lessons learned

For APE FVG, one challenge was to convince the designer, which already had a job deal with the operator of the plant, to change their design approach to follow the QM standards. In fact, most of the plants built in the past years show a radically wrong design approach, which focuses only on the involved power and peak demand and not on the actual demand profiles.

On the other side, having a private company, which aims to get the plant up and running in order to make profits, managing the design and construction process reduced a lot bureaucratic delays.

Further information

Involved parties:

Povoletto Municipality as owner of the plant:	Stefano Serafini (technician), Mara Tarnold (City Council member), Rudi Macor (City Council member), Giuliano Castenetto (mayor)
Chiurlo srl as operator of the plant:	Enrico Fasano, Marco Mosco, Raffaele Costantini
Studio Marchiori Energie as plant designer:	Fabiano Di Lazzaro, Federico Cisint
APE FVG as regional sectorial agency:	Matteo Mazzolini, Samuele Giacometti, Francesco Locatelli
Further information:	www.interreg-central.eu/ENTRAIN

Image credits

Page 1:	Municipality of Povoletto
Page 2:	APE FVG elaboration of Google Maps image

Pilot case fact sheet

Gemona del Friuli (Italy)

New DH in school and sport district

Background

Located at the bottom of the major alpine valley of the region, Gemona del Friuli is the major town of the area. The city hosts many commercial activities and a large industrial district. Moreover, here are located high schools and professional schools.

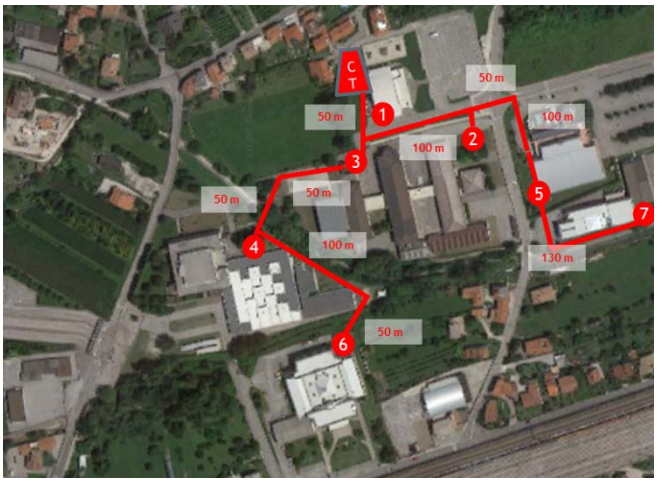
Key facts

County	Italy
City	Gemona del Friuli
Inhabitants	ca. 11.000
Area	ca. 56 km^2

Description of the project

In the north-western area of Gemona del Friuli the school and sport district of the city is located all within a relatively small area. Currently, there are 4 schools, 2 gyms and a swimming pool. Moreover, during 2022 two new gyms will be built in the same area. All these buildings are either owned by the Municipality or by the Region. Having such a high number of high heat demand buildings in such a small area suggests that a DH network might be a very promising solution.

As there is no precise monitoring of the consumption demand over the year (and therefore it would be impossible to calculate the avoided emissions), the administration is not able to ask for white certificates for energy efficiency and renewable energy supply interventions. Therefore, the project will be realized in 3 different steps, allowing to spread better the initial investment and to give time to monitor one heating seasons' consumptions in order to access white certificates incentives.



Interested area and buildings

Even so, it was possible to retrieve a rough estimation of consumptions for heating and hot water for each building, and therefore the linear heat density was calculated, and it results above 5.000 kWh/m*a. Moreover, adding the two new gyms that will be built right next to the power plant, the density should even improve. In the table below the heat demand, the installed power and the energy vector of each building can be seen.

ID	EDIFICIO	Contatto	DOMADA CALORE [kWh/a]	POTENZA [kW]	VETTORE ENERGETICO
1	Palestra 1	Comune Gemona	350.000	347 = 300 + 47	METANO
2	Plesso scolastico Marchetti	Alessandro Pischiutti EDR Ente Decentramento Udinese	560.000	1.032 = 516+516	METANO
3	Plesso scolastico Magrini	Alessandro Pischiutti EDR Ente Decentramento Udinese	280.000	322 = 166+166	METANO
4	Plesso scolastico Raimondo d'Aronco	Alessandro Pischiutti EDR Ente Decentramento Udinese	1.100.000	2.624 = 1163+1163+107+120+71	METANO
5	Piscina + Centro benessere Atlantis	Luca Pesamosca	750.000	666 = 333+333	METANO
6	IAL	Davis Goi Assessore Gemona	270.000	847 = 316+500+31	GASOLIO
7	Palestra Gemona Atletica	Paolo Pesamosca	220.000*	140 = 35+35+35+35	METANO
Lunghezza rete = 50+50+50+100+50+100+50+100+130=680m					

Interested buildings and current heat demand

The project will then be implemented in three different phases, with 3 different boilers that will give high flexibility to the final plant. First, the building for the power plant will be built and one single biomass boiler will supply the two new gyms and building 1. The following year buildings 2-3-4 and 6, after a year of detailed monitoring, will be connected and a second biomass boiler will be added to the system. Last, on the third-year of the project, buildings 5 and 7 will complete the network, and another biomass boiler will be added. The size of each boiler will be decided following QM guidelines and after having analysed properly the consumption curves.

Since the space is limited in the area, a small woodchip storage will be located next to the boiler room, while a larger logistic platform for wood seasoning, chipping and storage for multiple weeks will be located in an already selected area a couple of kilometre away.

For future developments, it can be considered to enlarge the network to the hospital, which is located just across the street, and retrieve waste heat from the crematorium, which is also located close to the area and would supply high quantities of waste heat, only during weekdays and from 7 am to 19 pm.

Project phases and activities

First step of the project was to involve the Municipality and each owner association of the interested building, because a strong political willingness is fundamental for such a project. All relevant data about the consumptions for heating and hot water were retrieved, and the pre-feasibility carried out.

A detailed evaluation of how to supply the plant with local biomass was performed using the sustainable management reports of the municipality-owned forests of Gemona, Venzone and Trasaghis (two neighbouring municipalities).

Regarding the timeplan of the project, it is likely that the actual construction of the first phase will take place in 2023, using 2022 in order to perform a detailed and optimal planning. Therefore:

- 2022-2023 planning and construction of phase 1;
- 2024 second phase;
- 2025 third and last phase.

In the meantime, additional analysis regarding the hospital and the crematory can be done and implemented in the following years.

Given the small distances and the high demand, plus the fact that all the buildings are expected to stay in place and continue their activity for a long time, there are great expectations regarding this project. With the local supply of biomass, it could become a good practice example to be exported and replicated in many other areas of the region, and to boost public opinion towards such projects. Moreover, it is expected to create several local jobs and to create a notable economic benefit for the local community and especially for the Municipality, which would cut on fuel costs for its buildings and would create a new revenue from the management of its forest, currently unexploited.

ENTRAIN and its partners provided the methodology for such project, and in particular AEE Intec provided advise on the pre-feasibility and helped with the right questions and analysis.

Climate protection and economic data

The Municipality of Gemona has already received the funding for the two new gyms and there is already a good dialogue with the region in order to obtain the funding for the DH project. Moreover, since the project will be split into three different phases, it will be easier to obtain the financing. In fact, the current regional assignment of funding works in the way that each project is ranked and financed for about 70% and up to a certain amount, usually 450 thousand Euro. The second- and third-year enlargements can therefore be eligible for a new funding every year.

Currently, the average heat cost for all the buildings is around 70 Euro/MWh. Since it is not a direct market competition with fossil fuels it can be assumed that DH heat can be sold at about the same price.

Lessons learned

Again, the main obstacles to the actualization of the project are the delays due to politics and bureaucracy.

Anyway, this is a case of how different associations, public authorities and forestry companies just need to be linked together to create a possible best-practice project that creates local benefits on multiple aspects. This project could then be further developed to reach more buildings and integrating more renewable heat sources, but can also be exported and replicated in other areas.

Further information

Involved parties:

Gemona del Friuli Municipality as owner of the plant:	Roberto Revelant (mayor), Manuela Rigo (technician), Massimiliano Crapis (technician), Davis Goi (City Council Member)
APE FVG as regional sectorial agency:	Matteo Mazzolini, Samuele Giacometti, Francesco Locatelli
Cigliani Primo S.n.c. as forestry company:	Mirco Cigliani
Legambiente Gemonese as environmental NGO:	Sandro di Bernardo, Nicola Ceschia
Further information:	www.interreg-central.eu/ENTRAIN

Image credits

Page 1:	APE FVG
Page 2:	APE FVG elaboration of data and Google image

Pilot case fact sheet

City of Karlovac (Croatia)

Integration of geothermal energy into the district heating system of the city of Karlovac

Background

City of Karlovac is located in central Croatia. Karlovac is framed by rivers Kupa, Korana, Dobra and Mrežnica. Considering that it is located in the smallest part of Croatia, only 50 kilometers away from Slovenia and Bosnia and Herzegovina, Karlovac has important traffic and economic significance. Karlovac area is known as an area with large geothermal potential.

Key facts

County	Karlovac County
City	City of Karlovac
Inhabitants	ca. 49.594 (2021)
Area	402 km²

Description of the project

Karlovac is well known geothermal area where high temperature geothermal water was found at 3.5 to 4.1 km depths, in two wells about 10 km away from the city. The highest water temperature at the well was registered during well logging at 140°C. City of Karlovac is interested in an area closer to the city where geothermal waters with somewhat lower temperatures are expected, but still high enough for district heating. Karlovac has gas operated district heating network but is looking for geothermal source in order to lower prices for consumers and lower CO_2 emissions in the city. Gradska toplana d.o.o. is located in the heart of the city of Karlovac which has a district heating tradition of almost 50 years, since 1968. The district heating system is a typical one for a smaller city (around 50 thousand inhabitants), a unique network in a star configuration, 22,1 km long. The boilers in the district heating company are long past normal lifetime and the district heating company can expect a sudden shutdown or a major failure of the boilers main equipment or material. It should be of prime interest for the district heating company of Karlovac refurbish the leakage to save fossil fuel. It is highly possible to use water from the existing geothermal wells in Karlovac (Ka-2 and Ka-3) to support at least 50% the district heating system or 21 MW of the total 39 MW, which is installed at the Karlovac heating central. By connecting the geothermal wells to the Karlovac district heating system, it is possible to save considerable amounts of fossil fuel (gas).

Project phases and activities

The City of Karlovac recognized the geothermal potential and founded the company GeotermiKA d.o.o. for energy from Karlovac for research and exploitation of geothermal water for the needs of the existing heating system and to produce electricity for the needs of public facilities, such as hospitals, schools, kindergartens, city administration facilities, public lighting, etc. Company GeothermiKA received a permit for exploration of geothermal springs for Karlovac 1 in December 2019, and it is valid for 5 years. Modernization of Karlovac's district heating system through ITI scheme City of Karlovac was selected to apply the integrated territorial investment scheme in the MFF 2014-2020. Within the scheme there are actions connected to the DH system network refurbishment. The City of Karlovac receives financial EU support for investments in geothermal potentials. The financing of the project 'Geothermal Energy Utilization Potential in the city of Karlovac – GEO4Ka9' within the framework of the program Horizon 2020, from the European City Facility (EUCF) has been endorsed for the city of Karlovac. After the company GeotermiKA d.o.o. complete the testing of wells and determine the quality and temperature of water, it is necessary based on the obtained data to determine which is the best way to exploit geothermal energy in the Karlovac County. If the possibility arises, Karlovac County should start the process of installing a heating plant on geothermal energy and connecting to the existing district heating system, but, if possible, start expanding the existing district heating system. Furthermore, it is necessary to consider whether the temperature of geothermal water will be high enough to produce economically viable electricity and to determine the possibility of starting the installation of the plant. In this way, thanks to geothermal energy, the City of Karlovac could become energy independent. The City of Karlovac is in the process of modifying its Spatial and zoning plans. In order to utilize this opportunity to define the cities development pathway into a sustainable future, the North-West Croatia Regional Energy Agency is supporting the city to transform the process and deliver a green spatial and zoning plan, the first one of its kind in Croatia. The analysis within the Entrain project showed the four most viable

renewable energy sources (solar, biomass, geothermal and heat pumps) can all supply energy at relatively affordable prices. Finally, geothermal energy is the cities strongest option and can be viable long term if adequate sources of energy and funding are discovered at favourable locations.

Climate protection and economic data

The implementation of such an investment project in the Karlovac County will require the mobilization of significant financial resources. For the successful implementation of the measures, the budgets of the city of Karlovac and the County are not enough and it is necessary to find an appropriate combination of loans, private capital and non-refundable opportunities to finance their implementation. The successful use of grants will require significant involvement of city and county employees as well as subcontracting by external experts. To ensure project's success and to increase the degree of commitment of the involved parties, REGEA will work on continuous research of available and eligible funding options (public, EU funds and private) to match the requirements of the identified project in Karlovac. Finally, we hope that in the near future even the largest energy companies in Croatia – HEP (national electric company) and INA (national oil company) will recognize this potential and reach for the hot water from Croatian depths as an opportunity to expand their portfolio, each of them in their own way.

Geothermal energy – economic data	
Load factor	90 %
Unit investment cost	2710 EUR (without borehole)
Unit maintenance cost	22,6 EUR/year
Annual increase in maintenance costs	1 %
Annual fuel consumption	0 kWh/year
Fuel price	0,04 EUR/kWh
Annual increase in fuel prices	0
Annual energy production	7884 kWh/year
Equipment life	25 years
Discount rate	5 %
LCOH (Levelized cost of heat)	26,39 EUR/MWh

Lessons learned

Entrain, with its aim to promote DH expansion and zero-carbon heat sources, generates substantial replication potential in cities with functional DHS. Besides Karlovac, additional 12 cities in Croatia use DHS at least on a small scale. However, with the increased awareness of the benefits of fuel switch, it is only matter of time when these cities will make a step forward and actively start integrating DH in spatial plans and connecting building stock to DHS. Replication potential is strong in the entire SEE as DH system were similarly designed and built. As this is a pilot project in Croatia, it consisted of several new concepts in the field of spatial and urban planning and was, as such, a learning experience both for the City of Karlovac and REGEA. It was a challenge to adapt some of the proposed measures to the language of spatial planning for them to be properly adapted to the plans they were being integrated in. The learning and transfer potential of this practice is very strong. All municipalities, cities and regions have spatial planning practices across Europe and often lack the capacity or experiences to properly integrate energy and climate into them. This can be a lighthouse example of how to develop and implement green spatial plans thus enabling local and regional governments to tailor their development pathways explicitly and directly.

Further information

Involved parties:

The stakeholders directly targeted by ENTRAIN include public authorities and DH operator/supplier in the City of Karlovac. North-west Croatia Regional Energy Agency has provided technical assistance, support and expertise from other countries through project ENTRAIN to pilot city Karlovac, as well as the DH operator Gradska Toplana in preparing the DHS for the introduction of renewable energy sources such as geothermal. REGEA has act as a neutral facilitator, with a dedicated and skilled operational team, aiming to assist public authorities, companies and citizens in Karlovac. Coordination between local authorities and DH suppliers in each city is crucial to promote and introduce RES heat supply options in the DHS. The final beneficiaries of all projects and activities in the City are in all cases its inhabitants – the local people.

Further information: www.interreg-central.eu/ENTRAIN

Pilot case fact sheet

DOLB Ptuj (Slovenia)

District heating on wood biomass

Background

The largest municipality within the lower Podravje region, Ptuj City Municipality consisting of the town of Ptuj and adjacent settlements and villages plays an important role in different fields of everyday life of the citizens of the Administrative unit Ptuj. Ptuj is the oldest documented town in Slovenia. The entire town core is protected as monument.

Key facts

County	Lower Podravje
City	Ptuj
Inhabitants	23.530 (1.1.2020)
Area	66,7 km^2

Description of the project

Renovation of the existing District Heating System and transition to renewable energy sources.

- Phase I.: Reconstruction of the existing boiler room and transition to RES.
- Phase II.: Expansion of the district heating network and connection of new customers.

Technical details:

- Transition from natural gas to wood biomass - wood chips.
- The annual amount of wood chips is estimated at approx. 11.000 MWh.
- Additional heat demand (new connections) is estimated at approx. 2.050 MWh
- Additional connection power (new connections) is estimated at approx. 1.9 MW

Project phases and activities

- Creating a conceptual design of the project and finding the optimal solution - status: completed
- Preparation of a project for obtaining a building permit - status: completed
- Obtaining consents, permits, easements for construction and other necessary documents - status: in progress
- Execution of the public procurement for the supply of hardware - status: in progress
- Preparation of a project for implementation - status: in progress
- Execution of public procurement for execution of mechanical, electrical, construction and other works - status: in progress
- Preparation of the application for co-financing within the JR DO OVE 2019 tender and obtaining a decision - status: completed

Search for the best provider (banks) for a loan - status: in progress

Timeplan:

- Initialisation phase: 2017
- Feasibility phase (collecting data): 2018 - 2019
- Planning phase: 2019 – 2021
- Public procurement implementation phase: 2021 - 2022
- Implementation phase: 2022 – 2023

The main result is: If existing DHS can be efficiently and if the implementation of renewable energy sources is possible. The disadvantage is: the existing boiler room is located in a residential area with a relatively small land, which does not allow a larger supply of wood biomass next to the boiler room. The driveway itself is also a bit difficult, as the size of the land does not allow the arrangement of a larger manipulation space. We anticipate that the project will be implemented as planned and that Ptuj will receive a renovated district heating system. Minor problems we had with convincing city councillors to approve the investment.

Climate protection and economic data

The estimated value of the investment is EUR 3.8 million (boiler room + new DH network). The new average price of heat is estimated at approx. 80 - 90 EUR/MWh (now approx. 110 EUR/MWh).

Approx. 68 % - own funds (bank loan), approx. 32 % - Grants - JR DO OVE 2019, tendered by the Ministry of Infrastructure.

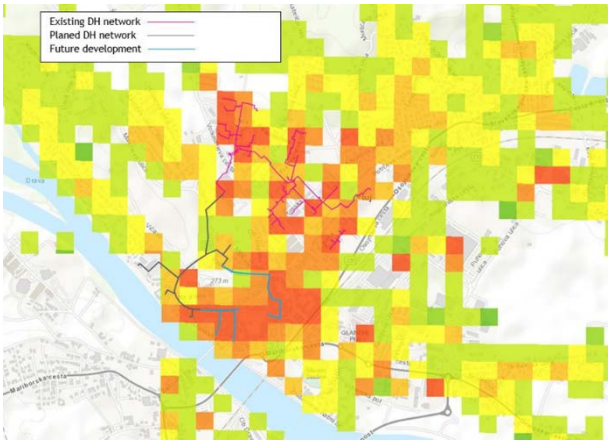
The mentioned funds or co-financing of such projects has been a constant in Slovenia for several years. The funds are exclusively intended for district heating projects based on renewable energy sources.

CO_2 savings would be approx. 1.950 tCO_2 per year.

Lessons learned

The main challenges were mainly to change the mindset of the local community that such systems are good and that technology on this area is extremely advanced. The ENTRAIN project played a major role in overcoming this obstacle, and the activities carried out within the project were more than welcome.

In Slovenia, there are mainly bureaucratic obstacles that are demanding and take a lot of time and energy for those who prepare the project. In principle, we overcame these obstacles with full commitment and constant vigilance over the project to make things run as nicely and quickly as possible.



Existing DHS network with planed and future development network

All the knowledge we gained during the ENTRAIN project and the pilot project will have an impact on systems design in other regions. The pilot project will be a sample system, which will be summarized by other regions that want or have the potential to carry out such projects. All the knowledge gained during this time will also be more than welcome for the further development of the project, for example: expanding the network and planning new production resources.

The ENTRAIN project had a very strong impact on the course of the project in Ptuj. The RSAG meetings with the partners, both those who participated directly in the project and those who were indirectly involved in the project, had the greatest impact. The main thing is that with the help of the ENTRAN project we managed to unify the opinion of all participants and the interested public.

Within the project:

- we explored the possibilities in the region and prepared an action plan, which we presented to the RSAG group,
- we gained a wealth of knowledge from experts in this field, which we were able to use in project planning,
- and have good result of work and cooperation and implementation in certain activities.

Further information

Involved parties:

Municipality of Ptuj	local authority, decision-makers
Local energy agency Lower Podravje	external experts and planners
Javne službe Ptuj, d. o. o.	DHS operator
Institute Kssena Velenje	external experts
Komunalno podjetje Ptuj	utility company / CHP owner and producer
Others:	Hardware supplier (wood biomass boiler, hot water pipelines, filter systems)
	Wood biomass suppliers (wholesale suppliers of wood energy products)

Further information: www.interreg-central.eu/ENTRAIN
www.js-ptuj.si/energetika/projekt-entrain

Image credits

Page 4: Expected appearance of a new wood biomass boiler room

Page 6: Existing DO network with planned and possible extensions

Project partners:

With the participation of

Pilot case fact sheet

Dußlingen (Germany)

From district concept to local heating

Background

The municipality of Dußlingen is located in the Neckar-Alb region in the northern Steinlach valley, embedded between the foothills of the Swabian Alb and the Rammert landscape conservation area south of the university town of Tübingen. In recent years, urban development measures such as the construction of the B 27 tunnel have improved the quality of life and housing. This has also enabled new areas to be gained. Following this trend, the quality of life is to be further enhanced by a climate-neutral heat supply.

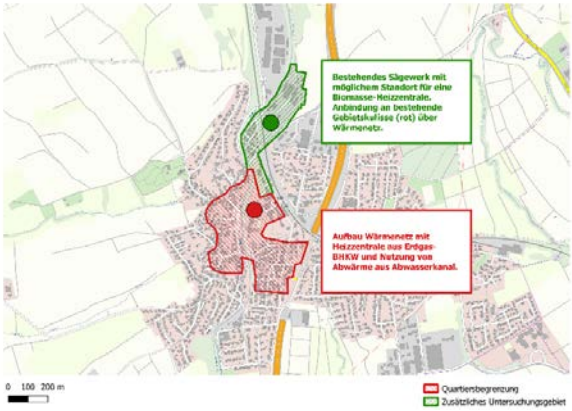
Key facts

County	Tübingen
City	Dußlingen
Inhabitants	6.300
Households	330
Area	1.306 ha

Description of the project

The district in the centre of Dußlingen goes side by side with the local development concept of the municipality from 2016. In addition to the renaturation of the Steinlach and making it more attractive for the public, the district concept is intended to develop approaches for reducing energy consumption in the future and making it prepared for the future.

An already existing gas network supplies about half of the development area, which, however, does not affect the realisation of the heating network. In the context of the urban district concept, the potentials of the energetic renovation and the expansion of PV systems are also being investigated, and the potential CO_2 savings that can be achieved as a result are being determined.



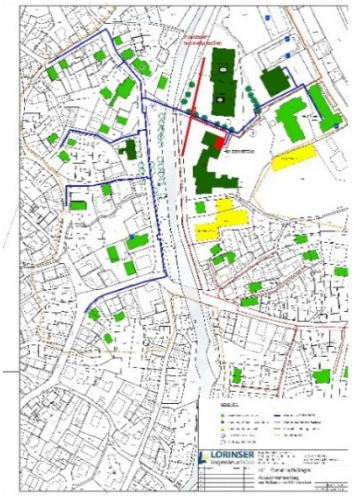
Study area of the energy efficient urban district concept

The total heat demand in the area is approximately 9,220 MWh per year. This is the result of the survey in the concept and estimates based on the building age and the renovation status of the properties.

Project phases and activities

A two-stage expansion of a local heating network is planned for the district. In the first stage, the Anne Frank School, the sports hall, the town hall and the adjacent nursing home, as well as other private households will be connected. The project was approved in the first application stage of the "Klimaschutz mit System" funding programme and must therefore be implemented by the end of 2022. In a second stage, a heating plant with woodchip firing can be built in the extended area of the neighbourhood in order to expand the heating network in the district and beyond and to increase the share of renewable energies.

Length of the network	1,7 km
Capacity waste water HP	210 kW
Capacity gas boiler	600 kW
Heat production	1.350 MWh
Share of renewables	41 %



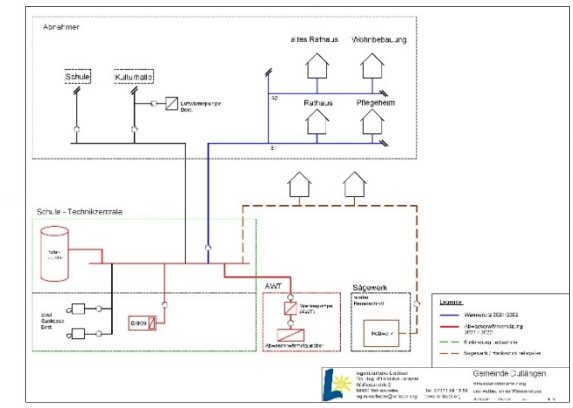
Possible plan of the first expansion step of the heating network in the centre of town

In the first extension stage, at least 26 of 244 possible buildings, which represents a connection rate of 11 %, will be connected to the heating network. The goal for the second extension stage is to significantly increase this share. In addition, an existing air-water heat pump with an output of 50 kW feeds into the network.

Climate protection and economic data

In the first step, a CO_2 saving of approx. 103 t per year can be achieved by replacing the heating systems of private and public buildings, which have been predominantly fossil-fuelled so far. It can be assumed that additional efficiency potentials will be tapped, as old heat sources in the existing buildings, most of which are linked to high losses, will be replaced with the connection to the heating network.

Heat production: fossil regenerative	 810 MWh/a 540 MWh/a
Emission of existing heating systems	302 t/a
CO_2-savings in the initial phase	103 t/a



Supply scheme

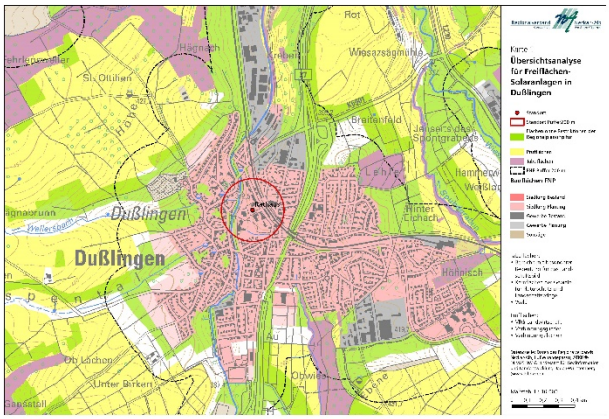
Due to the approval of the project proposal in the funding programme "Klimaschutz mit System", a high funding rate for the heating network and the generation plants can be expected. The high share of subsidies has a positive effect on the heating price.

Lessons learned

The development of the heating network on the basis of renewable energies boosts local value creation on site and actively contributes to the necessary climate protection. By using wastewater heat from sewers with the help of a heat pump, unused potential can be utilised and a contribution can be made to the stability and security of supply of the electricity grid.

Through the two-stage extension, important anchor buildings such as the school and other public buildings can be supplied with heat in the first stage and CO_2 emissions can be reduced at the simultaneously. With the extension in the second stage, the connection rate can be increased at a later stage, more buildings can be connected and the share of renewable energies in the grid can be significantly increased.

Overall, the project can give a positive impulse to neighbouring communities and the region. In the future, it will be important to establish an early and conceptual consideration of energy related issues in the context of development planning procedures.



Overview analysis for ground-mounted solar systems in Dußlingen

Further information

Project participants and contact:

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Further information:

www.interreg-central.eu/ENTRAIN
www.wärmewende-neckaralb.de

Image credits

Page 1: Regionalverband Neckar-Alb

Page 2: Agentur für Klimaschutz Kreis Tübingen

Page 3: Ingenieurbüro Lorinser (both)

Page 4: Regionalverband Neckar-Alb (on the right)

With participation from

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Pilot case fact sheet

Ammerbuch-Entringen (Germany)

Energy concept for the Schlossblick district

Background

The district of Entringen is the largest one of Ammerbuch. Entringen has a rural character and is connected to Herrenberg and Tübingen by the Ammertal railway. The village lies directly on the Schönbuch Nature Park and is embedded in an orchard belt.

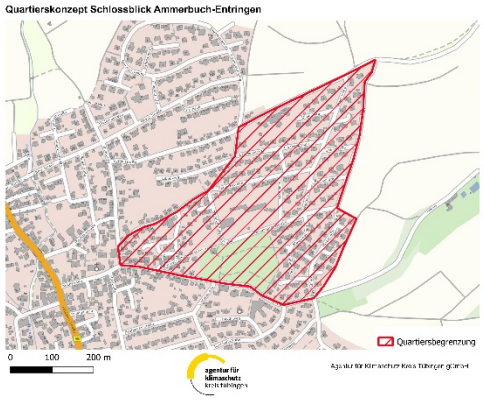
Key facts

County	Tübingen
City	Ammerbuch
Inhabitants	ca. 3.700
Area	1.394 ha

Description of the project

In the district Schlossblick, there are about 200 existing buildings as well as a planned new building district with several multi-storey buildings and single-family houses. Most of the existing buildings are heated with fossil oil and natural gas. Wood-fired central heating and heat pumps account for only a very small share of heat generation. Due to the rural character, there are still numerous wood-burning stoves as additional heating, which increase the share of renewable energies in heat production. In a first step, the new buildings are to be supplied via a local heating network.

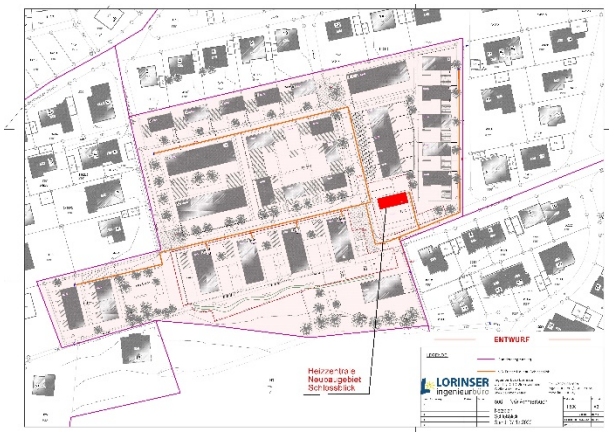
The total annual heat demand in the area is approx. 4,600 MWh; the data from the survey and the building file review were extrapolated accordingly. Of this, 17 % (approx. 781 MWh) is covered by renewable sources such as wood, pellets or heat pumps.



Study area of the energy-efficient urban district concept

Project phases and activities

The project includes the construction of a heating plant and a two-stage extension of a local heating network. In the first step, a local heating network is to be implemented in the new building area. Wood pellets and a gas heater as peak load will be used for this. Since the land is owned by the municipality, all new buildings will be required to be connected to the heating network through a connection and use obligation in the purchase contract. With the pellets, an efficiency standard of 55 EE will be achieved in the new buildings. It is possible to integrate the neighbouring existing buildings in the first network section in order to increase the heat consumption. Within the framework of an urban district concept, it will be determined whether the extension to the existing buildings is feasible.



Possible network plan of the first extension step of the heating network

Length of the network	1,1 km
Capacity pellet boiler	300 kW
Capacity gas boiler	475 kW
Heat production	880 MWh
Heat consumption	800 MWh
Share of renewables	70 %

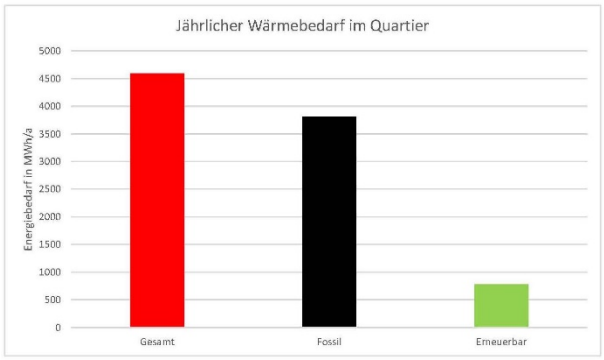
Climate protection and economic data

With a connection rate of 50 % in the existing area, a fossil energy quantity of 1,900 MWh/a could saved each year. This is equivalent to about 190,000 litres of heating oil, or about 14 full oil tankers per year.

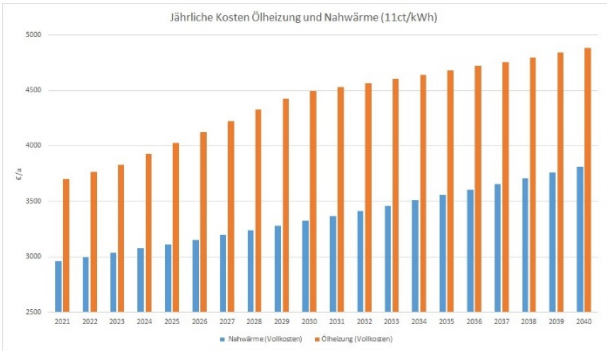
The first stage of planning is to implement a woodchip system in combination with a solar thermal system for the existing buildings. With a collector area of 1,000 m², the solar thermal field could cover approximately 10-15 % of the heat demand in the existing buildings. This corresponds to an open space of 2,000 to 3,000 m² and is thus less than half a football field.

Heat production:	
fossil	3.800 MWh/a
regenerative	780 MWh/a
Fossil emissions	1.100 t/a
CO_2-reduction	Ca. 500 t/a

Compared to a new oil heating system, the costs of connecting to a heating network are lower. The CO_2 price is the key factor here. It can be seen that the investment in a heating network makes sense especially in areas with no area-wide natural gas supply. This is the case because, compared to a new oil heating system (with compliance with the EWärmeG BW), a price advantage is possible for the households connected.



Annual heat demand



Total cost calculation for oil heating and local district heating

Lessons learned

The new development area as a starting point and the extension of the heating network to include the existing buildings enables the rapid extension of renewable energies and the reduction of CO_2 emissions. An important point in the implementation is a high connection rate and thus a high heating network density. A so-called "connection and use obligation" in the new development area can ensure that this is accomplished. For this, the conviction and motivation of the residents plays an equally important role, which is why involving citizens at an early stage and a transparent approach to development and planning is crucial.

Further information

Project participants and contact:

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further information:	www.interreg-central.eu/ENTRAIN www.wärmewende-neckaralb.de

Image credits

Page 1:	Regionalverband Neckar-Alb
Page 2:	Agentur für Klimaschutz Kreis Tübingen (top), Ingenieurbüro Lorinser (bottom)
Page 3:	Agentur für Klimaschutz Kreis Tübingen

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Pilot case fact sheet

Breitenholz (Germany)

The cooperative heat transition

Background

Located between Tübingen and Herrenberg, directly on the south-western edge of the Schönbuch Nature Park, Breitenholz is a district of the municipality of Ammerbuch.

Surrounded by meadow orchards, Breitenholz is rural, mainly characterised by viticulture and agricultural sidelines.

Apart from a large inn with a hotel, there are no other significant commercial enterprises.

Key facts

County	Tübingen
City	Ammerbuch
District	Breitenholz
Inhabitants	742
Households	320
Area	20 ha

Description of the project

Planning for a comprehensive local heating network in the village has been underway since the first information event in 2018.

The Breitenholz local district concept covers a stock of 252 buildings, mostly residential buildings, as well as a small proportion of non-residential buildings such as churches, the town hall, the kindergarten, the community hall and the fire station.

All buildings are located in the area covered by the planned local heating network. There is no network-bound heat supply with natural gas. Up to now, most of the heat has been supplied with heating oil, wood, liquid gas, electricity or heat pumps.

Previous distribution of energy sources:

- Heating oil 280,000 l (73 %)
- Wood / Pellets 135 m³ (10 %)
- Other 645,000 kWh (27 %)

The total heat demand of the village of Breitenholz is approx. 3,825,000 kWh.

Project phases and activities

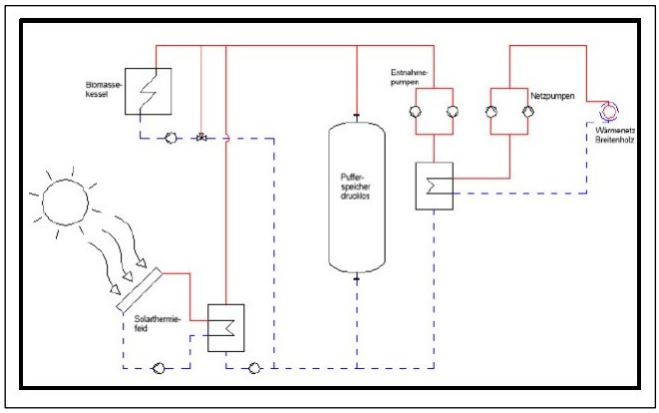
The entire project consists of a central heating plant, a solar collector field, a buffer storage tank and a local district heating network. The heat is generated by three woodchip boilers in combination with a solar thermal system.

One of the three woodchip boilers serves as redundancy. The heat is thus generated 100 % from renewable energies with a solar share of 37 %.

Buildings in the surrounding area	252
Initial connection rate	44 %
Potential connection rate	72 %
Length local heating network	4,430 m
Woodchip heat production	1,339 MWh
Solar heat production	790 MWh

The electricity demand is covered by a photovoltaic system.

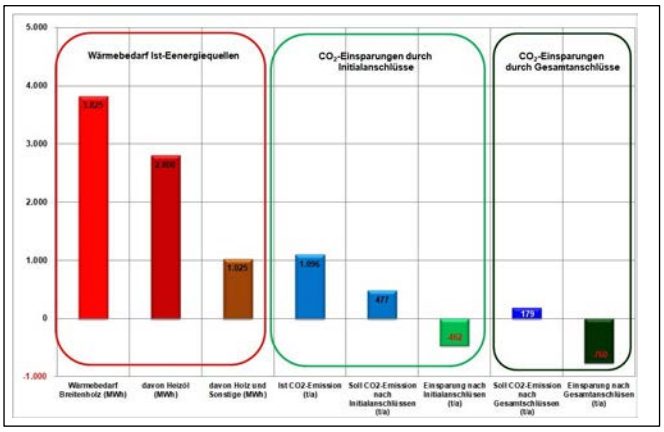
Network plan with heating plant



System diagram Breitenholz

Climate protection and economic data

The comparison of the total amount of heat produced in the existing situation and the target project illustrates the reduction of CO_2 emissions through the purely renewable local heating network of the future bioenergy village Breitenholz.



CO_2 reduction through a renewable system

The local heating project is also aimed at the future and thus enables a steady increase in heat consumers.

Investments:

District heating net	1.98 Mio. €
Heating plant	4.22 Mio. €
Overall Investment	6.20 Mio. €
Funding rate	44 %

The project is funded by the BAFA with the "Heat Networks 4.0" programme.

Lessons learned

The initiator and project developer of the Breitenholz bioenergy village is Bürger-Energie Tübingen eG. It is the general partner of Bioenergie Breitenholz eG & Co. KG, which operates the heating network. The heat customers participate in the KG as limited partners.

Bürger-Energie Tübingen eG was founded in 2009 and has 317 members. The objective of the cooperative is to promote the energy transition and climate protection as well as the realisation of projects for the generation of renewable energy in the region. All members are individual persons.

The heat price is already fixed in the heat supply contract and may only rise or fall within the framework of a price fluctuation clause.

"This is very transparent for our customers and a great advantage compared to oil heating, because the heating oil supplier who has been supplying the energy so far does not have a price fluctuation clause. The heating oil customer never knows how expensive the heating oil will be the next time he purchases it," emphasises Arvid Goletz, Managing Director of Bürger-Energie Tübingen eG.

Further information

Project participants and contact:

Bioenergie Breitenholz

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breitenholz@buerger-energie-tuebingen.de
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further information:

www.interreg-central.eu/ENTRAIN
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www.mehrstetten.de

Image credits

Page 1: RVNA

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MINISTERIUM FÜR UMWELT, KLIMA UND ENERGIEWIRTSCHAFT

Pilot case fact sheet

Mehrstetten (Germany)

Small village, big news

Background

The small municipality of Mehrstetten has an extraordinary sense of identification, which is characterised not only by an active sports club life but also by the founding of the energy cooperative "Energie für Bürger Mehrstetten eG (EfB)".

The municipality has a rural character and is located directly in the region of the Swabian Alb biosphere with its large forest areas.

The planning for the tender to construct the heating network is currently underway.

Key facts

County	Reutlingen
City	Mehrstetten
Inhabitants	1,450
Households	623
Area	17.1 km^2

Description of the project

The project area includes the centre of the municipality with many single-family houses, in addition to various older residential areas from the 70-90s and a population that is partly older and partly with many children.

With regard to future heat consumption, this means many, rather small connections, typical single-family homes with manageable heat consumption and little demand for heat in summer.

Currently, the existing buildings are mostly heated with heating oil and wood tile stoves. Since there is a lot of private forest in the municipality, firewood for own consumption has a long tradition.

Potentials:

- 56 % of all buildings built before 1977, 80 % before 1984 (>35 years)
- Roughly 34 % of all heating systems are over 20 years old (incl. night storage)
- Approximately 62 % currently heat with heating oil or gas
- Costs of more than 1.3 million euros per year for heating oil, electric stoves and liquid gas in Mehrstetten

Previous distribution of energy sources:

- Heating oil 1,959,982 kWh (57 %)
- Wood / Pellets 728,312 kWh (27,5 %)
- Liquid gas 106,712 kWh (3,5 %)
- electricity 322,805 kWh (12 %)

The total heat demand of households in Mehrstetten adds up to about 3.1 MWh. The share of emissions from heating oil as an energy source is about 75 % for the heat.

Project phases and activities

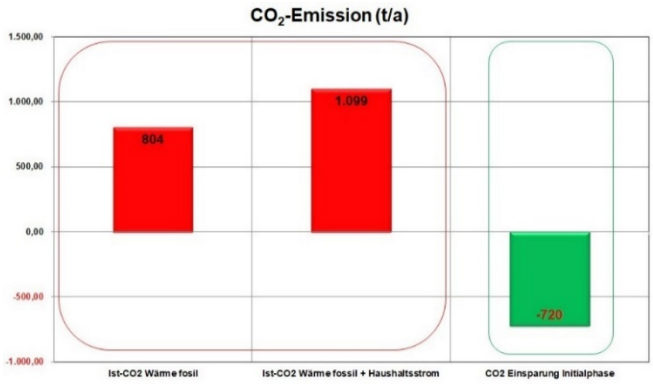
The project involves the construction of a heating plant with a local heating network, whose energy supply consists of a woodchip boiler (1,000 kW thermal output), an 80 m^3 storage tank and a 40 kWp photovoltaic system. Another oil boiler is installed as a redundancy.

Heat demand for the municipality of Mehrstetten

Climate protection and economic data

By contrasting the total amount of heat produced in the existing situation with that of the planned system, the reduction in CO_2 emissions resulting from the purely regenerative local heating network becomes apparent:

- Total fossil heat emissions: 804 t/a
- Total fossil emissions with household electricity: 1,099 t/a
- CO_2 savings in the Initial phase: 720 t/a



Savings of CO_2-emissions

The local district heating network extends over the entire town centre of Mehrstetten. The investments, together with the expansion for the fibre optic cable, are thus investments in the future and enable a steady increase in the number of connected local heating consumers.

- Length of heating network: 7.3 km
- Buildings in the area: 600

Investments:

- District heating net: 1.3 Mio. €
- Tech. for power production 1.7 Mio. €
- Total investment: 3.0 Mio. €
- Funding rate 33 %
- Invest (minus subsidy/) 1.4 Mio. €
- Net heat production price 6.8 Cent/kWh

Lessons learned

The project is integrated into active citizen participation also relevant on other topics to the village, such as the ideas workshop "Mehr Leben mittendrin" (More life in the middle).

Citizen participation is a priority

Communication and public participation are very important for the project. Several information events were held.

Another relevant aspect is that the added value remains local - there is enough wood - and the know-how of the population is integrated. This also strengthens the bond and cohesion within the village community.

Further information

Project participants and contact:

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further information:	www.interreg-central.eu/ENTRAIN www.wärmewende-neckaralb.de www.mehrstetten.de

Image credits

Page 1:	Gemeinde Mehrstetten
Page 2:	KlimaschutzAgentur Landkreis Reutlingen
Page 3:	KlimaschutzAgentur Landkreis Reutlingen

Co-financed by

Baden-Württemberg
MINISTERIUM FÜR UMWELT, KLIMA UND ENERGIEWIRTSCHAFT

Pilot case fact sheet

Pfronstetten (Germany)

Village of the future: Renewable, local, digital!

Background

Pfronstetten is a small municipality in the area of the Swabian Alb. With two biogas plants in the districts of Tigerfeld and Aichelau and numerous PV roof systems, more renewable electricity is already being fed into the grid than is being consumed. With the expansion of district heating grids, the municipality could take a big step towards becoming a "climate-neutral municipality" in the Swabian Alb!

Key facts

County	Reutlingen
City	Pfronstetten
Inhabitants	540
Households	241
Number of houses	185
Area	1,095 ha

Description of the project

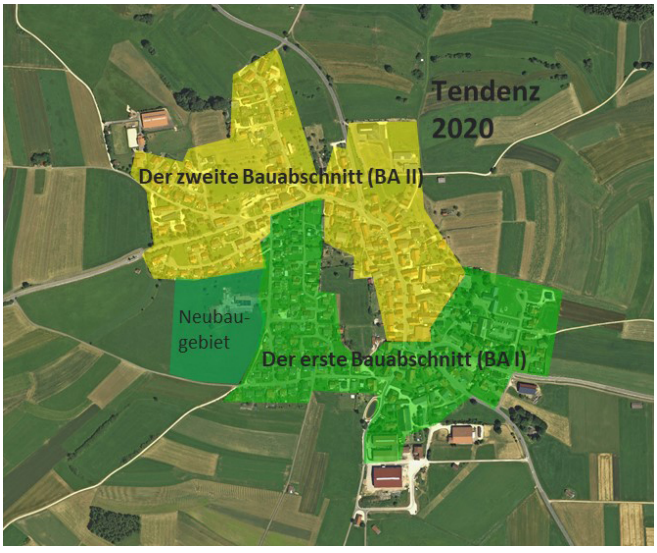
Pfronstetten is a small village without any major consumers with large distances between the individual houses. There are hardly any commercial enterprises, no hospital or monastery. Within the framework of the project "Pfronstetten Village of the Future - Renewable, Local, Digital!", it is planned to create an integrated development of the community with further added values for the citizens.

For example, with the construction of a local heating network from wood and solar energy, connection lines for a fibre-optic supply are also to be laid, thus providing high-speed internet for the community. Other planned new development areas are also to be connected to the local heating system.

Illustration of the district

Project phases and activities

In the future, the heat supply of the school centre with hall and kindergarten is to be provided with renewable energies, if possible in the form of a central "village heating system" where private households can also connect to the heating centre. The current plan is to build a 4.5 km long local district heating network with at least 80 active house connections in the centre of Pfronstetten. In the newly built heating centre, two woodchip boilers with 400 kW each (optionally another boiler with 400 kW) and a buffer storage tank are to be installed. The construction of the ground-mounted solar thermal system from 2022 onwards is to take place in two stages. Initially, it is planned to construct a collector field with an area of 800 to 1,000 m². The buildings could be supplied with heat from the end of autumn 2022 onwards.



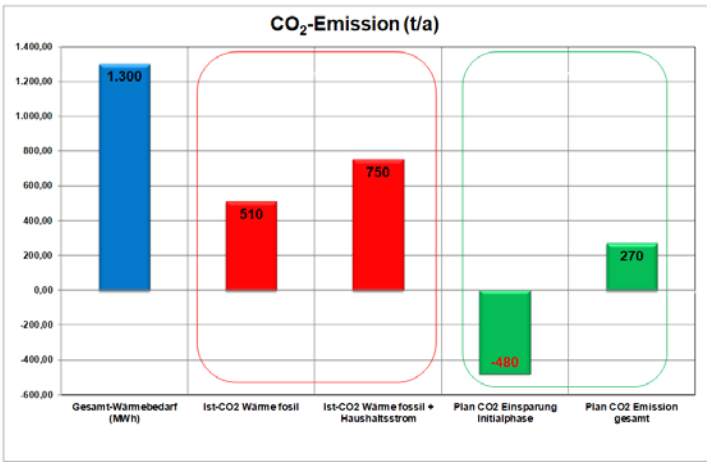
Planned construction phases of the local heating network

Climate protection and economic data

Depending on the number of consumers, the achievable reduction in CO_2 emissions is at least 510 - 700 t CO_2.

Investments for the heat generation plants and the first construction phase of the heating network are expected to exceed € 2 million. The total investment will amount to around € 4.7 million.

Total heat demand	1,300 MWh
previous emissions	approx. 510 t CO_2
Estimated savings	ca. 480 t -510 t
Total investment	4.7 Mio. €
Net length	4.5 km



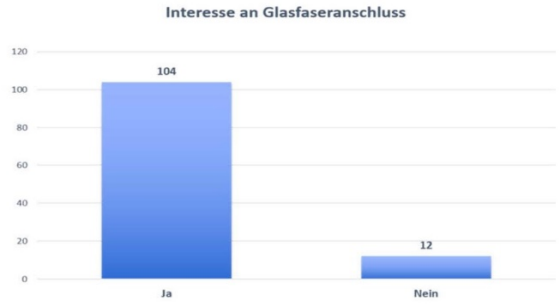
CO_2- savings through implementation of local heating network

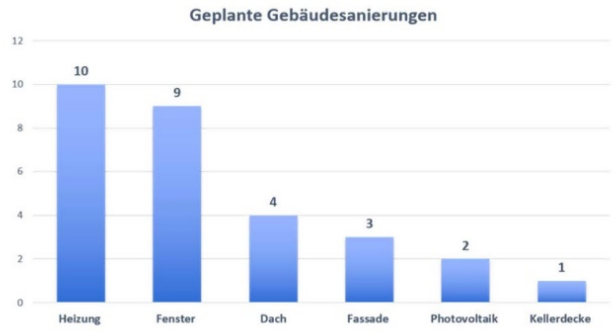
Lessons learned

Added value for Pfronstetten:

Under the slogan "Pfronstetten Village of the Future - Renewable, Local, Digital!", not only is the local heating network being developed, but the village is being made suitable for the future.

Citizen information and participation have been core elements of the project from the beginning and helped the community to grow together.





Results of the citizen survey

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www.pfronstetten.de

Image credits

Page 1: Gemeinde Pfronstetten

Page 2: top: KlimaschutzAgentur Landkreis Reutlingen, bellow: Gemeinde Pfronstetten

Page 3: KlimaschutzAgentur Landkreis Reutlingen

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MINISTERIUM FÜR UMWELT, KLIMA UND ENERGIEWIRTSCHAFT

Pilot case fact sheet

Kastanienhof (Germany)

District heating with inclusive workplaces and CO2-negative

Background

The Kastanienhof is a KBF gGmbH property consisting of an education centre with overnight accommodation, two residential houses for people with special needs, a market garden, a farm, a farm shop, a café and an indoor riding arena.

The agricultural and commercial activities are run by AiS gGmbH, which has created many inclusive jobs in this working environment.

Environmental awareness, a regional approach and humanity are the guiding principles of the owner and operator.

Key facts

County	Tübingen
City	Bodelshausen
District	Kastanienhof
Buildings	2 residential buildings
	1 education centre
	1 market garden
	1 farm shop with a café
	1 indoor riding arena

Description of the project

The entire property is currently supplied with heat using fossil fuels (heating oil and liquid gas) via outdated, decentralised and oversized heating systems.

The very large heat demand of the property is determined by the operation of the greenhouses, in which vegetables and flowers are grown, which are then sold in the regional trade via the farm shop.

AiS gGmbH employs people with and without disabilities in various fields of work. In addition to participation in working life, the orchard and nature conservation department aims to preserve our orchard meadow cultural landscape and maintain numerous nature conservation areas. During the year-round work and various maintenance measures, a large amount of biomass is produced, which was previously used for energy in a biomass heating plant.

Potentials:

The annual energy consumption in detail

- Market garden and agricultural business including farm shop, café and indoor riding arena
  - approx. 100,000 l heating oil
- Educational centre and residential house
  - approx. 30,000 l heating oil
- residential house
  - approx. 5,000 l liquid gas
- total power consumption of the property
  - approx. 250,000 kWh

The air-conditioning of the greenhouses is completely outdated and contributes to a significant increase in energy demand.

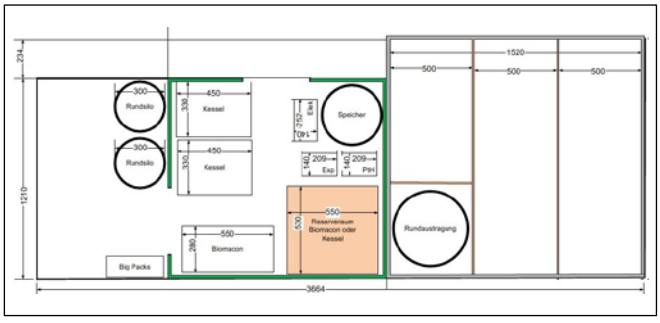
Project phases and activities

The project involves the construction of a heating plant with a local district heating network, the energy supply of which consists of two pellet boilers (2 x 330 kW thermal output), a 50 m^3 storage tank, a power-to-heat plant (250 kW) and an additional 120 kWp photovoltaic system for electricity supply.

Integrated into the heat generation is a pyrolysis plant for the production of vegetable charcoal (thermal output 150 kW).

The material supply of the pyrolysis plant with wood chips / shredder materials for the production of vegetable charcoal comes mainly from the activities of the "Green Group" of AiS gGmbH and thus combines heat production, the maintenance of the regional cultural landscape, the production of an innovative product for soil improvement and natural fertilisation with inclusive jobs

Heating system and district heating network



System diagram with storage capacities

Climate protection and economic data

The comparison of the total heat produced in the existing situation and the target set-up illustrates the reduction of CO2 emissions through the purely regenerative local heating network:

- Total fossil heat emission: 375 t/a
- Total fossil electricity emission: 120 t/a
- **CO_2-emissions fossil System: 495 t/a**
- CO_2-reduction heat: 375 t/a
- CO_2-reduction electricity: 40 t/a
- CO_2-reduction plant coal: -130 t/a
- **CO_2-emissions RES System: - 50 t/a**

The integration of the plant carbon production into the overall system results in a neagative overall CO_2 balance for the energy production of the Kastanienhof due to the CO_2 binding in the plant carbon.

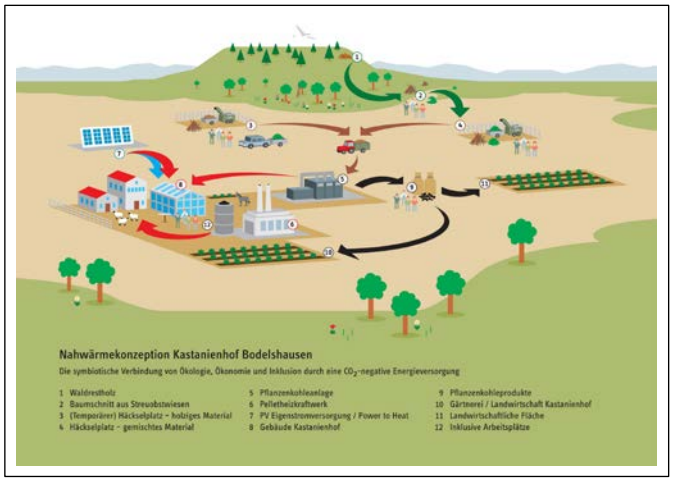
Investments:

district heating net:	180,000 €
heat plant and storage:	1,388,000 €
pyrolysis plant:	395,000 €
total investment:	1,963,000 €
funding rate:	50 %
Invest (less subsidy/exp.)	**982,000 €**

Lessons learned

The KBF gGmbH's understanding of the human being is based on respect for the dignity and uniqueness of each person and is the basis for every encounter and support. Every person within our facilities should be given individual acceptance and support.

The aim of AiS gGmbH is to offer employees an activity that corresponds to their abilities and preferences. The task is to provide them with a holistic approach to coping with the everyday reality of their lives, both professionally and in their social and private environment. The AiS supports the employees in living as independently as possible and promotes their professional and personal development, self-responsibility and social development.



ecology – economy – inclusion

a symbiotic connection

Further information

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Image credits

Page 1: Regionalverband Neckar-Alb
Page 2: KBF gGmbH
Page 3: KBF gGmbH
Page 4: PEAK-Agentur für Kommunikation

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Pilot case fact sheet

Bitz (Germany)

Development of an urban district concept

Background

The municipality of Bitz, located on the high plateau of the south-western Alps, has an area of 882 ha and lies at 850 to 930 m above sea level. The number of inhabitants in the municipality is about 3,700, with 86 % of the houses being single-family homes.

The municipality of Bitz began its energy management and climate protection activities in the mid-1990s and continues to do so.

Key facts

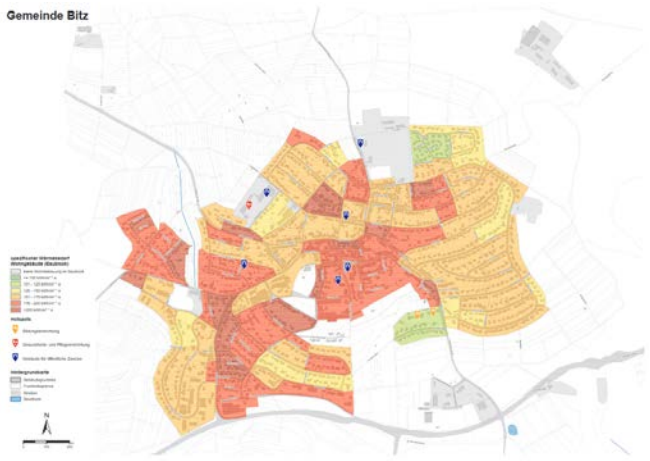
County	Zollernalbkreis
City	Bitz
Inhabitants	ca. 3.700
Area	882 ha

Description of the project

The inhabitants of Bitz live in 1,408 buildings. Of these buildings, 1,186 are single-family houses (86 % of the housing stock).

73 % of the buildings were built before 1978, i.e. before the first heat insulation regulation came into force, which defined energy standards for the building sector for the first time.

In Bitz, 66 % of the total energy required in the municipality is used for heating. The most commonly utilised energy source for heat generation is oil, followed by renewable energies and natural gas. A total of about 860 oil heating systems are installed, 30 % of the installed oil or gas heating systems are older than 25 years.



Specific heat demand of the residential buildings

The municipality of Bitz is partially connected to a gas grid. Industrial waste heat from the production process of the textile company Bitex is available.

Project phases and activities

Within the framework of the integrated energy and climate protection concept of the municipality of Bitz, various potentials were identified with the active participation of the inhabitants. In order to implement these measures, the position of climate protection management has been created since October 2019, which takes care of the implementation of the developed measures.

Potential energy sources:

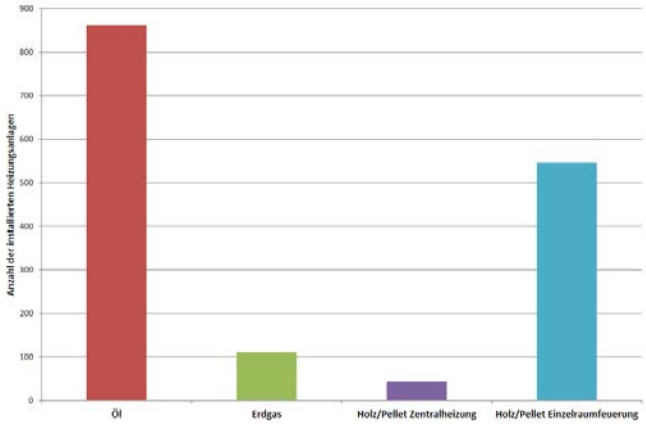
- Wood chips
- Waste water heat
- Photovoltaics & heat pump
- Solar thermal energy
- Industrial waste heat

In the concept for climate protection, two areas were identified that are generally suitable for a local heating network, based on the age of the heating systems and the age categories of the existing buildings. These neighbourhoods will be examined more closely in the future.

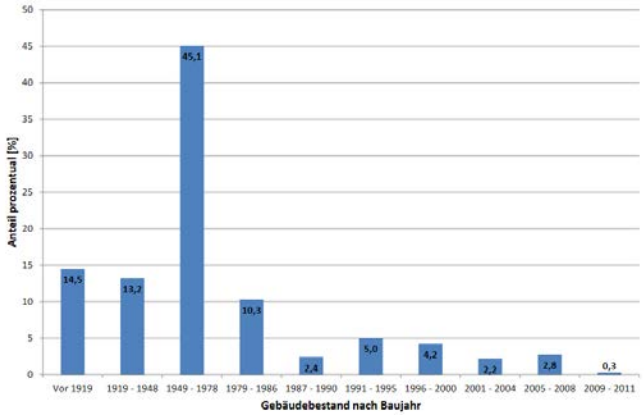
Concept for energy and climate protection of the municipality of Bitz, 2017

Climate protection and economic data

The building stock in the municipality of Bitz is relatively old. The installed heating systems show a high proportion of boilers that are operated with fossil fuels and are often already more than 25 years old (see illustrations). Here, the conversion of the heat supply with the help of a renewable local heating network can quickly and effectively make a high contribution to energy and climate protection. The total heat consumption in the municipality is estimated at just under 16,500 MWh/a, with a clear focus on the winter months.



Heating systems broken down by energy source and technology



Distribution of the building stock according to age categories

Due to the CO_2 pricing that has been in effect since 2021, the costs for supplying heat to these buildings are constantly rising. In addition, many buildings have a high energy demand due to their age or limited renovation options. Thus, the use of local heating becomes steadily more economical as the CO_2 price continues to rise.

Lessons learned

Analysis of the strengths, weaknesses, opportunities and threats of the project (SWOT)

Strengths of the project	Opportunities through the project
Resource-efficient heat supply, realised through central generation using sustainable raw materials; lower costs for heat consumers due to the elimination of their own central heating system on site (less space required)	Replacement of fossil fuels for decentralised heat generation in the connected buildings; role model and pioneering function of the municipality in the energy transition grows (acceptance and awareness of sustainable energy sources increases among the population)
Weaknesses of the project	**Threats caused by the project**
Acceptance within the public still unclear	High consumption of wood resources

Further information

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www.wärmewende-neckaralb.de

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Page 1: Regionalverband Neckar-Alb

Page 2 and 3: EnergieAgentur Zollernalb

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Pilot case fact sheet

Rosenfeld (Germany)

District concept for the extension of a heating network

Background

The town of Rosenfeld is located between Balingen and Oberndorf am Neckar, about 60 km south of Stuttgart in the Zollernalbkreis district. The plateau known as the "Kleiner Heuberg" is located in a charming landscape between the Swabian Alb and the Black Forest.

The town of Rosenfeld includes the seven districts of Bickelsberg, Brittheim, Heiligenzimmern, Isingen, Leidringen, Rosenfeld and Täbingen. More than 2,600 jobs are available in over 310 businesses.

Key facts

County	Zollernalbkreis
City	Rosenfeld
Inhabitants	6.427
Area	5.111 ha

Description of the project

Town of Rosenfeld

The energy supply in the municipal area is predominantly decentralised. The buildings are mainly heated with central oil-fired heating systems and wood-fired auxiliary furnaces. A considerable part of the buildings is supplied by electric night storage heaters.

Some buildings use central pellet or firewood heating systems, partly with solar energy. An existing local heating network already supplies 27 buildings.

The considered district is located in Rosenfeld and comprises around 691 buildings, including:

- 22 public buildings (fire department building, kindergartens, churches, sewage treatment facility building, post office, town hall, schools, sports hall, event buildings, administrative buildings)
- 44 buildings used for economic/ commercial purposes
- 47 multi-use buildings (residential and commercial)
- 578 residential buildings

Project phases and activities

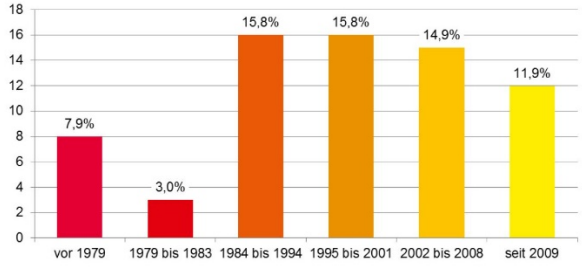
In parts of the village there is already a local heating supply from Naturenergie Kleiner Heuberg GmbH & Co. KG, a private company founded in 2007. This company supplies heat to private residential buildings, commercial facilities and public buildings in parts of the village. The heating centre is equipped with a woodchip boiler with buffer storage and a supplementary oil boiler. A possible expansion of the network was investigated within the framework of an urban district concept.

- Buildings connected initially: 27
- Buildings in the surrounding area: 691
- Proportion of heating systems > 20 years old: ~ 40 %
- Length of existing local heating network: 5.1 km
- Energy source: wood chips, oil (peak load)

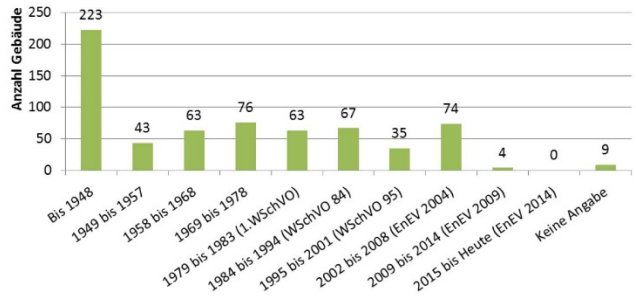
Expansion strategy for the local heating network

Climate protection and economic data

The date of construction of the residential buildings is very mixed, starting in the 18th century and extending to the beginning of the 2000s. However, the majority of the buildings were built between 1900 and 1960 and thus before the first heat insulation regulation in 1977. The need for energy refurbishment is therefore estimated to be correspondingly high.



Age of the heating systems in the building stock



Building age categories in the district

Many buildings in the quarter have a high specific heat demand and are heated with fossil fuels. Due to the CO_2 pricing that has been in effect since 2021, the costs for the supply are also steadily increasing. Many buildings have a high energy demand as a result of their age or limited refurbishment options due to their historic preservation status. Thus, the use of local heating and therefore an extension becomes more and more economical as the CO_2 price continues to rise.

Most of the heat is generated from wood chips from local forests. Currently, the local heating supply has a primary energy factor of 0.36. The investigated expansion concepts all have ecological advantages compared to the previous supply of the area. The greatest effect for climate protection can be achieved in particular by replacing a large proportion of older oil heating systems (see figure of old heating systems).

Lessons learned

In Rosenfeld, an existing local heating network already supplies some of the buildings with heat from woodchips.

As part of the initiative of the town of Rosenfeld, a possible expansion of the local heating network was investigated as part of a local district concept.

The participants were the company Naturenergie Kleiner Heuberg GmbH & Co. KG, which operates the existing network and the heating plant, the Zollernalb Energy Agency, the engineering office IBS Schuler and the Karlsruhe District Energy Agency.

Further information

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Image credits

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Page 3:	Quartierskonzept Rosenfeld, Stadt Rosenfeld

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Pilot case fact sheet

Płońsk

Construction of a thermal waste treatment plant for municipal waste with energy recovery

Background

PEC in Płońsk is planning to build an installation for thermal processing of municipal waste with energy recovery.

In Poland, there has been a relatively large increase in waste undergoing thermal treatment since 2012; in 2018, about 3 million Mg, or about 24% of municipal waste was thermally treated.

The experience of other EU countries shows that the thermal transformation of waste should be implemented complementary to recycling, as it solves the problem of landfilling (neutralization) of waste that is unsuitable for recycling and reprocessing. This ensures the minimization of negative effects on the environment.

Key facts

Country	Poland
City	Płońsk
Inhabitants	22 256
Area	11,6 km^2

Description of the project

The aim of this project is the energy recovery from RDF and pre-RDF fractions in order to produce heat and electricity within Płońsk Energy Cluster and the implementation of the closed - cycle economy idea (one of the most important goals implemented within the strategy of Płońsk Energy Cluster).

Sub-objectives:

- application of innovative technologies for municipal waste gasification and use of synthesis gas for production of electricity and heat in cogeneration
- primary energy savings in the process of electricity production based on a cogeneration system,
- increase of electricity supply security for local needs, in particular for Płońsk Energy Cluster,
- increase in generation capacity from RES for electricity production in the fuel-energy mix of PEC in Płońsk, Płońsk Municipality, Płońsk Energy Cluster and Masovian Voivodeship.

According to the assumptions of the Resolution No. 57 of the Council of Ministers of 6 may 2021 amending the Resolution on the National Waste Management Plan 2022, the missing capacities of Polish thermal waste treatment installations in 2028 and 2034 will amount to: 3,233 thousand Mg/year and 3,070 thousand Mg/year, respectively.

Demand for thermal waste treatment services from the processing of municipal waste is conditioned by transformations regarding the permited methods of management. On 1 January 2016, the landfill ban regulation came into force, established by the Regulation of the Minister of Economy of 16 July 2015 on admitting waste to landfills (Journal of Laws 2015, item 1277). In accordance with Annex 4 of the said regulation, the scope of tests and criteria for allowing waste with codes 19 08 05, 19 08 12, 19 08 14, 19 12 12 and group 20 to be deposited in a landfill for non-hazardous and inert waste, were defined.

The ban introduced on the storage of the above mentioned waste fractions refers to the restrictions on the storage of biodegradable waste established by the Landfill Directive and currently implemented into national law by the UCPG. According to Article 3c of UCPG: “1. Municipalities are obliged to limit the weight of biodegradable municipal waste going to landfills. At the same time it should be pointed out that the factor determining the search for alternative methods of processing waste from the subgroup 19 12 of the Waste Catalogue, compared to landfilling, is the significant increase in the rates of charges for using the environment for storing this type of waste in the last few years.

It should be assumed that thermal waste processing plants are a prerequisite for the possibility of carrying out municipal waste management in compliance with the requirements of European and national laws. In spite of increasingly stringent requirements concerning recycling and preparation for reuse of municipal waste, given the national and regional state of development of the ITPOK market, such investments do not threaten the attainment of the target recycling levels and, in turn, ensure the possibility of reducing waste storage and landfilling.

Project phases and activities

The planned investment is in line with the strategy of the Płońsk Energy Cluster, as it increases the generation capacity of RES and minimizes the mass of landfilled municipal waste (which is in line with the idea of a closed-cycle economy).

The scope of work includes:

- morphological analysis of waste fractions intended for energy recovery,
- development of project documentation for thermal waste treatment for municipal waste with energy recovery,
- delivery and installation of the thermal utilization of waste system along with construction of necessary power and technical infrastructure with a capacity of approx. 20,000 Mg,
- technical acceptance of the installation and putting it into service.

The thermal waste treatment installation will consist of the following nodes:

- Fuel preparation node,
- Thermal processing node,
- Recovery and processing of generated energy node,
- Flue gas cleaning and removal node,
- Emmision monitoring and control node,
- Power take-off feeding node,
- Solid waste treatment node,
- Automation and measurement node,
- Other technical infrastructure.

Climate protection and economic data

The total cost of the investment will amount to approximately PLN 78,000,000.00 net.

The project will be financed from PEC's own funds and the funds obtained from the National Fund for Environmental Protection and Water Management (NFOŚiGW) as part of the "Racjonalna gospodarka odpadami" priority program.

Lessons learned

The main lesson learned is that it should be assumed that thermal waste processing plants are a prerequisite for the possibility of carrying out municipal waste management in compliance with the requirements of European and national laws. In spite of increasingly stringent requirements concerning recycling and preparation for reuse of municipal waste, given the national and regional state of development of the ITPOK market, such investments do not threaten the attainment of the target recycling levels and, in turn, ensure the possibility of reducing waste storage and landfilling.

Also the input to the planned installation had been assumed, and it will consist of (codes defined in accordance with the Regulation of the

Minister of Climate of 2 January 2020 on the waste catalogue):

- 19 12 10 Combustible waste (solid secondary fuels),
- 19 12 12 Other waste (including mixed substances and objects) from mechanical treatment of waste other than those mentioned in 19 12 11).

Further information

Involved parties:

The investment is carried out by PEC Sp. z o.o. in Płońsk

The energy fraction of municipal waste will be supplied by PGK Sp. z o.o. in Płońsk.

Company's project team is responsible for the project.

The project is implemented within the framework of Płońsk Energy Cluster.

Project stakeholders are the members of Płońsk Energy Cluster and the local community.

Further information: https://www.pecplonsk.pl/

Project website: www.interreg-central.eu/ENTRAIN

Pilot case fact sheet

Płońsk

Construction of an autonomous low-temperature source and low-temperature grid with energy storage

Background

PEC in Płońsk is planning to build an autonomous low-temperature source based on heat pumps with a dedicated photovoltaic installation, heat and electricity storage and a low-temperature district heating network. The new source will supply heat and electricity to newly constructed multi-family buildings (low-energy, adapted for low-temperature heat) in the city.

Key facts

Country	Poland
City	Płońsk
Inhabitants	22 256
Area	11,6 km^2

Description of the project

The aim of the project is to reduce the negative impact on the environment through the construction of a hybrid energy source based on combined heat and power generation with RES for the city's district heating subsystem.

Sub-objectives:

- Application of ecological energy source in the process of heat and electricity production,
- Primary energy savings in the proces of electricity production based on the installation of heat pumps, energy storage and PV,
- Increasing the security of electricity supply for local needs, in particular for multi-family housing,
- Increase in RES generation capacity for electricity production in the fuel-energy mix of PEC in Płońsk, Płońsk Municipality, Płońsk Energy Cluster and Masovian Voivodeship.

The planned investment will allow to create a district heating subsystem with an autonomous source of heat from RES. Thanks to the application of heat pump and photovoltaic installation, the condition of energy infrastructure will be improved and the use of RES will be increased. This solution will also allow to reduce pollutant emmisions.

Ensuring energy security is important, especially in the context of developing new investment areas and ensuring continuity of energy supply to consumers. Construction of the hybrid source will contribute to the promotion of Płońsk as an environmentally-friendly city investing in modern ecological technologies and caring for the future of energy and environmental protection. Moreover, the implementation of the investment will increase the public awareness in the scope of economical and efficient use of energy as well as shaping pro-ecological behaviours.
The need for the project stems from diagnosed deficiencies and investment needs respect to the technical assessment of the system and focuses on the following areas:

- The need to reduce the level of pollutant emissions,
- The need to adjust PEC in Płońsk to the existing emission standards.

The need to adjust the district heating system to national and EU regulations on environmental protection as well as to implement the company’s development strategy.

Project phases and activities

The planned investment is in line with the strategy of Płońsk Energy Cluster as it increases RES generation capacity and improves air quality.

The scope of work includes:

- Introduction of appropriate provisions in the local spatial development plan preferring the use of low-temperature heat
- Development of project documentation for construction of heat pumps, energy storage, photovoltaic installation, low-temperature networks and heat centres
- Delivery and installation of the above mentioned system with a capacity of about 500 kW,
- Commisioning, putting into service.

The material scope of the construction of an autonomous low-temperature source with a district heating network includes the following types of work:

- Project documentation
- Installation of air-to-water heat pumps
- Photovoltaic installation
- Construction of energy storage facilities

- Construction of low-temperature networks and heat centres
- Commissioning the installation

Climate protection and economic data

The total cost of the investment will amount to PLN 3,500,000.00 net.

The project will be financed from PEC's own resources and from the resources of NFOŚiGW as part of the priority program "Ciepłownictwo Powiatowe".

Lessons learned

It was learned that ensuring energy security is important, especially in the context of developing new investment areas and ensuring continuity of energy supply to consumers. Construction of the hybrid source will contribute to the promotion of Płońsk as an environmentally-friendly city investing in modern ecological technologies and caring for the future of energy and environmental protection. Moreover, the implementation of the investment will increase the public awareness in the scope of economical and efficient use of energy as well as shaping pro-ecological behaviours.

Further information

The investment is carried out by PEC Sp. z o.o. in Płońsk.

Company's project team is responsible for the project.

The project is implemented within the framework of Płońsk Energy Cluster.

Project stakeholders are the members of Plonsk Energy Cluster and the local community.

Further information: https://www.pecplonsk.pl/

Project website: www.interreg-central.eu/ENTRAIN