SDH solar district heating

Case study : Case one (Austria)

Context of the study

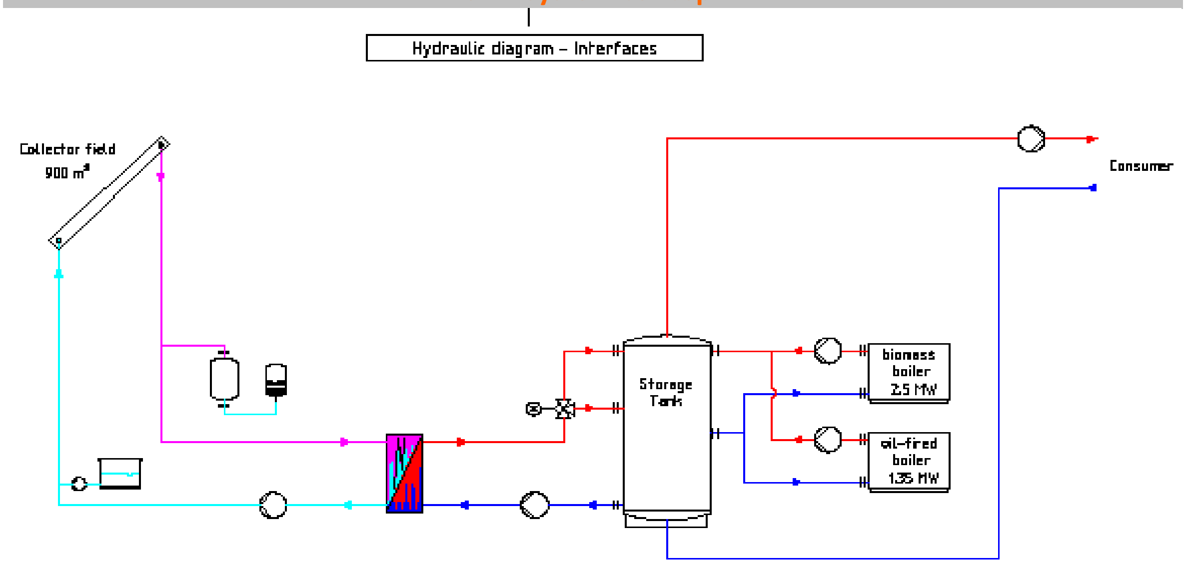
Mr. XXX contacts company S.O.L.I.D. regarding worse efficiency of the district heating plant. The plant was established in 1997. They installed one biomass-fired boiler 1 MW and one oil-fired boiler with 1.35 MW. In the year 2007 association decided to substitute the smaller biomass fired-boiler against one more powerful. The new boiler has an output of 2.5 MW and is designed to supply both in summer and in winter monovalent. 2.5 MW Boiler has an efficency of 0.13 in summertime because of low consumption for hot water. So the association wants to supply the village with solar energy in summertime.

Support

In Austria a funding program **exists, which is called "Solar Thermal – Large-scale solar plants"** of the Austrian climate fund: It promotes the design and construction of innovative solar systems and integration into the system in four areas:
1) Solar process heat for manufacturing plants
2) Solar feed-in grid-connected heat supply systems (micro-networks, local and district heating networks)
3) High solar fraction (over 20% of the total heat demand) in commercial and service enterprises
4) Solar-assisted air-conditioning plants and its combination with solar hot water heating and cooling demand dur
The **subsidy rate** in all four subject areas is max. **40%** of the environmentally relevant additional needed invest

SDH plant

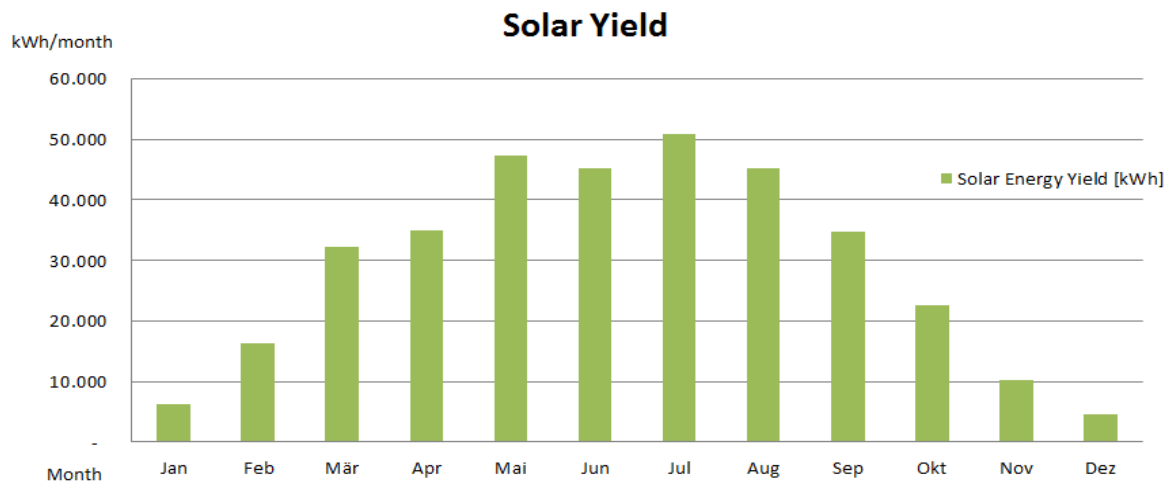
SDH system concept



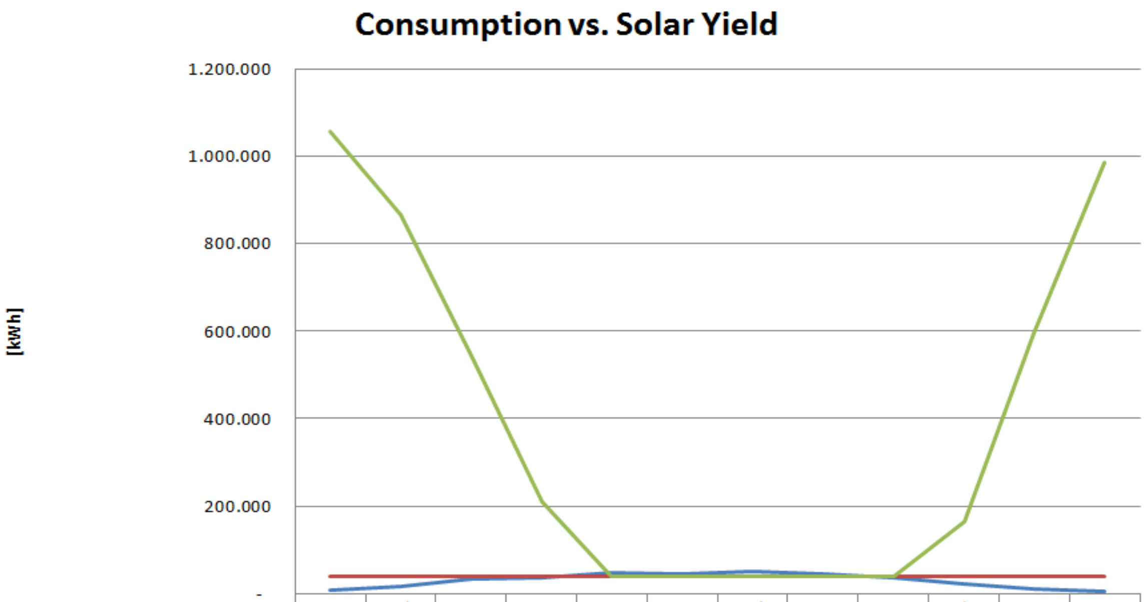
SDH technical data

The collector field is about 900m² and ensures a daily need of hot water from May to August. Energy yield is calculated with an overrun of 12% in summertime. Existing hydraulic separator should be subtituted against one storage tank with a volume about 30m³. Expansion unit and heat exchanger is needed in the solar circuit due to cold weather condition in winter. We assume a solar energy yield of 350 MWh per year.

SDH energy balance (kWh)



Solar plant is designed to produce the entire energy demand in summertime. In shoulder season March to April and September to October we will use the existing oil-fired boiler to ensure a constant energy supply with low losses of boiler. From mid of October till mid of March the plant switch to biomass operation. The customers need about 4,700 MWh per year. Most of them is needed between November and March. In this time the plant is in biomass operation. The solar energy yield is only a small fraction of the entire demand. Only 7 to 8% of energy demand is produced by solar plant which causes savings of high energy losses in the big boilers.



	Jan	Feb	Mär	Apr	Mai	Jun	Jul	Aug	Sep	Okt	Nov	Dez
Solar Energy Yield [kWh]	6.285	16.231	32.204	34.995	47.326	45.222	50.871	45.155	34.795	22.502	10.216	4.606
Tap Water [kWh]	40.364	40.364	40.364	40.364	40.364	40.364	40.364	40.364	40.364	40.364	40.364	40.364
Heating & Tap Water [kWh]	1.056.1	866.942	544.246	210.549	40.364	40.364	40.364	40.364	40.364	164.515	594.171	986.188

SDH economics

	Price of primary Energy [cent/kWh]	Efficency η	Sum [€]	Produced Energy [kWh]	Surplus Production
Oil	0,0748	0,5	52.421	700.812	200%
Solar	0,05	1	17.520	350.406	100%
Biomass	0,0356	0,15	83.163	2.336.040	667%
Solar Yield	**350.406**				

		Investment [€]		Savings [€]	Amortisation [a]	
Solarplant	€	450.000	€	65.643	4,1	against Biomass
Subsidy 40%	€	180.000	€	34.900	7,7	against Oil
excl. Subsidy	€	270.000	€	1.042.854		Savings in 20 Years

Because of the poor efficiency of conventional power generators, the plant pays back very quickly.

SDH plant opportunities & threats, benefits & limits

General benefits: 1) Energy solution with a minimum of maintenance work 2) Greater independence from conventional energy sources; Stable energy prices for the next 25 years; Annual energy (electricity, fuel oil) savings due to solar system; Reduction of carbon emissions

Photos

Authors

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