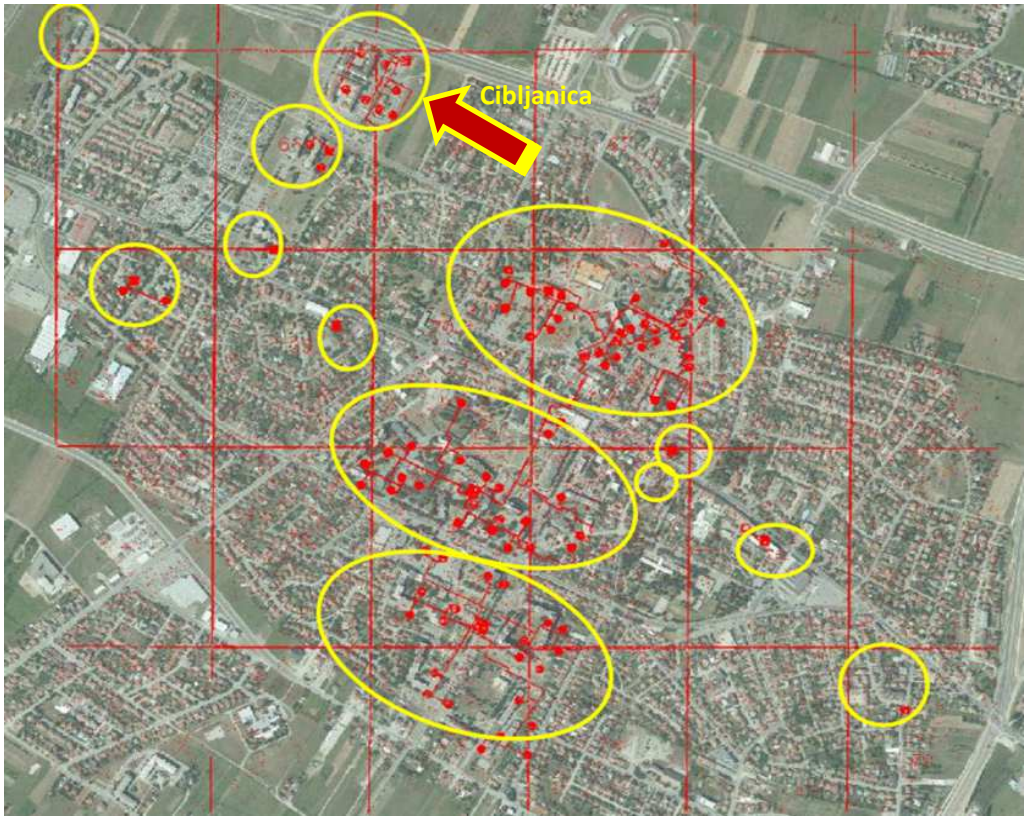
Case study : HEP Toplinarstvo - Cibljanica

Name of the project:	SDHplus - HEP Toplinarstvo - Cibljanica
Address of the project:	HEP Toplinarstvo d.o.o, Velika Gorica, Jurja Dobrile 40a
Name and type of the owner:	HEP Toplinarstvo d.o.o. / District heating company
Owner contact person:	Mr Tomislav Kanić e-mail: tomislav.kanic@hep.hr

Context of the study

EIHP had started a joint discussion with HEP Toplinarstvo d.o.o, the largest district heating company in Croatia, to promote the solar district heating. HEP Toplinarstvo d.o.o. has a long-term wish to introduce renewable energy in its systems. The district heating system of the city of Velika Gorica, close to Zagreb, is a part of HEP Toplinarstvo. The system consists of 13 heating grids with boiler houses. In Cibljanica, fuel oil is used exclusively. There were former plans to build a biomass-fired cogeneration plant to supply the entire city of Velika Gorica, but these were not realized. This has emphasised their wish to introduce a renewable energy source into the DH system. The basic principles of solar district heating match the intentions of HEP Toplinarstvo in this project.



Support

There are no direct incentives available for solar heat. However, an indirect national incentive is possible within implementation of the project, if the power production is combined with heat production, i.e. if photovoltaic panels are combined with the solar thermal panels. The plant/entity would than gain a more favourable tariff for the electricity, as an eligible power producer. Also pending is another incentive upon introduction of the status of the eligible heat producer, which is foreseen for entities who produce heat using renewable energy in an economically viable way.

SDH plant

SDH system concept

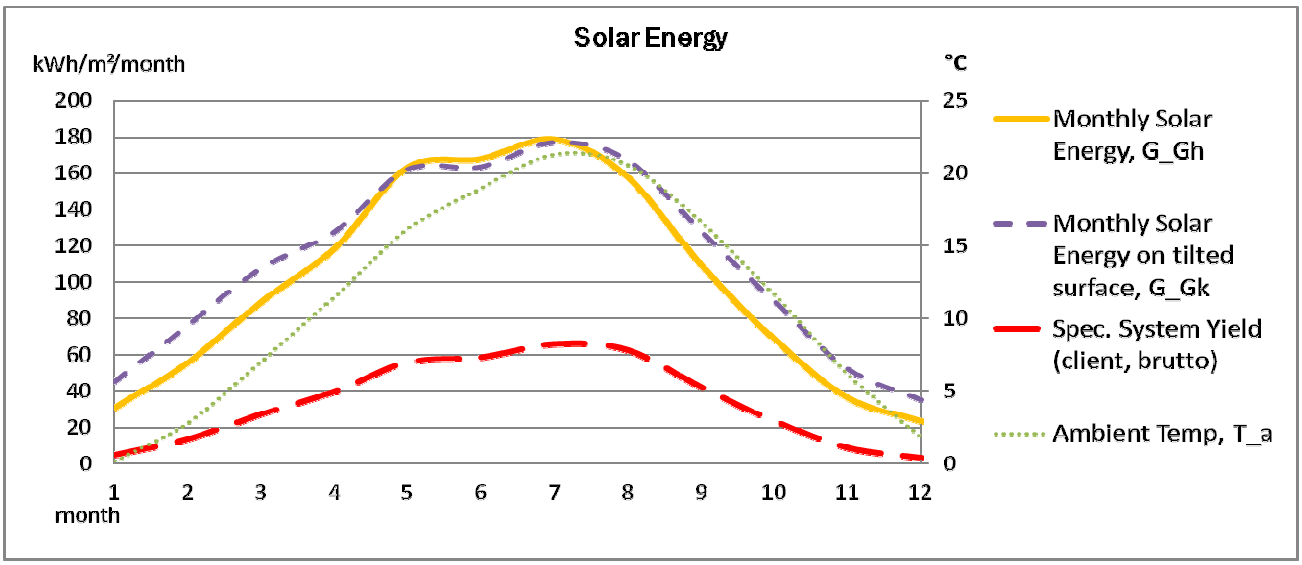
The targeted plant, Cibljanica, is the part of district heating network of the city of Velika Gorica, a satellite city to Zagreb. Velika Gorica has 13 heating grids which operate individually, most of them with a fuel oil-fired boiler house, and only two run on natural gas. The average annual boiler efficiency is around 70%. One of these boiler houses/grids is in Cibljanica, situated in north-western part of Velika Gorica. It supplies heating and domestic hot water to eleven heating substations, in several multi-storey apartment buildings with 21,864 m^2 of residential and 2000 m^2 of business premises area. The installed heat power of the boiler house is 4,36 MW. The fuel currently used is the light fuel oil. The new boilers for natural gas are planned, as well as the interconnection of the existing heating grids in city of Velika Gorica. The area for solar collectors is available on the boiler house roof, roofs of the multi-storey buildings and the parking lot.

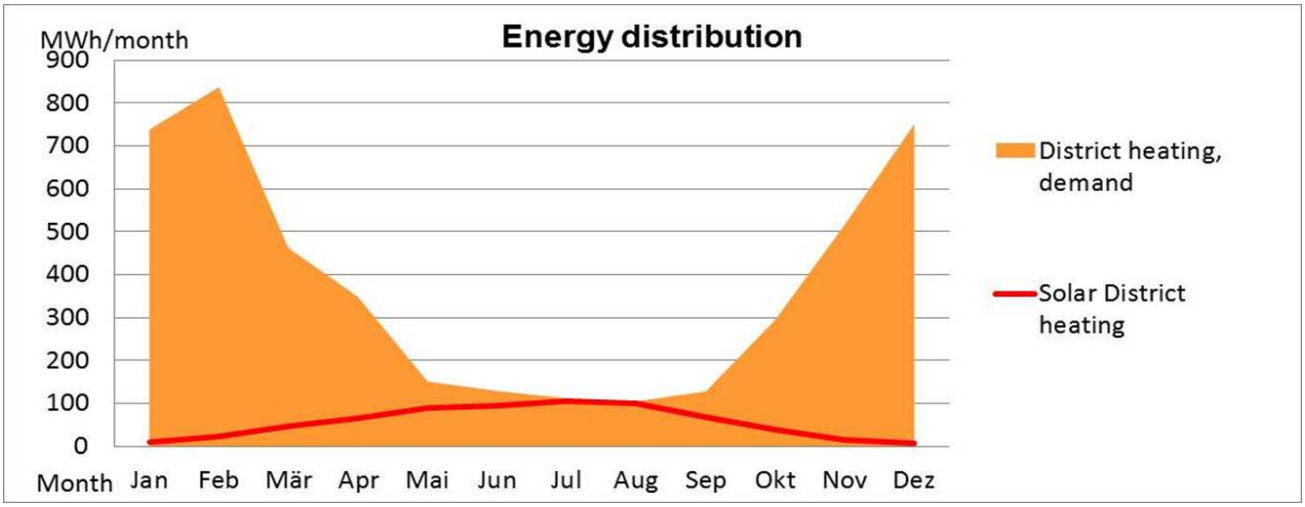
SDH technical data

Future heat demand: 4,57 GWh/year (used for calculation)
Maximum heating power: 2,53 MW
Grid temperatures: 90°C flow, 70°C return
(It would be highly recommended to lower these temperatures, if possible, for the better feasibility of the project.)
Collectors: advanced plate collectors, area 1500 m^2, ground mounted
collector inclination: 30°
collector orientation: 205°C
SOLID concept tool in excel was used to calculate the solar yield (monthly figures shown below) based on the solar radiation data from software Meteonorm (location, inclination and azimuth of collectors). In addition, the following was taken into account: assumption of system losses from the collector field to the heat transfer station (in %), shadowing losses due to collectors itself (depending on the distance between the collector rows, azimuth and inclination of the collectors), monthly average of collector mean temperatures and type of collectors.

SDH energy balance (MWh)

Irradiation on field: 1332 MWh/year
Solar collector field gain: 649,5 MWh/year
Solar net gain: 609 MWh/year
Specific solar net yield (gross area): 433 kWh/m^2 year





Plant dimensioning: collector area necessary for having almost a 100 % solar fraction in summer - approximately 1,500m^2 of advanced flat plate collectors, ground mounted.
All solar heat, also in summer, can be used for district heating; no surplus production of solar heat.

Month	Irradiation on tilted surface (kWh/m², month)	Solar System Yield (MWh)	Demand District Heating (MWh)	Solar Coverage
Jan	45	7,20	738	1%
Feb	76	20,26	837	2%
Mar	108	41,40	462	9%
Apr	128	60,14	348	17%
Mai	162	84,80	151	56%
Jun	164	89,11	129	68%
Jul	177	99,87	112	88%
Aug	167	94,80	105	89%
Sep	128	63,72	128	49%
Okt	90	35,38	295	12%
Nov	52	13,06	517	3%
Dez	35	4,84	751	1%
	1,332	609	45,730	13%

SDH economics

Estimated investment: € 500.000 (HRK 3.8 mio)
lifetime of system: >25 years
Incremental analysis was conducted as a part of a financial – economic analysis in order to show the economic performance of the solar district heating system construction in Cibljanica, Velika Gorica in relation to the current situation. The analysis evaluated the costs and benefits resulted from the above mentioned investment.
The cost resulted from the investment are investments cost (CAPEX) and additional operational costs. Main benefit implies decrease in production cost of heat, because after the construction of solar collectors, part of energy will be generated from sun, and part from boiler room using fuel oil.

NPV	IRR	PBP
133.000 EUR	10%	9

Considering all input data, the profitability indicators were calculated. According to indicators, the benefits are sufficient to justify the investment cost of solar collectors. Net present value amounts circa 133,000 EUR with payback period of 9 years.

SDH plant opportunities & threats, benefits & limits

Opportunities and benefits: introduction of renewable heat source in district heating, profiting of a good example, user-friendly energy system in a residential area, proof of concept for the project replication, possible extension on the entire city, if economically viable it is eligible for supports

Threats: possibly not viable if no heat storage is introduced, maintenance and metering

Limits: interventions on existing buildings, plans for network, financial restrains, recent legislative changes that consequently lead to an increase in bureaucracy and may have adverse effects on security of new investments/market position

Photos

Authors

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