Case study : TE-TO (Croatia)

Name of the project:	SDHplus - HEP Toplinarstvo - TE-TO
Address of the project:	HEP Toplinarstvo d.o.o, Zagreb, Miševečka 15a
Name and type of the owner:	HEP Toplinarstvo d.o.o. / District heating company
Owner contact person:	Mr Damir Božičević e-mail: damir.bozicevic@hep.hr

Context of the study

Within the studies and analyses of power and heat supply of Zagreb in the forthcoming period, HEP Toplinarstvo is regarding the renewable energy sources that could be coupled with district heating facilities of Zagreb system. Beside biomass plant and geothermal energy, a solar array which could be installed within the area of one of city's two cogeneration plants is considered. Such solar plant would be connected to the DH network, operating combined with the conventional cogeneration plant, thus acting as a SDH facility. The eastern plant, TeTo, is chosen for the appraisal of the viability of an SDH plant installation, as it provides enough space for the array. Economical parameters are key for any further decision on this project, so this analyse is set as an estimation.

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 is considered to be installed within the "TeTo" power plant (Zagreb east) that operates various cogeneration facilities. The area provides enough space to install the solar collector array. An array of total output power of 15 MW is considered, on the area of about 27 000 m^2. For this location, an energy yield of 500 kWh/m^2 is supposed. A heat accumulator is planned for this location independently, which is favourable for an SDH option. The SDH plant would substitute the operation of conventional cogeneration, either by pre-heating the heating water or by transferring the heat directly to the system.

SDH technical data

Future heat demand: 13,5 GWh/year (used for calculation)
Maximum heating power: 15 MW
Grid temperatures: 98°C flow, 75°C return
For CPC collector type: 27000 m^2 of collector area
collector slope: 30°

SDH economics

Estimated investment: € 7.700.000 (HRK 58,4 mio)
lifetime of system: >20 years
heat generation cost of solar system: 63 €/MWh (225 HRK/MWh)
heat selling price: 43 €/MWh (330 HRK/MWh)
maintenance costs: 1% of the investment
acceptability criteria: positive NPP with 7%

The regarded SDH plant would get its income from production and sales of heat. The presumption is that the plant would be selling heat for 330 kn/MWh (43,5 €/MWh). O&M costs are set at 1% of the investment. This analysis is to be regarded as an opportunity analysis, i.e. a study where only principal cost categories are regarded, by means of using the estimated values. The table below is representing the project rentability assessment.

year	income	MWh	(kn/MWh)	expenses	Operative income	investment	Final income	cumulative income
0						58.520.000	-58.520.000	-58.520.000
1	4.455.000	13.500	330	585.200	3.869.800	0	3.869.800	-54.650.200
2	4.455.000	13.500	330	585.200	3.869.800	0	3.869.800	-50.780.400
3	4.455.000	13.500	330	585.200	3.869.800	0	3.869.800	-46.910.600
4	4.455.000	13.500	330	585.200	3.869.800	0	3.869.800	-43.040.800
5	4.455.000	13.500	330	585.200	3.869.800	0	3.869.800	-39.171.000
6	4.455.000	13.500	330	585.200	3.869.800	0	3.869.800	-35.301.200
7	4.455.000	13.500	330	585.200	3.869.800	0	3.869.800	-31.431.400
8	4.455.000	13.500	330	585.200	3.869.800	0	3.869.800	-27.561.600
9	4.455.000	13.500	330	585.200	3.869.800	0	3.869.800	-23.691.800
10	4.455.000	13.500	330	585.200	3.869.800	0	3.869.800	-19.822.000
11	4.455.000	13.500	330	585.200	3.869.800	0	3.869.800	-15.952.200
12	4.455.000	13.500	330	585.200	3.869.800	0	3.869.800	-12.082.400
13	4.455.000	13.500	330	585.200	3.869.800	0	3.869.800	-8.212.600
14	4.455.000	13.500	330	585.200	3.869.800	0	3.869.800	-4.342.800
15	4.455.000	13.500	330	585.200	3.869.800	0	3.869.800	-473.000
16	4.455.000	13.500	330	585.200	3.869.800	0	3.869.800	3.396.800
17	4.455.000	13.500	330	585.200	3.869.800	0	3.869.800	7.266.600
18	4.455.000	13.500	330	585.200	3.869.800	0	3.869.800	11.136.400
19	4.455.000	13.500	330	585.200	3.869.800	0	3.869.800	15.006.200
20	4.455.000	13.500	330	585.200	3.869.800	0	3.869.800	18.876.000

IRR	3%
NPV	-16.376.901

With the employed presumptions, the plant is not rentable, as it returns a very negative net present value of the project, with the internal revenue rate of only 3%. The impact of investment amount to the project rentability is given in the table below. Only with a very significant decrease of the investment value (85% of the base value) the project would fulfil the acceptability criterion (NPV>0 with the 7% discount rate).

investment	NPV	IRR
7.700.000	-16.376.901	3%
7.315.000	-13.352.619	3%
6.930.000	-7.606.485	5%
6.545.000	150.796	7%
6.160.000	8.942.381	10%

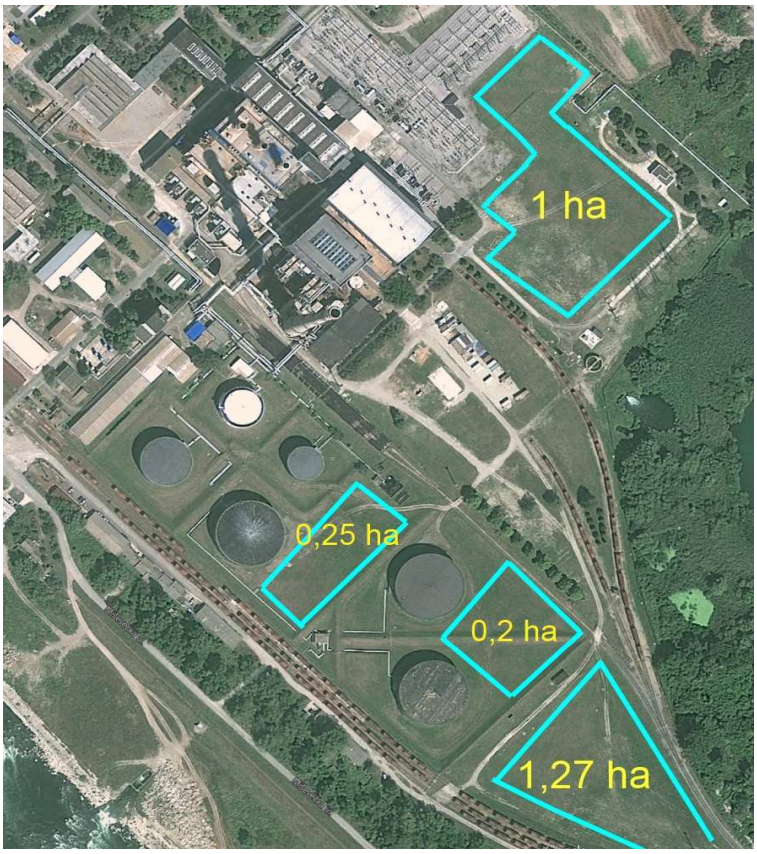
SDH plant opportunities & threats, benefits & limits

Opportunities and benefits: introduction of renewable heat source in district heating, integration with the conventional power plant, user-friendly energy system in a residential area

Threats: no economical viability with this size of investment, adjustment with the operation of the conventional plant

Limits: investment and rentability, difficulties with adjustment to district heating regime, financial restrains, recent legislative changes that consequently lead to an increase in bureaucracy

Photos



Authors

Robert Söll, Moritz Schubert, Vedran Krstulović, Jurica Brajković

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