General information

The “Schneider-Gössl” is located on the outskirts of Vienna. The building is splitted into a hotel and a “Heurigen”-restaurant. The hotel has 9 guest rooms and 20 beds and is open during the whole year. A micro CHP was installed in 2003 for heating, domestic hot water production and electricity generation. The micro CHP from Senertec company has an electric output of 5 [kW] and a thermal output of 12,3 [kW]. For covering the thermal peak loads a low-temperature gas boiler from Buderus company with a thermal output of 44 [kW] was addionally installed. The micro CHP and the peak load boiler are fuelled with natural gas. For hot water storage a storage tank with a volume of 1000 [l] is used.

Figure 1 Partial view of the lodge “Schneider-Gössl”

Analysis of the installed micro CHP system

The analysis of the micro CHP system included a detailed analysis of the building, the energy demand and the assessment of the economic opportunity. All required details were collected by detailed investigations by the Austrian Energy Agency. The analysis of the energy demand was assisted by the computer program “BHKW Plan”, a new software tool created for the planning of CHP systems.

The following basic data were used for the analysis.

Basic input data		
Heated net floor area	484	m^2
Heat required for domestic hot water	20,4	MWh/a
Electricity demand	65000	kWh/a
Climate data	Meteorological station: Vienna, Austria Sea level: 171 m	

The total thermal energy demand for heating and domestic hot water is calculated to 82,8 [MWh]; the required maximum heat demand to 56 [kW]. The installed micro CHP system from Senertec company is designed for a heat driven operation. The total electric energy production of the micro CHP system is calculated to 25,2 [MWh/a]. Figure 2 shows the annual heat demand of the lodge, a picture of the installed micro CHP system and the amount of heat generated by the micro CHP unit. The area in which the heat generation of the CHP is above the heat demand curve corresponds to the charging time of the storage tank. The operation time can be significantly extended by the installed hot water storage tank (with a volume of 1000 [l]). Around 22 % of the maximum thermal demand is covered by the micro CHP system.

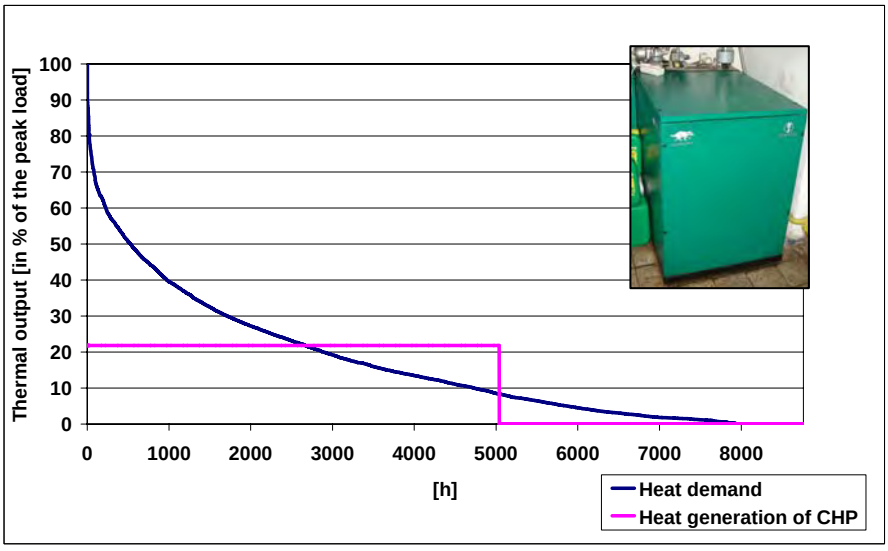

Figure 2 Annual heat demand curve (blue line) and heat generation of the micro CHP system (purple line), picture: installed micro CHP system from Senertec company

Profitability calculation

The economic evaluation is based on VDI 2067 and includes a comparison with an alternative energy system. At the “Schneider-Gössl” the heating system was replaced after 27 years of operation by a micro CHP system consisting of a micro CHP unit and a peak load boiler. For the profitability calculation the “existing” micro CHP system is compared to an alternative energy system consisting of a low-temperature gas boiler with a thermal output of 58 [kW]. The following table summarises the different cost positions of the “existing” micro CHP system in comparison with the alternative energy system.

Profitability calculation		Micro CHP System	Alternative Energy System
Capital costs	[€/a]	1783,03	735,76
O&M costs	[€/a]	848,16	97,50
Fuel costs	[€/a]	5829,07	4333,45
Total costs	[€/a]	**8460,26**	**5166,71**
Reimbursement of tax on fuel	[€/a]	377,93	
Avoided electric energy supply	[€/a]	3237,76	
Total revenue	[€/a]	**3615,69**	
Net costs	[€/a]	**4844,56**	**5166,71**
Specific costs of heat generation after crediting electricity generation	[€/kWh(th)]	0,0585	0,0624

The different cost positions and the total revenue are represented by Figure 3 showing a cost advantage for the “existing” micro CHP system.

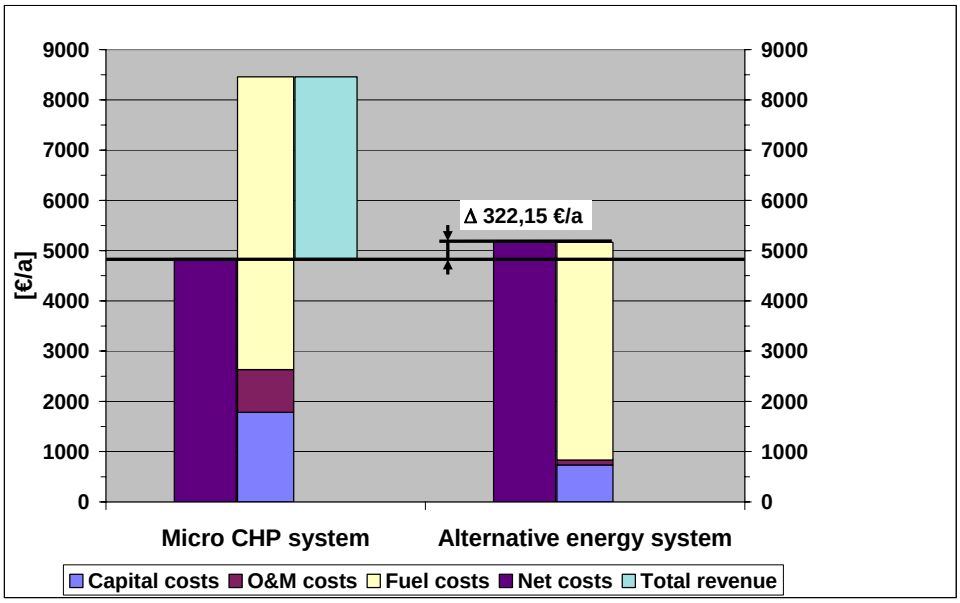

Figure 3 Profitability calculation of the “existing” micro CHP system in comparison with an alternative energy system (low temperature gas boiler)

Pay-back period

The analysis concerning the pay-back period is based on a dynamic calculation. Figure 4 shows the development of the accumulated discounted cash flow. The payback period for the investment in the installed micro CHP system is calculated to 10,2 years.

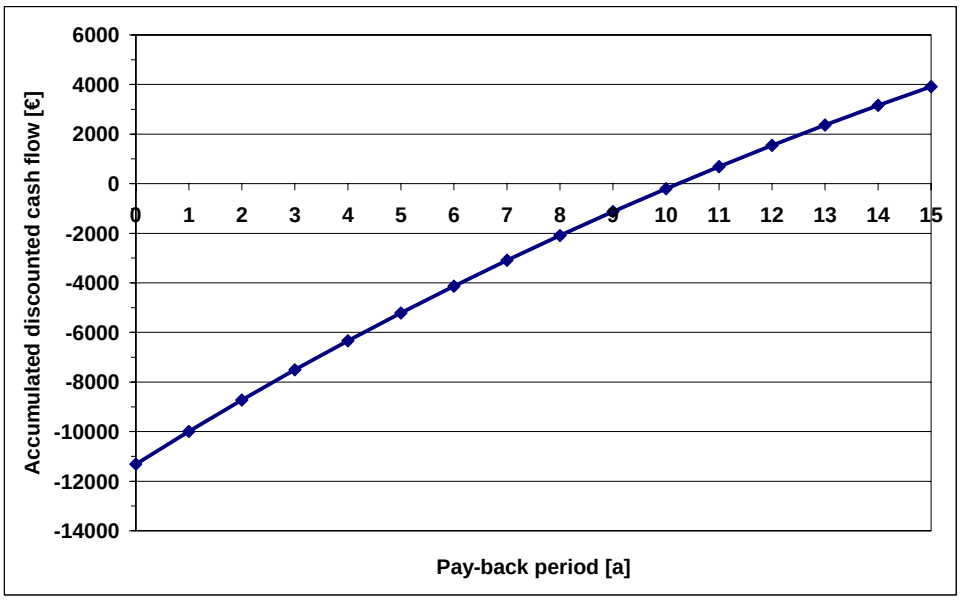

Figure 4 Accumulated discounted cash flow showing a pay-back period of 10,2 years

Conclusion

The analysis shows that the “existing” heating system consisting of a micro CHP unit in combination with a peak load boiler is a good technical solution. The installed micro CHP system achieves an appropriate operation time in a heat driven operation mode and supplies almost 38 % of the electricity demand of the building. Due to the frame conditions in Austria and due to the energy situation at “Schneider Gössl” the deployment of the micro CHP system shows an economic efficiency which leads to a pay-back period of 10,2 years. The main reasons for this result are:

- High tariff for the electrical energy supply
- Significant amount of avoided electric energy supply from the grid
- Subsidy of 30 % for the investment and installation costs of the micro CHP system
- Reimbursement of tax on fuel used for the micro CHP unit