Subject:	ESCo services, best practise example
Description:	Example of Wasserwerk Andriz / Solar.nahwaerme Energiecontracting GmbH, Graz, Austria
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1 Introduction

Solar.nahwaerme Energiecontracting Gmbh is a subsidiary company of nahwaerme.at Energiecontracting GmbH, which is an Energy services company. It was established and operates in collaboration with local partners, systems based on renewable energy sources. In the project “Wasserwerk Andritz” a large scale solar thermal plant was erected on the ground of the local water supplier. The system supports the local heating system (LH) of the office buildings of the local water utility. The surplus heat is fed into the district heating grid (DH) from the city of Graz. With the installed high temperature (HT) flat plate collectors, the necessary temperatures for district heating supply can be achieved. On the local water conservation area, enough open space was available for construction of the plant.

The free available area of the water conservation area zone is used for the construction of the solar field.

The installed solar thermal system covers about 40 % of the heating energy which is needed for the local office buildings. The large part of the heat production is fed into the district heating grid.

Figure 1. Picture of the Wasserwerk Andriz installation

2 Quick Facts

LOCATION:	Wasserwerkgasse 9-11; A-8045 Graz
PLANT SIZE:	3,855 sqm
TECHNOLOGY/RES:	Solar thermal HT collectors
SITE OWNERSHIP:	Holding Graz AG
INVESTOR:	Solar.nahwaerme Energiecontracting GmbH
PROJECT COST:	1.57 Mio. €
State grants:	0.55 Mio €
KEY PARTNERS:	S.O.L.I.D. GmbH; Holding Graz AG; Energie Graz AG
CURRENT STATUS:	Operational

3 Design and construction

The solar plant feeds in over a heat exchanger into a storage tank with 62 m³. As a matter of priority which serves as an inventory heat storage tank. In the case that the solar plant cannot deliver energy, the district heating as a conventional source of energy provides the storage tank. Furthermore, it is planned to install a heat pump this year, which will operate, if the temperatures of the collectors fall below a decent temperature, because this temperature is still high enough for reaching a satisfying COP of the heat pump. Starting out from the storage tank the existing objects as well as the new building are provided with warmth. If there is a surplus of solar energy, i.e. storage tank is fully loaded and can take no more warmth energy; the solar energy will be fed directly into the district heating net of Graz. All collectors are ground mounted on the area of "Wasserwerk Andritz". This large-scale solar plant demonstrates the commitment of the city of Graz to renewable energies and the protection of the environment. The plant is the 4th solar system which is integrated into the district heating system of Graz.

3.1 Technical details

TOTAL SURFACE:	3,855 sqm
NUMBER of thermal collectors:	270
HEAT STORAGE:	62 m³
TOTAL solar yield:	1,657 MWh/year
SPECIFIC solar yield:	430 kWh/m²BRUTTO*a

4 Energy production

4.1 Totals

Local energy consumption:	654 MWh/a
Local energy distribution:	262.3 MWh/a
Grid energy distribution:	1,394.6 MWh/a

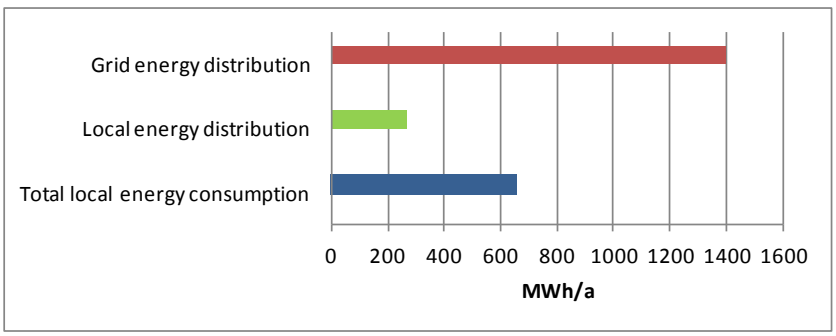

Figure23. Grid distribution and consumption

4.2 Energy distribution, monthly

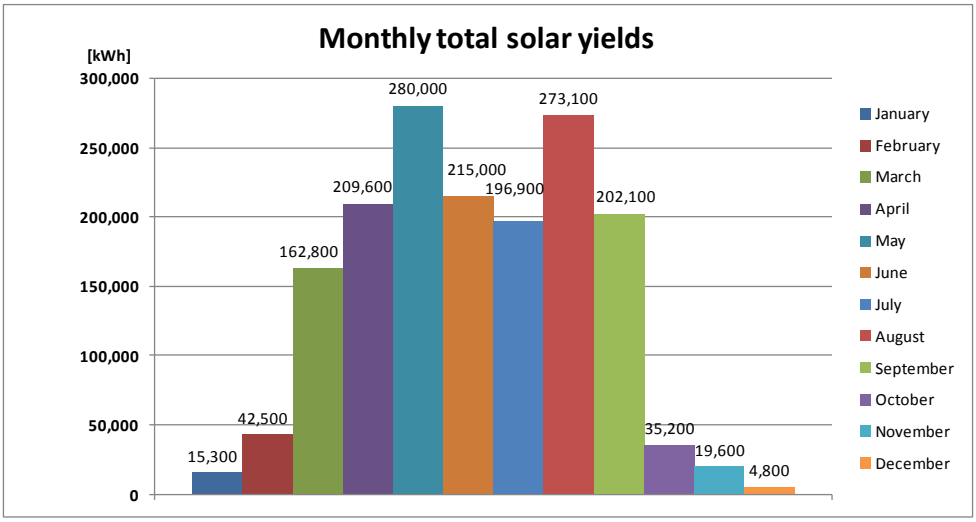

Figure 3.Monthly distribution of solar yields

5 Feed-in-tariff and other benefits

5.1 Parameters of installation

Typology and Profitability of equipment:

- Installation: 2nd QT 2009
- Capacity [kW_{therm}]: 2,062.4

Feed-in-Tariff :

- LH: 54,352 €/MWh
  - Demand rate LH: 204,6 €/month
- DH:
  - Winter tariff: 31,51 €/MWh
  - Summer tariff: 26,74 €/MWh

6 Business plan

6.1 Consumption parameters

See feed -in-tariffs

6.2 Parameters of economic's simulation sale

Interest rate:	4.0%
Grants:	550,000 €
Maintenance and insurance cost:	app. € 1.000
Depreciation period:	25 years

System's Depreciation charge: 4 %
Discount Rate:

- LH: 0%
- DH: 17.3 % (based on the winter tariff)

Income tax: 25 %

6.3 Simulation's technical parameters

District heating net: 84.2 % of total solar energy produced
Local heating demand: 15.8 of total solar energy produced
Solar fraction: 40 % of the local heat demand
Payback period: 19.6 years
IRR after 25 years: 8.7 %

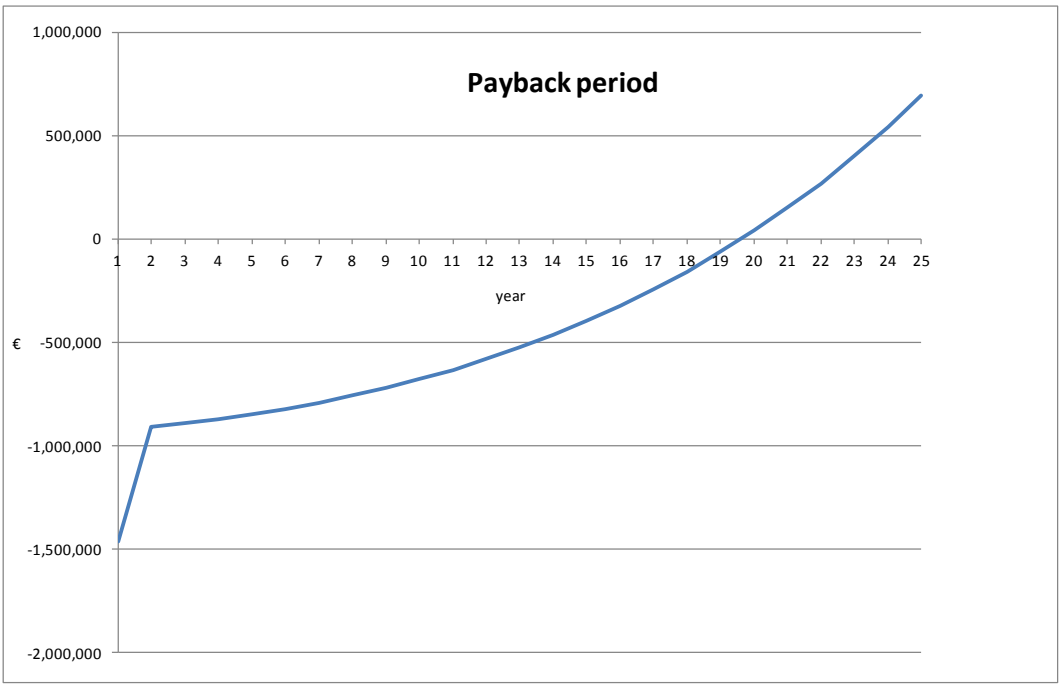

Figure 4.Payback period

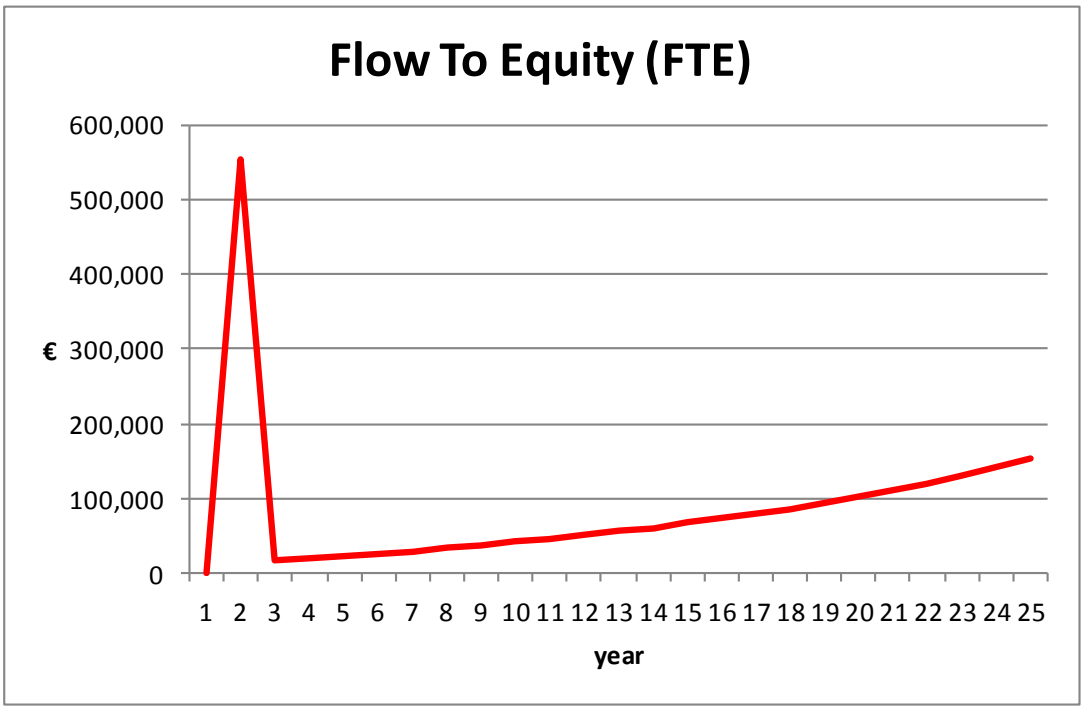

Figure 5.Flow to equity (FTE)

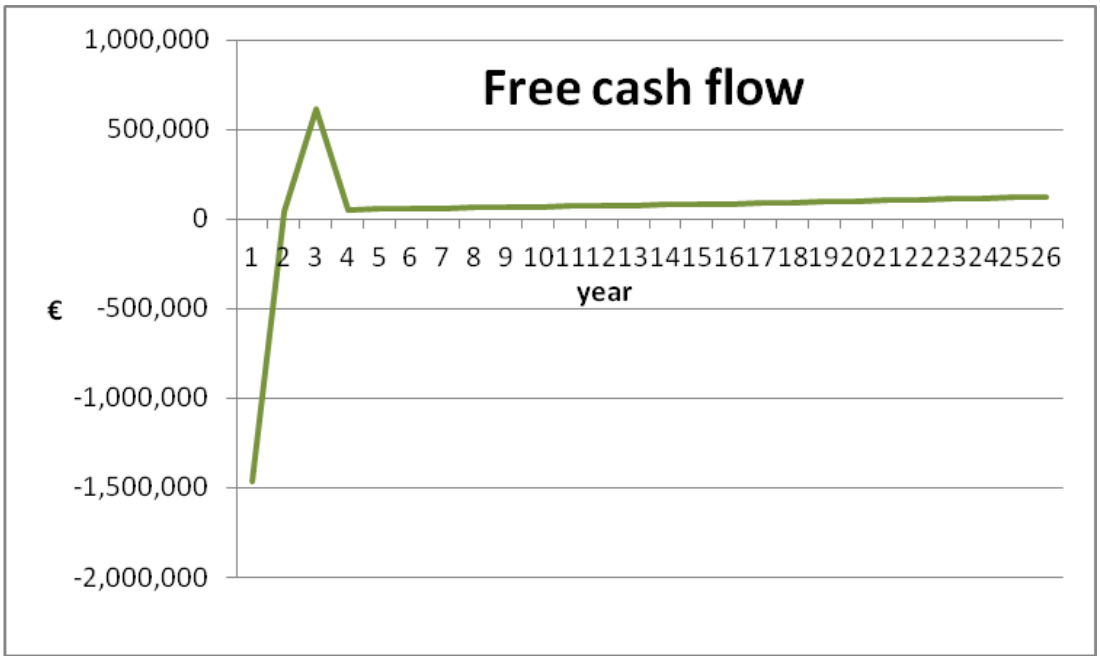

Figure 6.Free cash flow

7 Environmental & economic sustainability

The measured total solar yields are shown in the table/figure below.

	Total solar production [kWh/month]	Total solar production [kWh/brutto m² coll.]
January	15,300	4.0
February	42,500	11.0
March	162,800	42.2
April	209,600	54.4
May	280,000	72.6
June	215,000	55.8
July	196,900	51.1
August	273,100	70.8
September	202,100	52.4
October	35,200	9.1
November	19,600	5.1
December	4,800	1.2
SUM	1,656,900	429.8

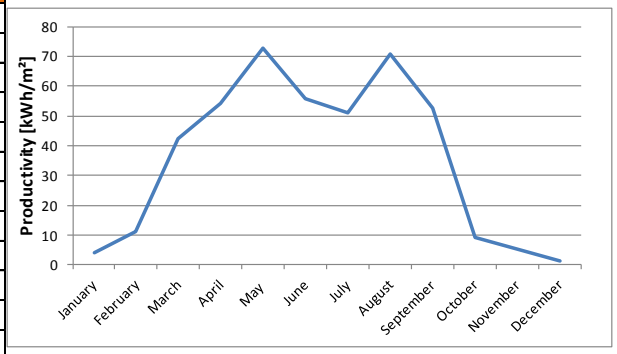

Figure 7.Measured solar output

Solar thermal energy is CO2-free and therefore environmentally friendly. In determining the CO2 savings following substituted heat sources were considered: Coal power plant, natural gas power plant, gas heating plant, industrial surplus heat. The impact of the district heat amounts to 99.206 kg CO2/MWh.

Contribution to the environment		
CO_2 Savings	**164**	[tons CO2/year]

Figure 8.Annual CO2 savings

8 Lessons learned

This solar thermal system shows us following points:

- Efficiency of large solar thermal applications
- Application of an ESCO model in this field of RES
- Existing economy (also with a 17.3% lower feed in tariff compared to conventional heat sources, which feed into the district heating grid)
- Possibility of solar district heating supply

This example shows the possible use of large solar thermal plants. Due to higher feed-in tariffs in an industrial area, the payback time could be significantly reduced.