

Case of study: ZAC Constellations - Juvignac

Name of the project:	ZAC Constellations - Juvignac
Address of project:	ZAC Constellations F-34990 Juvignac
Owner contact person:	COFELY Services, energy Operator 1095 rue Henri Becquerel CS 49531 34.960 Montpellier Cedex 2
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Context of the study

In the agglomeration of Montpellier in South of France, the district “Les Constellations” extends on 36,5 hectares in the North of Juvignac. Intended to accommodate about 1 300 housing, so approximately 4 500 residents in the next ten years, the district “Les Constellations” wants to be a green district.

The whole multifamily houses and many individual residences will be with high energy performances. Initiated in 2005, the district “Constellations” accommodated its first inhabitants at the end of 2012.

Cofely, subsidiary of GDF SUEZ, built, finance and will exploit, during 20 years the district heating of “the Constellations” district. This DH will be feed by a biomass boiler combined with high performance solar collectors. This innovating energy combination of biomass and solar must cover more than 80% of the energy demand for heating and domestic hot water.

This DH was brought into service in 2013. It is now fed by a biomass boiler and a gas boiler. This study aims to define a solar plant mounted on the boiler room roof. This plant will approximately reach 300m² of solar collectors.

Support

The case study was carried out by CEA INES and TECOSOL with the support of the partners of the project “SmartGrid Solaire Thermique” (INDDIGO, CLIPSOL and COFELY).

The studies for the realization of this solar plant will have a support from ADEME within the framework of the realization of a demonstrator of the project “SmartGrid Solaire Thermique”.

SDH plant

SDH technical data

The district heating length is 1.6km. It provides energy to 1300 residences with high energy performances. The current heat demand is estimated at approximately 3.5 GWh/an. The installation is composed of a biomass boiler (1250 kW) coupled to 24 m³ of storage and of a gas boiler (2000 kW).

The biomass currently ensures 80% of the supply of heat, the remain being provided by a boiler gas.

The operating temperature of the district heating is 75°C/65°C all the year.

SDH system concept

The solar plant has an area of 292 m² of solar collectors (area available in the flat roof of the boiler room). It is a centralized plant with a feeding connection on the return pipe.

The collectors are high performance flat plate solar collectors ($\eta_0=0.8$; $a_1=2.56 \text{ W.m}^{-2}.\text{K}^{-1}$; $a_2=0.005 \text{ W.m}^{-2}.\text{K}^{-2}$)

SDH energy balance (MWh)

The solar fraction of the installation is approximately 6.5% with an annual solar productivity of 750 kWh/m². The annual solar energy in Montpellier on a 30° tilted plane, 30° South-eastern oriented is 1765 kWh/m².

The monthly distribution of the solar production is detailed on the next figure.

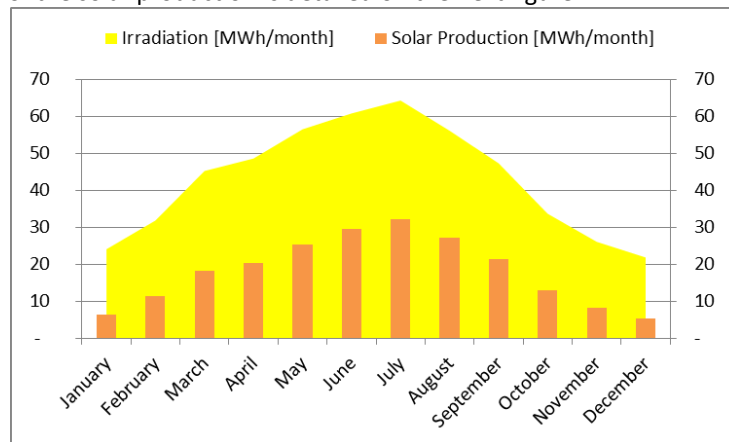


Fig1 Monthly distribution of the solar production

The estimated energy mix of the DH is:

- Biomass: 72.5%
- Gas: 21%
- Solar: 6.5%

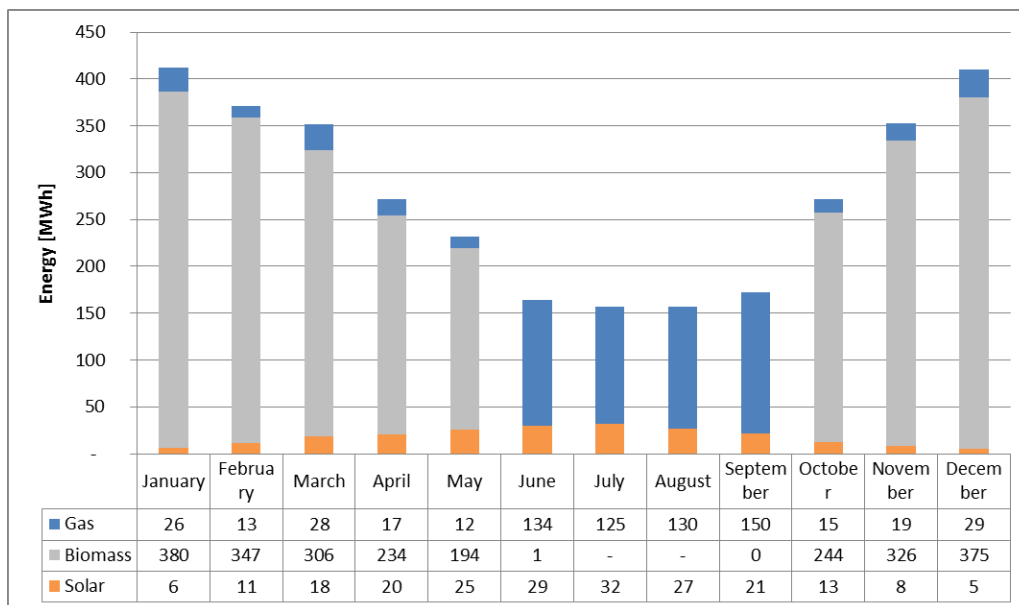


Fig2 Estimated energy balance of the district heating

SDH economics

The cost of solar heat is approximately 61€/MWh (calculated with the LCOE method without grants, no VAT).

Assumptions of the calculation of LCOE (levelized cost of energy) are the following ones:

- Discount rate 4%
- lifespan of the solar plant 20 years
- interest rate of the loan: 3,75%

All the prices are expressed without VAT.

Type of collectors	FPC
Collectors surface	292.5 m ²
Solar yield	745 kWh/(m ² .an)
CAPEX	146 k€
	500 €/m ²
OPEX	2.3 k€/an
LCOE	61.0 €/MWh

SDH plant opportunities & threats, benefits & limits

Opportunities and forces:

- Low temperature (75/65°C) district heating providing energy to a high energy performance district;
- Limited area of solar collector field : not bad for a 1st demonstration plant
- Actors of the project are motivated : operator of the district heating, developer, city

Barriers and limits:

- Although low for a French district heating, the return temperature of the district heating could be decreased
- low surface available for the solar field without any possibility of extension

Picture / Graph / Scheme



Fig3 Block plan of district “Les Constellations”

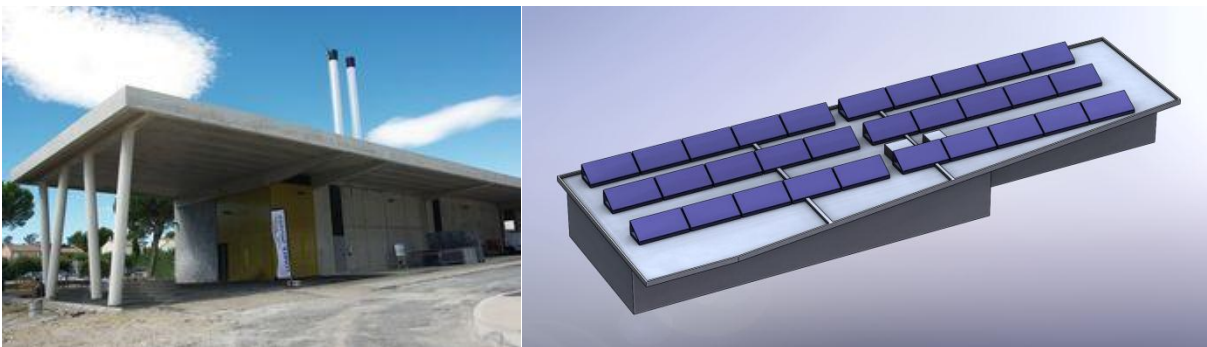


Fig4 Picture of the boiler room before solar collector installation (on the left) and view with solar collectors on the roof (on the right)

Authors

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