Case study : TORRELAGO (Spain)

Name of the project:	TORRELAGO
Adress of the project:	Torrelago, E-47140 Laguna de Duero, Valladolid (Spain)
Name and type of the owner:	Dalkia, utility company
Owner contact person:	Oscar Hidalgo, Project Engineer oscar.hidalgo@dalkia.es

Context of the study

Dalkia, a subsidiary of Veolia Environment and EDF, is an Energy Service Company that offers management and maintenance services to operators of industrial production sites, public entities, residential areas, offices, hospitals, etc. The aim of Dalkia is to provide innovative solutions for the sustainable development of cities and companies, through the operation and maintenance of district heating (DH) and cooling networks and other energy services in buildings and industry. Dalkia is Europe's leading energy services company with more than 800 district and local heating and cooling systems and nearly 111.600 energy facilities worldwide.

Laguna de Duero is a city in Spain, located in the province of Valladolid, with 22.590 inhabitants, being the second most populated city in the province. Torrelago is a residential area in Laguna de Duero with 31 buildings and 48 dwellings per building (1.488 dwellings in total). The existing district heating network is going to be renovated and it will supply heat to the whole residential area. The heat will be produced by biomass boilers, replacing actual gas boilers. Due to the interesting combination of biomass and solar thermal energy, Dalkia is interested in analyzing the technical and economic feasibility of integrating solar thermal energy in this plant.

This would be the first DH plant with solar thermal energy contribution in Spain. It would be an important best practice example therefore for other potential DH systems in Spain.

Support

In the past there were subsidies for the investments on renewable energy sources and energy efficiency actions, but recently all the supports that were available in the past from the National Government have been limited or cut off. The investments on solar thermal energy do not receive any subsidies at present. In some regions local authorities support this kind of actions at local level, but it is not the case of the region involved.

SDH plant

SDH system concept

The total heat demand of the residential area is 9.590 MWh/year (4.959 MWh/year of space heating and 4.631 MWh/year of DHW). The operation of the DH network will be optimized to reduce as much as possible the supply and return temperatures; it is expected that the system will work with nominal supply/return temperatures of around 75/55ºC. The concept is to have a centralized heat production based on biomass boilers (and natural gas boilers as backup). In each substation (19 in total) there is a heat exchanger to produce heat for space heating and hot water is stored in small buffer tanks for the DHW application.

Solar energy will be used to cover the DHW demand. A collector surface of 4.400 m2 is needed to get a solar fraction of around 33%. Small solar collector fields will be installed in the roof of each building and each of the individual fields will be connected to the corresponding substation, covering the DHW demand of the dwellings connected to that substation.

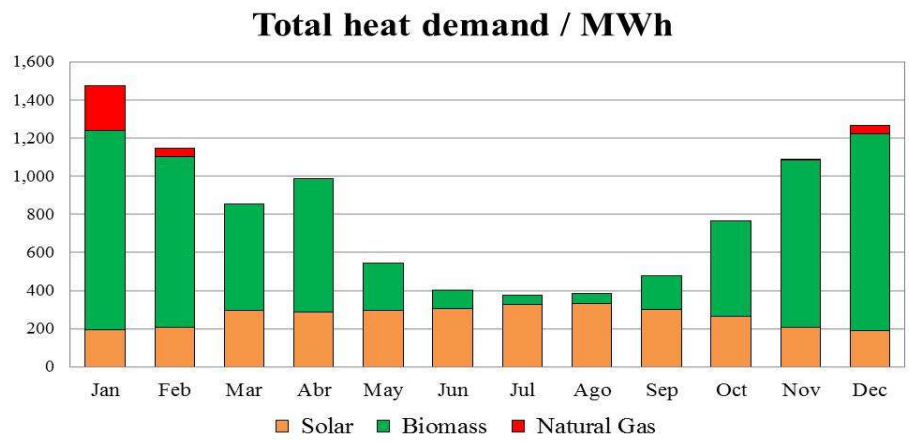
SDH technical data

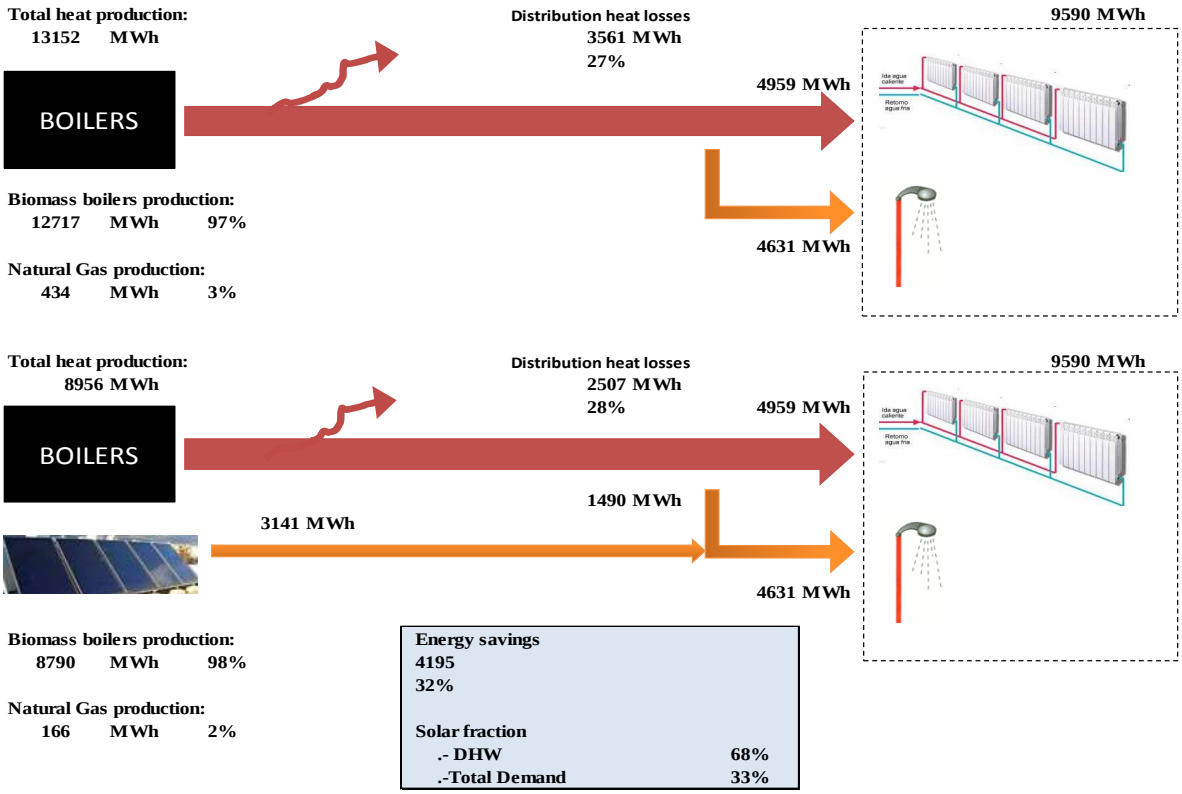
Simulations have been performed to estimate the required surface area for different solar fraction values. Being the objective to maximize the solar fraction in summer time and considering technical and economic feasibility, the required size has been optimized. Information about each of the solar collector field connected to each substation has been summarized in the table below:

Substation	number of buildings	number of dwellings	Solar collector field (m2)	Buffer storage (L)
1	1	48	150	4.000
2	1	48	150	4.000
3	1	48	150	4.000
4	1	48	150	4.000
5	1	48	150	4.000
6	1	48	150	4.000
7	1	48	150	4.000
8	1	48	150	4.000
9	1	48	150	4.000
10	1	48	150	4.000
11	1	48	150	4.000
12	1	48	150	4.000
13	2	96	300	6.000
14	3	144	400	10.000
15	3	144	400	10.000
16	3	144	400	10.000
17	3	144	400	10.000
18	3	144	400	10.000
19	2	96	300	6.000
Total	**31**	**1.488**	**4.400**	**110.000**

SDH energy balance (MWh)

Solar production of studied case would cover 68% of DHW demand, 33% of total demand. Figures below show distribution of how total heat demand is covered (by solar, biomass and natural gas bacup system) and comparisson between system with and without solar installation.





SDH economics

The total investment cost estimated for the renovation of the existing network is around 2M€, the investment cost for the described solar thermal plant (4.400m2 in total) has been estimated to be around 1,3M€ and the operational and maintenance costs around 300k€/year in total. Economic calculations have been performed without considering any subsidies and lifespan of 20 years. A return of investment of about 15 years and a heat cost of 43€/MWh is expected for the considered system.

SDH plant opportunities & threats, benefits & limits

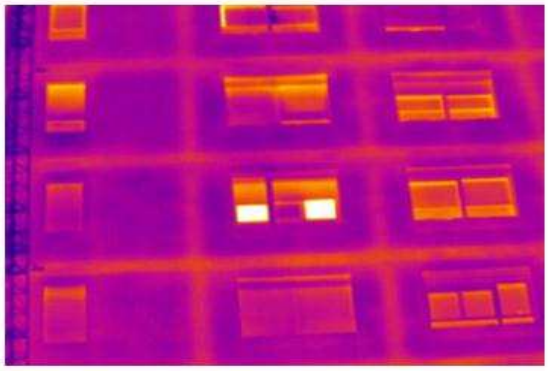
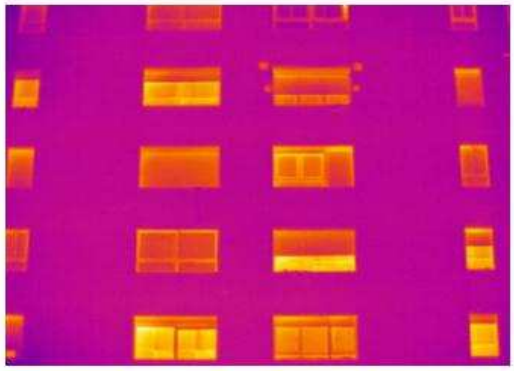
Opportunities and benefits: Each substation installation would be improved, increasing nowadays very limited DHW tanks volume.

Threats and limits: Main limit of planned solar instalation is there is not enough space in district outskirts and both solar collectors and storage tanks should install in each building roof, being limited collectors area and tank weight could be install in them.

Photos

Torrelago District views and first thermografy analysis of retrofitted façades:



Authors

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