Pilot SDH plant in Aosta

Subject:	Pilot SDH plant in Aosta
Description:	This document describes the possible implementation of a pilot SDH plant in the existing grid of Aosta, the capital city of Valle d'Aosta Region, as a key to market roll-out in the region.
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Document download:	www.solar-district-heating.eu/en/knowledge-database/

Summary description of the instrument

Region: Valle d'Aosta

Partners involved: Ambiente Italia (SDHp2m partner), COA Finaosta, Valle d'Aosta Region, Telcha Srl, Politecnico di Milano

Short description of the measure

The inclusion of a pilot SDH plant in the capital city of Aosta would allow to show the benefits of using solar thermal in DH networks increasing, at the same time, the local general acceptance of DH as a reliable and 'green' heat supply option. SDHp2m Italian partner and regional stakeholders are convinced that such a measure could act as a key to stimulate the market roll-out and foster the replication of SDH solutions in smaller centres in the regions, in both existing networks or new initiatives.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691624

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Initial situation

The district heating network in the capital city of Aosta started its operation in 2014 and, therefore, it is relatively recent. The heat sources feeding the network are natural gas and industrial waste heat recovery from a steel production factory. Furthermore, the waste heat is used as an input source for a heat pump included in the network, at a temperature of 22 °C and with a COP of 3. The three natural gas boilers (one is used as a back up) have a power of 48 MW_{th} and then there is also a gas-fired CHP unit with 6.5 MW_{th} and 7.5 MW_{el}. 12 MW_{th} are recovered as industrial waste heat and 5 MW_{th} through the heat pump.

The company managing the DH system is Telcha Srl, belonging to the large ENGIE Group and the network, with an extension of slightly more than 23 km, heats a volume of about 1.2 Mm^3, with 270 connected users and a heat demand of about 55 GWh. The final goal is to reach a network extension of 47 km and to cover a heat demand of 154 GWh/year, mainly by connecting users which are currently burning LPG for heat production.

DH network in Aosta (blue: In operation; Red: In the pipeline)

Objectives

The main objective of this measure is to design and realise a SDH plant whose output will be included in the DH network of the city of Aosta. The opinion of the managing utility is that this action would allow to meet several goals at the same time:

- Increase the acceptance of DH as a 'green heat' supply and, therefore, winning more customers, thus allowing to further extend the network.
- Provide additional heat to cover future network extensions.
- Start a process towards efficient district heating as outline in the EC Directive on Energy Efficiency.
- Test the solar thermal technology for such large-scale applications and, then, consider possible future extensions of the SDH plant.
- Role as a pilot plant: Foster and stimulate a market roll-out in the region by showing the technical and economic feasibility, as well as the local and social benefits, of a SDH plant.

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Measures and actions

The idea of a SDH plant to be integrated in the Aosta DH network has been discussed several times with the local utility Telcha Srl, which showed a serious commitment towards this action.

A first evaluation of the potential benefits of such a plant has been performed by Ambiente Italia, assuming a plant size of 2,500 m^2 which is the maximum size that can apply for the national incentive scheme of 'Conto Termico'. Thanks to this scheme, assuming a specific plant cost of 500 Euro/m^2, the incentive could cover more than 50% of the total investment cost.

By connecting the solar plant to the industrial waste heat flow, given the low temperatures in that section of the network, it should be possible to reach a high operating efficiency of the solar thermal system and a specific output of more than 500 kWh/m^2 year could be assumed. The total solar output of about 1.3 GW_{th}/year could represent a good contribution to cover the summer heat losses in the network.

Since these preliminary figures already look promising, a precise assessment of the solar thermal integration into the existing DH network was performed through a detailed computer simulation carried out by the Politecnico di Milano University in order to evaluate in details the energy and economic savings due to the produced solar heat.

Barriers and opportunities

The first barrier, typical of renewable energy technology, is the high initial investment cost which, however, can be compensated by the remarkable opportunity of a relevant incentive available through the national support scheme reported above.

An additional obstacle is represented by the need for finding suitable areas for the installation of solar collectors. As a matter of fact, the past feed-in tariff for photovoltaic systems caused a proliferation of such plants, especially ground-mounted systems, which had the effect of a very negative image and a reaction by the regional administration issuing restrictive ordinances limiting solar installations on the ground. To overcome these difficulties, several possible solutions have been elaborated by Ambiente Italia together with the regional actors and are reported in the following paragraph about results.

The last barrier is the low price for fossil fuels, especially regarding natural gas, which can benefit of reduced taxes when used in cogeneration units.

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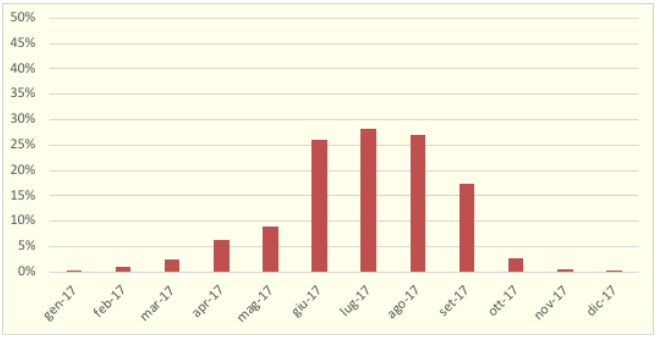
Results

Solar collectors could be placed on two buildings of the heating plant (400 m^2) and on the ground (1,600 m^2), with an expected output of around 1.6 GWh_{th} and an annual solar fraction slightly lower than 3%. Even though it could look like a very small amount, one should consider that the size of the DH network is quite relevant.

The area issue was therefore not so crucial allowing to find enough space to host a solar thermal plant whose size is close to the limit accepted within the Conto Termico 2.0 scheme.



Frazioni solari mensili dell'impianto solare termico

Of course, looking at the solar thermal yield in the warm season, when there is no space heating demand, the solar fraction values are much higher, almost reaching 30%, as shown in the graph below.

The economic payback ranges from 13 to 15 years depending on the operational logic of the whole DH network.

Lessons learned

Solar thermal could represent an attractive option for DH utilities for both covering summer heat losses and ensuring additional thermal production for network extensions. Furthermore, the SDH solution is seen as a valid and robust tool to increase customer acceptance and trust towards district heating.

The economic performance of SDH could be underestimated due to change in future conditions, such as the increase in the carbon tax and in the price of conventional fuels, mainly natural gas.

Finally, the detailed analysis needed to evaluate the solar thermal integration can be helpful for the utility also to see the potential for further improvements in the operational logic of the whole DH network, especially when it includes a mix of different energy sources and diverse technological solutions.

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