EuroSun 2010 – French High Quality Solar Heating and Cooling Demo Projects Incentive Scheme: Emergence Program

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Abstract

A grant mechanism called Emergence program specific to solar heating and cooling installations was prepared in France in 2009 and is active now in 2010. This program is completely new and unique in France and even in Europe: it comes from a wish of both French government and solar heating and cooling professionals to build a high quality solar heating and cooling demo projects incentive scheme. The chillers targeted by the program are those with a capacity between 5 and 200 kW, this range of capacity permits to include the wide majority of chillers manufacturers on the market. The Emergence Program aims at granting 15 to 30 installations until June 2012. The grant will be insured in regard to 3 selection criteria: the project data must be coherent (low energy building, energy used for cooling and for heating adapted to solar resource, etc.), there is minimum annual thermal performance level to reach (overall thermal useful energy per collector area unit: 350 kWh/m².year), there is a minimum electrical annual efficiency to reach (minimum annual electrical COP: 5), and the installation will have to be monitored for at least the first complete two years. Then, if the project respects these three selection criteria, the grant should be calculated on the basis of the European maximum rates (system aid directive, 01/04/2008). By this way, the Emergence program should strongly stimulate the French solar air-conditioning market with performances and reliability against high grant level.

1. Introduction

In 2008, France has launched a wide national renewable heating and cooling development programme called "Fonds Chaleur" (Heat Fund). This incentive scheme is aimed at massively promoting the use of Renewable energy, (biomass, solar, geothermal heat) and increasing their share in the French energy balance. Following this incentive scheme on the performance based criteria application, a development programme for solar heating and cooling systems has been initiated in 2009 beside the Heat Fund and is now operational since the beginning of 2010 in France.

2. French situation on solar heating and cooling

Solar heating and cooling technology is well known in France and nearly 15 installations – mainly demonstration systems- are now operating in France. A lot of lessons have been learnt about technical aspects to make these installations reliable and energetically performing. In addition, there are numerous motivated building owners and a significant know-how among professionals (engineering companies, installers and system providers). However, even if a funding scheme managed by ADEME has existed till now to support the development of new solar heating and cooling installations, the procedure was quite complex and has mostly stopped the initiatives. Nearly 25 French companies made of manufacturers, installers, engineering companies, utilities and represented by ENERPLAN (French solar energy association) have decided to promote a new development programme from 2009 to 2012 based on simplified management procedures and, above all, on high level of quality and energy performance requirements. These conclusions were the result of several round tables, workshops, and meetings which took place these two last years and which involved the main actors of solar cooling in France.

The management and diffusion of this programme is still managed by the French Energy Agency (ADEME) with the help of ENERPLAN. This program aims at granting 15 to 30 new installations within end of 2012 including for each of them an intensive monitoring and high performance expectations.

3. Priority areas and selection criteria

The framework of this programme is first delimiting the targeted building application type and the maximum financed cooling capacity. In order to finance efficient demonstration projects, technologies accepted in priority are reversible systems (heating & cooling) with sorption chiller and product available on the market (a French distributor including after sales management will be compulsory for the chiller manufacturer). Desiccant cooling can also be financed. The nominal solar cooling power range of the eligible systems will be from 5 to 200 kW of nominal cooling capacity. This power range permits to integrate the majority of chiller manufacturers and is limiting the final size eligible for grants (limitation of the risk of budget « cannibalisation » by a few large projects). The lower limit is due to the ADEME policy which doesn't wants to support solar cooling in small residential houses.

The targeted buildings will be tertiary buildings, large dwellings, industry sector and agriculture. There are no geographical limitations on the projects (balance between heating and cooling loads changing between areas) because the system can be mostly valorised on cooling mode in the Southern part of France and on heating mode in the Northern part. In addition, some areas such as Rhône Alpes or Poitou Charentes - even if it is not in the Mediterranean part of France - are very motivated to support solar heating and cooling systems.

Two selection levels are used:

- a specific pre-feasibility study with definition of parameters of opportunity to move to an "advanced feasibility study" including compatibility of the site with the major constraints of solar and cooling applications. This pre-feasibility study will be divided into 2 parts: a questionnaire [1] giving technical information (administrative, context, technical…) and a check list method [2] with minimum score to reach to go to the next step. The financer

(ADEME/Région) is giving its agreement to finance a detailed feasibility study after the analysis of the 2 previous documents.

- a feasibility study [3] including the definition of the selection criteria in order to move to the "realization" step. The content is including a proof by calculation of minimal required solar yield and is serving of basis of monitoring checkings. As it is difficult to predict such kind of minimum performance level for solar cooling systems (because strongly depending on the real heating and cooling load of the building), reasonable sizing will probably lead to overall solar fraction less than 50% so as to make significant margins on real load variations. Such a feasibility study will be financed by public funding till 50% of the cost and will be compulsory to go to the works. It will also be used as a reference document on reference minimum energy performance levels.

The 2 main criteria to be reached, proven through the study and to be confirmed through the monitoring campaign are following:

- a minimum productivity value of 350 kWh/m².year has to be reached. This value is the addition of Heating energy used for space heating and/or DHW heating (useful heating kWh out of the storage tank and without back up) and Cooling energy (useful cooling kWh produced at evaporator divided by a ratio of 0.6 to absorption chillers and of 0.4 to adsorption chillers which corresponds to the average COP values on daily energy production).
- a minimum electric annual efficiency value of 5. The value is calculated on the yearly basis and equal to the ratio between useful solar kWh (heat output from the solar hot storage in heating mode and cooling output from the evaporator in cooling mode) divided by the total annual power consumption of auxiliaries used in the solar system (excluding distribution and cold/heat back up power consumption).

4. Monitoring and funding: towards Guarantee of Solar Cooling and Heating Results

These energy performance based approach will be checked thanks to a compulsory monitoring campaign (energy measurements) organised by a neutral institution and the funding scheme will be organised to deliver the full grant in several payments: a first advance payment, a second payment when the commissioning of the installation is successful and a final payment after 2 full years of operation and fulfilment of energy performance criteria. The budget framework for realization and funding rates should be as follows:

- Investment funding limited by European maximum rates (system aid directive, 01/04/2008)
- 50% of total amount at contract signature and on presentation of the expenses justifications engaged (year 0)
- 30% at commissioning without reserves (year 0 + 6 months nearly)
- 20 % residual of the grant under respect of the planned performances on the feasibility study and checked by the monitoring (year 0 + 2 full years monitoring)

For this crucial 20% residual amount, there should be beside the Emergence program an invitation to the building owner to make a direct contract with the consortium made of the engineering company

responsible for the design and planning, the installer, the O&M company and the main manufacturers of components (mainly collectors + chiller). If the performances are not reached and if the heating and cooling loads are not significantly different of what was used for the design, the consortium should have to pay back the building owner on this 20% basis.

The planned grant amount level is in line with the European maximum funding levels:

- 60% of the total investment for the large sized enterprises
- 70% of the total investment for the medium sized enterprises
- 80% of the total investment for the small sized enterprises or the local authorities or the organizations

For the monitoring, a separate and dedicated financing agreement should be made between the financers and the building owner. It will include two aspects:

- the monitoring material should (still under discussion on June 2010) be financed up to 100% of investment (limited to an indicative of 15 000 €). It is to note that control products able to do both control and monitoring will be eligible.
- the monitoring work which is compulsory during the 2 first years, will be able to be financed up to 50% of the cost for the 2 first years limited to a total amount of 15 000 €. It should permit to measure and communicate to ADEME at least the 3 energy measurements (heating, cooling and parasitic electric consumption) and to inform the client of any functioning problem within 1 week.

5. Conclusion

The Emergence program is now starting running after a transient period when audits were processed among French solar heating and cooling existing installations, showing the extreme importance to conciliate high performance requirements, good quality design and high level of grants to make success stories. However, the program is still in its development phases, as a consequence some aspects described in this paper might slightly change until the end of 2010.

This program is a very promising method to develop the solar cooling field and to stimulate the market by selecting and funding high quality solar heating and cooling demo projects. This Emergence scheme could also be adapted and used by other European countries, leading to a global dynamics to develop the solar cooling field at European and international scale.

References

[1] The questionnaire giving technical information (administrative, context, technical…) is downloadable on the ENERPLAN website called SOCOL (www.solaire-collectif.fr) following the direct link: http://www.solaire-collectif.fr/upload/data/Questionnaire%20faisabilite%20emergence.doc

[2] The check-list method with a score calculation is also downloadable on the SOCOL website following the link: http://www.solaire-collectif.fr/upload/data/Check%20list%20clim%20solaire.xls. Its user manual can also be downloaded following the direct link: http://www.solaire-collectif.fr/upload/data/Manuel%20utilisateur%20check%20list.pdf

[3] The new feasibility study framework can also be downloaded on the SOCOL website following the direct link: http://www.solaire-collectif.fr/upload/data/Plan%20etude%20faisabilit%C3%A9.doc