



Removal of non-technological barriers to Solar Cooling technology across southern European islands

**Report of EIE/06/116 action
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Intelligent Energy  **Europe**

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All the details on the SOLCO project and its deliverables (this report included) can be found at www.solcoproject.net

SOLCO is a European Project dedicated to the removal of the barriers that hamper the diffusion of solar cooling plants.

The project has been supported by the Intelligent Energy – Europe Programme of the European Commission.

In order to achieve its main objective, SOLCO has locally acted in four different European insular regions: Canary Islands, Crete, Cyprus and Sicily. This is due to the fact that the solar radiation availability in all the islands of Southern Europe is ideal for solar cooling. Even though SOLCO has been developed locally, the lessons learned and experiences gained can be applied throughout Europe. As a result the SOLCO experience has a high community added value.

SOLCO has produced direct and indirect results and had an impact that has already been felt and will continue beyond the project lifetime. A list of SOLCO's outcomes is summarised below.

Direct results:

- *COLLECTION OF SOLAR RADIATION. Solar radiation data have been collected, organised and are easily downloadable from the project website. SOLCO has explained where to find solar radiation data and how to utilise them for solar cooling plant design.*
- *DATABASE OF TECHNOLOGICAL COMPONENTS CHARACTERISTICS. A database of solar collectors and chillers commercially available has been developed and is available online on the project web site. Designers can*

immediately know what products are available, their technical characteristics, their cost and related commercial contacts.

- *ECONOMICAL AND COMMERCIAL INFORMATION. Using the Solar Cooling database that is downloadable from the project website, designers can compare prices among different local markets of Europe.*
- *IDENTIFICATION OF PROBLEMS AND PROPOSALS TO SOLVE THEM. All market barriers that nowadays hamper the diffusion of solar cooling have been studied together with all possible solutions to overcome them. All the possible solutions and all relevant recommendations have been submitted to local authorities.*
- *OVERCOMING THE CULTURAL BARRIERS WITH TRAINING. At the end of SOLCO about 550 local key actors have been trained in solar cooling. The lack of knowledge about solar cooling among designers, installers and potential users is one of the most important non-technological barriers. The solar cooling technology needs specific expertise for design, maintenance and operational tasks that presently are missing among technical actors. A strong effort was necessary to reverse this cultural situation.*

Information tools

- *WEBSITE. A fully dynamic website that contains all relevant project information as well as extensive information on solar cooling technologies and equipment available.*
- *TECHNICAL BROCHURE. A technical brochure on solar cooling in four languages is downloadable from the project website. The brochure in different national languages has been locally diffused in all the partners islands.*
- *NEWSLETTER. Seven electronic newsletters were issued during the whole SOLCO's duration and diffused at international and local level in different languages (English, Greek, Italian and Spanish).*
- *SOLCO LEAFLET. A promotional leaflet in four languages was produced and diffused. The versions of the leaflet in all the different partners languages are downloadable from the project website.*
- *PRESS DISSEMINATION. Several publications of articles in local newspapers and TV reports on local news have been produced for the dissemination of solar cooling technology*

- *DISSEMINATION AMONG THE SCIENTIFIC COMMUNITY. Publication of articles in technical journals and participation in technical conferences for the dissemination of solar cooling technology.*

Indirect results and impacts beyond the project lifetime

- *LOCAL ENERGY POLICIES. Changes of both strategies and priorities of local energy policies.*
- *GRANT SCHEMES. In Sicily solar cooling is now included in government grant schemes for the first time. Similar impacts are soon expected in other island of Southern Europe.*
- *FEASIBILITY STUDIES. It is expected that 75% of feasibility studies carried out during SOLCO will become real installations.*
- *DIFFUSION BEYOND THE PROJECT LIFETIME. SOLCO has already been invited to present its results at 3rd International Conference Solar Air-Conditioning that will be held from September 30th to October 2nd, 2009.*
- *SOLCO TRAINING STANDARDS for all relevant target groups, contents of training courses and training material are available on the project website and fully replicable.*

SOLCO has achieved its expected results. Nevertheless the removal of the non technological barriers to solar cooling is still an ongoing process and the results of SOLCO can be a new starting point.

SOLCO is a fully replicable project. The whole methodological approach is clearly described into this report.

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1. The SOLCO Project

Cooling from renewable energies, particularly solar cooling (SC) technologies, represents a key issue within the European Union energy policy.

The higher temperatures experienced in Southern Europe widely attributed to climate change continue to increase the summer energy demand for air-conditioning. Employing the power of the sun can substantially reduce electricity peaks during the summer months and at the same time reduce CO₂ emissions.

Solar heating, a widely accepted concept for hot water production enjoys a high level of market penetration and is widely accepted by the general public. Solar cooling, however, although a mature technology, has rather low levels of market penetration and public acceptance. This is due to a number of non-technological barriers such as its relatively higher initial investment costs compared to traditional air-conditioning installations.

1.1 Overall objective

Solar Cooling is nowadays possible and reliable but a number of non technological barriers hamper its large scale exploitation.

SOLCO's global aim is the removal of the non-technological barriers in an effort to improve the penetration and acceptance of SC technologies and chilling systems.

In order to meet this objective the project endeavoured to achieve the following:

- the identification of the non-technological barriers that hinder the implementation and use of solar technologies and chilling systems
- the elaboration of possible solutions to increase the present low diffusion of the technology
- the training of the market actors and potential users
- the raising of awareness regarding these technologies and a large and targeted campaign of dissemination of information and results.

The long term objective of the project is to encourage and facilitate the implementation of SC technologies and to support their use in Southern European insular territories and areas, particularly those associated with high levels of solar radiation.

The dissemination of data and information, as well as the advice given during professional targeted training sessions and courses are expected to further support the wider and faster diffusion of this renewable energy source (solar energy).

1.2 Project partners

In order to achieve the project goals, an international partnership was formed on the basis of both geographic and climate criteria. Members of the project cluster are from Southern European islands where ideal summer conditions make solar cooling a reliable option for sustainable air conditioning.

APEA (Agenzia Provinciale Energia e Ambiente di Agrigento, Italy) is the coordinator of the project. The rest of the partners came from Cyprus (**CIE**), Greece (**ENV/TUC**), Spain (**ITC**) and the United Kingdom (**ISLENET**). Unfortunately, the Sardinian partner that joined initially was forced to withdraw from the consortium due to problems of financial nature.



The SOLCO Consortium

LIST OF SOLCO PARTNERS

Partner name	Partner short name	Country
Agenzia Provinciale Energia e Ambiente	APEA	Italy
European Islands Network on Energy & Environment	ISLENET	UK
Environmental Engineering Department/Technical University of Crete	ENV/TUC	Greece
Cyprus Institute of Energy	C.I.E.	Cyprus
Canary Islands Institute of Technology	ITC	Spain
ESCO SARDEGNA s.r.l (*)	ESCOS	Italy

(*) ESCOS left the consortium after the presentation of the interim report



The SOLCO team at EUSEW 2009

1.3 The activities

The SOLCO project started on 01.01.2007 and ended on 28.02.2009.

The implementation of activities has been performed following identical patterns in all the project islands. ISLENET, the leading partner for Communication and Dissemination, has been responsible for the tasks defined by the project Dissemination Plan (website, newsletters, information material, leaflets, final brochure, international conference etc.).

An overview on the work is summarised below:

Market Analysis

Partners performed a market study in each participating island and carried out a complete evaluation of solar technologies (including chillers) that are locally available.

A database of solar collectors and chillers commercially available in the four islands participating in the project has been developed and is available online on the project web site.

A detailed analysis of the non-technical market barriers of both heating and cooling technologies and recommendations to overcome them has been produced.

Networking

The development of SOLCO has been based on effective and permanent communication between partners and all various categories of market actors and stakeholders.

These key players were represented within four Local Action Committees (LAC) created at the beginning of the project in each insular partner area.

The members of the LAC are typically local designers, installers and equipment suppliers if they are locally present, SMEs, public bodies, such as the local government, the regional government, the chamber of commerce, and potential users, particularly hotels, resorts, hospitals and universities. Each key actor has provided useful contributions and input that have been critical for the success of the project.

There have been several meetings in the four islands participating in the project: Sicily, Crete, Canary Islands and Cyprus.

Training Activities

Another important task of the SOLCO project was the development of training material and the organisation of training courses for key actors in each of the four partner areas. Each course has a maximum duration of 5 days and has been designed according to the needs and characteristics of the local key actors it addresses: Designers – Installers/Producers/Sellers - Private Potential Users - Public Potential Users.

Information dissemination

The dissemination effort has as its main objective to reach as many key stakeholders as possible and to inform the general public on the advantages of solar cooling technologies. The main dissemination tools used were:

- A fully dynamic website that contains all relevant project information as well as extensive information on solar cooling technologies and

equipment available in the four island-partners. The website has registered more than 100.000 hits during 2008.

- Seven electronic newsletters
- A promotional leaflet in four languages (English, Greek, Italian and Spanish)
- A technical brochure in four languages (English, Greek, Italian and Spanish)

The partners were also involved in: participation to technical conferences, several visits to solar cooling plants, meetings with similar projects, such as SOLAIR and SOLARCOMBI+, publication of articles in local newspapers and technical journals for the dissemination of the SOLCO work and the solar cooling technology.

2. The market analysis

The complete study of local solar cooling market in participating islands was one of SOLCO's goals. Partners developed this study using the same tools in order to be able to compare different local situations.

2.1 Market analysis in the partner islands

2.1.1 Sicily

Sicily is the largest and most populated of the Mediterranean sea islands and is located in Southern Europe where solar radiation has high values.

Solar Cooling technology is not yet known in Sicily. Technical actors which APEA came in contact with did not have a clear understanding of Solar Cooling technology. After coming in contact with the SOLCO activities they expressed a strong interest in learning more about the potential of solar cooling and its environmental advantages.

There are no solar cooling installations in Sicily with the only exception of the desiccant cooling plant recently installed at the Energy Department of the University of Palermo. There is no real Sicilian market of solar cooling technology. The Sicilian market of cooling is actually dominated by the extensive use of electrical chillers.

In Sicily, the Energy Performance Contracting is not yet present in the local market, and the absence of local ESCOs (energy saving companies) with specific experience in energy efficient cooling technologies is clearly felt.

The local market of flat solar panels is rather active. A rather high number of firms of solar collectors operates in Sicily. Most of them work with flat plate collectors used for water or space heating. It is quite simple to locate manufacturers, suppliers and installers of solar collectors with specific experience in flat solar thermal panels. It is, however, quite difficult to find expertise in high efficiency collectors with particular reference to vacuum tube solar collectors.

With respect to vacuum tubes, which is a more interesting technology for solar cooling, ten different firms were located, resulting in 24 different vacuum tube collectors available in the Sicilian market.

The solar thermal market in Sicily is not sufficiently mature yet. The percentage of coverage and penetration of solar thermal technology is very different and quite smaller in comparison with other SOLCO islands (Canary Islands, Crete and Cyprus).

Presently, different public subsidies are available for solar panels. The most important and utilised one is the 55% tax allowance scheme offered by the national Government.

There are no chiller producers in Sicily, however, there are 19 different types of chillers available in the local market thanks to the presence of local commercial agents of five different firms. Interviews of technical actors

(installers, sellers...) indicate that the local demand for chillers is definitely marginal.

Finally we can say that:

In Sicily there is no clear solar cooling market but there is a reasonable availability of single components of solar cooling plants (vacuum tube panels and chillers).

2.1.2 Crete

There is no Solar Cooling market in Crete.

During the study of the local market ENV/TUC distributed questionnaires. The answers received led to the conclusion that Solar Cooling technology is not yet known in Crete.

Most of the technical actors did not have a clear understanding of the technology, even though two out of eight solar cooling systems in Greece are installed on the island. They were, however, really interested to learn more when the benefits were explained.

There are two installations of solar cooling in Crete, both of them operate in hotels in Rethymno. In Crete there is a large and evolves solar panel market. Typically there are flat plate collectors used for water or space heating. There are at least 20 different firms of solar collectors available in Crete. More than 90 manufacturers, suppliers and installers of solar collectors were recorded in Crete. There is a good experience in solar collectors in general in Crete and people seem to trust the technology. However, it is really difficult to find vacuum tube solar collectors in Crete as there are less than 7 suppliers.

There are no chiller producers in Greece. As a result firms that could supply absorptions chiller were contacted. There is only one firm available in Greece (BROAD) whose representative is located in Thessaloniki in the North part of Greece.

Thermal driven chillers are not available in Crete as the technical actors (sellers etc) declared that there is no demand for this kind of chillers on the island.

In Crete there is no clear solar cooling market. There is a good availability of solar panels. There is a poor availability of chillers.

2.1.3 Cyprus

Cyprus is considered to be the first country among the world, on installed solar collectors per inhabitant (1,02m² of collectors/ capita). More than 120 manufacturers, suppliers and installers of solar collectors were recorded in the island. In Cyprus there are 46 different firms of solar collectors. The majority of the collectors that are available in Cyprus is flat plate collectors.

The 31 local companies manufacture flat plate collectors for domestic hot water purposes and plastic collectors for swimming pool water heating, a technology that is not compatible with solar cooling technology.

However in Cyprus there are not any manufacturers of vacuum tube collectors.

In Cyprus there also 15 other companies that import solar collectors from Austria, Germany, Israel and Greece. These companies import mostly flat plate collectors with coated surface and vacuum tube collectors. Most of the

imported collectors are used for domestic hot water production as well as for space heating and cooling technology.

From the analysis of the questionnaire results, it is obvious that solar cooling technology is not yet widespread and that there is a significant potential to be exploited. However, the technology is an option considered by both engineers and potential users. There is only one application of Solar Cooling technology in Cyprus in Amor Rouge bakery in Nicosia. It has been using the first solar cooling system in Cyprus since May 2006. It is important to observe that the plant is in an industrial building and not in a residential buildings (office or hotel).

In Cyprus there are no chiller manufacturers. There are only two companies in Cyprus that import thermal driven chillers (Chanat electrical and mechanical contractors and C & H Heat – Flow LTD). The available chillers in Cyprus are Century and Yasaki. In Cyprus there are no solar driven chillers available for small installations (domestic sector).

In Cyprus there is no clear solar cooling market. There is availability of solar panels but it is difficult to have small size chillers.

2.1.4 Canary Islands

The solar thermal market in the Canary Islands is a mature market. In the Canary Islands there are many companies devoted to the solar thermal market.

In Spain there are approximately 85 solar cooling installations and 11 of them are located in the Canary Islands. Other installations have already been planned. In other words, this market is increasing.

Several hotels are installing the solar cooling technology. There is a high demand of hot water provided by solar thermal energy installations. Hotels warm swimming-pools during the winter and utilise any energy excess for the solar cooling installations.

In the Canary Islands the Energy Performance Contracting is not yet introduced in the market, and at the moment there are only three companies that have installed solar cooling installations. (The most important company is Elca-Fricalan. They have installed nine of the eleven solar cooling installations in the Canary Islands).

The more frequent method of financing solar cooling technology in Spain is the subsidy. The subsidy for existing buildings is 22% of the installation cost. Nevertheless, equipment that have the maximum category of energy labelling may enjoy a subsidy of 25% and in exceptional situations the subsidy may be as high as 30% of the cost.

The most recently example of solar cooling installation subsidised is the Laguna Sport Games installation. Laguna Sport Games is a big sport centre. They have installed an absorption cycle for air conditioning, domestic hot water and warming the swimming pools. In this case the subsidy was 33,66 % of the estimated investment.

In the Canary Islands the solar cooling market is increasing and there is a good availability of different components of solar cooling plants (solar panels and chillers).

2.2 Market sectors

The local market studies summarised above raised concerns with respect to the following three relevant sectors:

1. Solar thermal panels;
2. Chillers;
3. Solar cooling technology (from a general point of view).

The market of solar thermal panels

The state of the art of solar thermal panels market is not the same for all SOLCO islands. The market is very mature in Cyprus and the Canary Islands (please see values of indicators mentioned on local versions of D13). The market in Crete is already well developed too. The Sicilian market is rather active even though the values of the local market indicators are far from those of the other islands.

The market is particularly active in the field of water or space heating in all islands.

A good number of manufacturers, suppliers and installers of solar collectors is present in every island.

There is full availability of “traditional” flat solar collectors in each island. Final users can have efficient design, installation and maintenance for water or space heating plants. The local population seems to trust the technology.

The market of vacuum tube collectors is relatively less developed. The number of local suppliers is smaller than that of flat plate collectors. Final

users do not understand why it is necessary to use a more expensive technology.



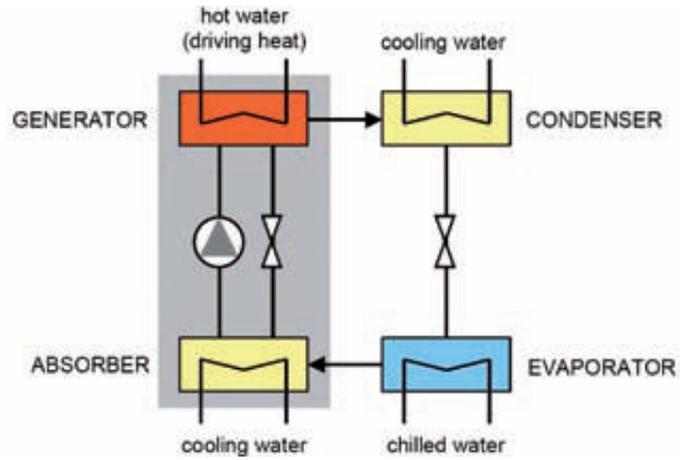
A field of vacuum tubes on a roof

The market of chillers

There are no producers of chillers based in the project islands. Chillers are available locally even though availability is very different from one island to the other. Good availability was observed both in Sicily and in the Canary Islands. The chillers market in both Crete and Cyprus is less developed. Only two firms are present in each island.

Interviews of technical actors (installers, sellers...) indicate that the local demand for chillers is rather low. Despite the fact that it is relatively easy to buy a thermally driven chiller, problems often arise later with respect to installation and maintenance procedures. Expertise of installers and maintenance firms has to be improved.

Based on the above mentioned reasons, one can conclude that the market of chillers is not mature in any of the SOLCO partner islands.



An absorption chiller (ITC) and the scheme of its functioning principle. Source: ESTIF

The market of solar cooling technology

The number of solar cooling installations is very different in the SOLCO islands:

- 11 installations are located in the Canary Islands
- 2 installations in Crete
- only one plant is operating in Cyprus and Sicily
- three new installations will be implemented in Cyprus by 2011



First solar air conditioning system in Cyprus, L'Amor Rouge Bakery

The solar cooling market is increasing in Spain but is at a standstill everywhere else. One of the biggest problems is that the answers received from the technical actors lead to the conclusion that Solar Cooling technology is not yet sufficiently known. Technical actors have no or very little understanding of the technology.

Presently, equipment performance, financial costs and other financial considerations are still marginal factors to be considered. What is principally missing is the basic knowledge among technical actors.

Another important barrier is due to the fact that there is no grant scheme covering specifically solar cooling plants within the surveyed markets. In other words, even though subsidies are offered for the installation of solar panels, solar cooling is not among the eligible technologies.

Only in Sicily, a draft call for public subsidies dedicated to solar cooling (among other solar installations) is already in progress. It will be launched in 2009 by the regional government.

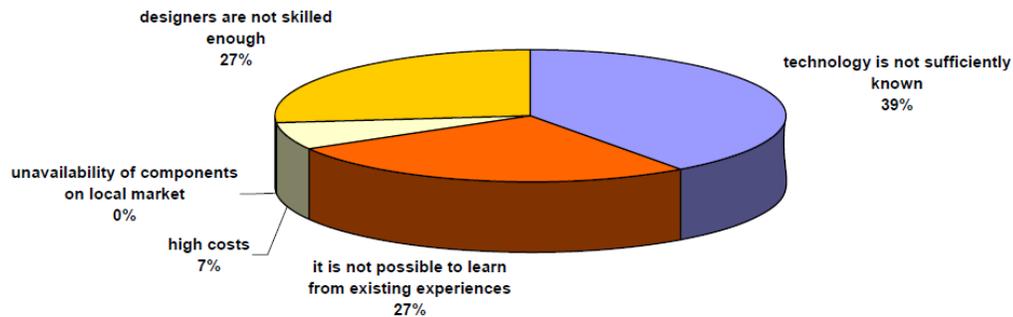
Modern methods of financing (e.g. Energy Performance Contracting with local ESCOs, TPF, etc) are not utilised within the insular markets that SOLCO studied.

2.4 Collective conclusions about the market analysis

The study of local markets in different islands has identified several important common barriers limiting solar cooling installations. These barriers are summarised below:

- The low level of knowledge by designers (engineers and architects do learn about solar cooling at University), technicians, installers.
- The lack of specific training in solar cooling.
- As local technical actors are not familiar with solar cooling technology, they do not propose it to their clients (potential users).
- Lack of design tools (software) and control tools.
- Lack of awareness in potential users (hotels, hospitals, public bodies) about the possibilities of using solar driven cooling plants and the related environmental advantages.
- Extremely limited dissemination activities for the promotion of the technology
- Lack of demonstration plants and experience. It is very important to monitor plants and to have information regarding the performance.
- A number of technical actors think that chillers are not available locally and they do not know that small size machines are now being produced and are available.

Why are applications so few? (answers from technical actors at Regional SOLCO Conference)



The higher development of the solar cooling market in the Canary Islands presents some of the typical barriers of an increasing market:

- The different maintenance types (for the chillers, the solar field, the hydraulic installation and the cooling tower overcoat) are complicated and expensive.
- Lack of packaged solutions in this kind of installations, not only during the setting-up but also during the life of the installation (maintenance). The installation and O&M need specific know-how.
- The use of sorption chillers requires the existence of wet cooling towers in most cases. This equipment is regulated by specific legal requirements in order to prevent the legionnaire's disease. As a result, the maintenance of the installation is more expensive and the majority of potential users avoid it..

Recommendations and possible solutions to overcome specific barriers:

Discussion among partners allowed the identification of the following general recommendations and possible solutions to overcome all barriers:

- Specific training courses for all professional actors, with particular reference to designers with, if possible, the proposal of design tools (software) and control tools. Lack of training is an important barrier and requires considerable human and financial resources. The training courses of WP5 can be a first step in this direction.
- Inclusion of solar cooling technologies into the standard education for engineers and other qualified technical actors. This goal is more difficult to be achieved but all the partners have communicated this problem to Universities in their areas.
- Information about the solar cooling market is very useful to technical actors. Information produced by SOLCO, such as the solar cooling database (D7&D8), solar radiation data and other deliverables that are downloadable from www.solcoproject.net are crucial tools.
- A strong dissemination campaign is necessary in order to improve technology awareness of both decision makers and potential users.
- Demonstration projects are absolutely necessary in order to provide real operational data about the performance of solar cooling plants to be offered to technical actors as design tools and references. The installation of a solar cooling system in a public building with all the economical, technical and environmental data available would certainly give an extra boost to the technology.
- Inclusion of solar cooling technologies into regional, national and European legislation regarding energy efficiency in buildings.
- Inclusion of the use of renewable energies for cooling in building regulations at national and European level.

- A significant effort to develop the local market of solar cooling technology is necessary in order to reduce the actual cost of different components.
- Standardization in the field of solar driven cooling plants, design guidelines and proven operation and maintenance concepts is necessary.



A local solar cooling workshop (ITC)

3. Normative and bureaucratic restraints

Several factors are driving the market for solar cooling solutions. On the one hand, the exploding demand for cooling and thus for electricity, to drive the conventional cooling machines is becoming not only very expensive but also endanger the stability of whole electricity grids.

In several European countries, the peak electricity demand has already shifted from winter to summer and the demand for more comfort and cooling is rapidly increasing also in more moderate climates. Furthermore, the trend to larger solar thermal systems and higher solar fractions, which it is possible to observe in several countries, leads to more solar heat being available in summer than what is needed. These two factors make solar thermal cooling a more and more attractive option. The number of installed systems has increased tremendously in the past few years and several new thermally driven cooling machines (especially designed for smaller capacities and lower driving temperatures) have entered the market. As this is a very new market, there are hardly any quality standards so far. To ensure a good quality and to avoid any backlashes from low- or no-performing systems, quality requirements need to be developed soon.

The application of solar cooling systems is currently mostly limited to demonstration and pilot plants. But the technology is developing very fast and high expectations are put in it. Solar cooling systems require always huge investments and therefore any kind of guarantees on life expectancy, performance or durability are welcome to convince or reassure customers

and investors. So it is necessary to develop a basis of requirements and test methods to assure the good performance and durability of the solar cooling plants.

According to the description of this SOLCO work package, the normative and bureaucratic restraints at national regional and local level in each region, associated with the utilisation of the solar cooling technology (integration with houses and residential buildings, maintenance restraints, etc.) have been analysed. In order to obtain the complete screening a specific collection of basic information has been carried out.

The process to collect the information has had two stages. The first stage was based upon questionnaires developed by the ITC and answered by all partners.

The second stage was later developed and led to information updates of the normative restraints situation in all regions. The reason for this approach is that some countries have changed their situation recently in order to implement the Directive 2002/91/EC of the European Parliament and the Council of the 16 th of December 2002 regarding the energy performance of buildings (EPDB).

As a conclusion, all SOLCO regions have implemented the EPDB.

Since the end of 2006, the Directive 2002/91/EC has been in force in Sicily and the Canary Islands, and since January of 2009 it has been in force in Crete and Cyprus. This Directive is mandatory and it is carried out through different

national laws with the objective of improving the energy performance of buildings by requiring:

- A methodology to calculate integrated energy performance of buildings
- Minimum requirements for the energy performance of all new buildings
- Minimum requirements for the energy performance of large existing buildings subject to major renovation
- Energy certification of all buildings
- Regular mandatory audits of both cooling and heating systems in buildings.

In each new piece of legislation created, there are requirements to improve the production of hot water and reduce the demand for conventional energy. Most of the regions have considered the use of solar thermal energy. In the Canary Islands, the use of solar thermal energy to produce hot water is mandatory since the end of 2006. The case of Cyprus is significant because it is a European leader in the total surface of solar collectors installed with 562 kWth per 1.000 persons and nearly 800 m² per 1000 persons (“Solar thermal markets in Europe 2007”, European Solar Thermal Industry Federation).

In order to improve the quality of solar plants, solar collectors need to be evaluated and certified. The tests required to certify solar collectors are described in the European standards EN12975-1:2006 and EN12975-2:2006.

With respect to solar collectors certifications required, the situation is different in each region. In the case of Greece, certification is not required,

but most of the manufacturers ask Solar Keymark certification as added value (<http://www.estif.org/solarkeymark/>).

In Cyprus the solar collectors must be tested to obtain the thermal performance (efficiency test) by an accredited laboratory.

In the Canary Islands (Spain), it is necessary to certify the solar collectors. Such a certification is issued by the Ministry of Industry, Tourism and Trade. In order to obtain the Spanish certification, the solar collector should be tested according to European standard EN12975-2:2006 and the manufacturing process should have ISO 9000 certification.

3.1 Bureaucratic restraints

The legislation survey, carried out within the SOLCO project, has proved that some relevant barriers to the diffusion of solar cooling can be both directly or indirectly linked even with the legislation framework itself.

Legislation represents a direct non-technological barrier when bureaucratic procedures necessary to authorise solar cooling equipment are so strict that potential users avoid such installations.

Legislation represents an indirect non-technological barrier when, for example:

- standard methods utilised by law for the evaluation of energy performance of buildings do not take into account energy consumption for cooling

- or public aid schemes and incentives do not include solar cooling installations among eligible actions
- specific conditions (e.g. for the prevention of legionnaire's disease) oblige the implementation of very expensive measures that make solar cooling not competitive.

The survey dedicated to bureaucratic and normative restraints has revealed that solar cooling is not mandatory in any region and there is not any plan, regulation, law or normative restraint concerning solar cooling plant construction and installation.

Most of the regions have financial incentive schemes to promote solar thermal energy installations but there are no subsidies for solar fields that could also drive a chiller to produce "solar air conditioning". A roadmap for solar-assisted cooling systems on national levels and on European level is not available.

One important point in the field of normative and bureaucratic restraints is the rules associated with wet cooling towers. Most of the regions have specific and national laws to prevent legionnaire's disease that are very restrictive. They represent very strict maintenance requirements regardless of the size of the wet cooling tower. The use of sorption chillers requires in most cases the existence of wet cooling towers. As they are associated with strict rules preventing legionnaire's disease potential users avoid them. On

the other hand the risk of legionnaire's disease in wet cooling towers is real and very important, and for this reason rules are necessary. This is a normative barrier.

At the same time, quality standards are lacking in order to ensure good quality in such installations to avoid any backlashes from poorly-performing systems. It is necessary to develop a basis of requirements and test methods to assure the good performance and durability of solar cooling plants.

3.2 Recommendations and proposals

In the regions across southern European islands there are nearly no specific normative and bureaucratic restraints for the implementation of solar cooling technology. Indeed there are several legislations to promote solar thermal energy to produce hot water and they are supported by different subsidy schemes. However in order to promote solar cooling technology, it is necessary to increase the level of subsidies.

As a conclusion, the main normative and bureaucratic restraints are the low level of financial support and the lack of specific quality standards

In order to overcome the normative and bureaucratic restraints faced by the solar cooling technologies the project partners identified the following remedial actions:

- Require EU member states to keep statistics on the energy demand for cooling purposes.
- Develop new possibilities to help potential users to finance the solar cooling installations. New proposals as tax exception or tax refund can increase the subsidies level until 50% of the total cost of the installation.
- Inclusion of solar cooling into financial incentive schemes for solar thermal at national and European level.
- Inclusion in building regulations of the use of renewable energy for cooling at national and European level.
- Develop different norms and standards for different size of wet cooling towers. The most of solar cooling installations have small wet cooling towers so they should not have the same restrictions that big wet cooling towers have. This is a very important recommendation because the wet cooling towers are affected by a specific legislation to avoid the legionnaire disease, and the maintenance of the installation is more expensive and most of the potential users prefer to avoid them.
- Develop test methods to assure the good performance and durability of solar cooling plants.
- Solar cooling installations must be installed in public buildings with the purpose of close the technology to the potential users.

4. Training actions

A specific WP of SOLCO was dedicated to training actions of solar cooling “key actors”: potential users and technical actors.

Training actions are considered crucial by partners in order to remove cultural barriers and promote the utilization of Solar Cooling technologies.

Each insular partner of the project, organized training courses on solar cooling technology targeted to different categories of “key actors”.

Each course was designed according to the needs and characteristics of the category of “key actors” it was addressed to.

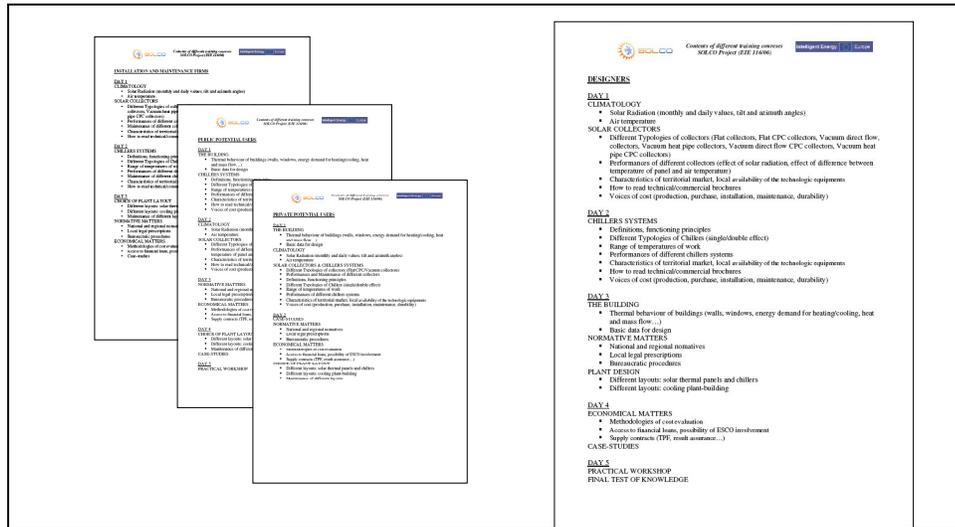
In the Canary Islands, Crete, Cyprus and Sicily, training courses were organized for:

- Designers
- Installers, maintenance staff, firms...
- Private potential users
- Public potential users

The general structure of the courses was jointly defined by partners. The indicative durations of different training courses are hereafter listed:

- 3-5 days “Designers”
- 2-3 days for “Installers”
- 3-5 days for “Public potential user”
- 1-2 days for “Private potential user”

The general contents of different courses (for the longest duration they could have) are available on www.solcoproject.net pages dedicated to training.



Contents of Training Courses are downloadable from the website

Both contents and durations were further discussed and finalised at local level together to local stakeholders involved within Local Action Committees. LAC members cooperated with SOLCO partners to adapt contents of courses to specific local needs. LACs provided contributions also to definitions of: calendars, diffusion and participants search activities.



Various local stakeholders were involved in training activities

The following table summarises all performed training courses in different SOLCO islands. Capital letters into cells refer to different trained target groups.

Calendar of SOLCO Training Courses									
	May 2008	June	July	August	Sept.	Oct.	Nov.	Dec.	Jan.09
Canary Islands	D I PrU PU					D I PrU PU	PrU PU		
Crete						D PrU PU	D PrU PU	D	I
Cyprus									D I PrU PU
Sicily		D I PrU	PrU		D			PU	

D designers
I installers

PrU private potential users
PU public potential users

Programs of all performed courses with all utilized training materials presentations in Greek, Italian and Spanish are available on SOLCO website.

Training presentations are also available in English.

After the end of the project, a total of 545 key actors were trained. The final cost for each single trained actor was very value for money.

The training actions performed in Southern Europe during SOLCO are easy replicable since structures and contents are free downloadable from the project website.



Pictures of some of SOLCO training courses

5. Main dissemination activities

Dissemination, exchange of information, and feed-back, in other words 'communication' was a major activity during the life of SOLCO project and will continue after its completion.

The Consortium had performed the following five specific tasks under the work package dedicated to dissemination:

- Development and implementation of a dissemination plan.
- The website
- The production of specific and general publications and other relevant materials in order to disseminate the results and success stories through local, national and European channels and networks.
- Development of the local targeted campaigns.
- European SOLCO conference

The main objectives of the SOLCO dissemination plan were to:

- Raise awareness and develop a positive image for solar applications; and
- Make the project material available to the largest possible number of people and to contribute towards the main objectives of the project mentioned above.

Due to the relatively low level of awareness of the advantages of solar cooling technologies by the technical world (designers – installers – maintainers), as

well as the public at large, it has been important to identify the main target groups and key actors:

- Local professionals and market actors: mainly composed of technical actors such as engineers, designers, installers and maintainers and potential users, such as hotel owners, store owners. They represent both key actors and target groups.
- Technical, technological, economic local and national operators and decision makers that have not been directly engaged in the development of the project. A good example is associations, such as island chambers of commerce, builders' and architects' associations, etc, who through increased awareness they will disseminate the SOLCO project information to their members and will improve RES penetration at local, regional, national and European levels.
- European level organisations and other relevant networks/associations, such as EREC, EuroHeat & Power, European Solar Thermal Industry Association (ESTIF) and others.
- Local and regional island authorities that through increased awareness would become important allies in promoting the technology and assist in the removal of non-technological barriers at local and regional levels. Work will mainly focus on improving the understanding of the potential benefits that local communities would gain from solar-based heating and cooling systems and technologies. In addition the market potential of acquiring such know-how would be presented and the positive impact

that it would have on local island employment and economic development.

- The general public so that it would develop a positive image regarding the possibilities offered by solar technologies.
- Local/regional/national press could be instrumental in increasing awareness as RES (Renewable Energy Sources) including solar technologies are becoming an important political issue.

The message had to reflect the long term objective of the project “to encourage and facilitate the use of solar technologies”. As the message is rather technical, the language employed has been easy to understand in order to reach various types of target groups and not only the ‘heating and cooling’ specialists. The implementation of the plan has been carried out by using the following main dissemination tools:

- A fully dynamic website that contains all relevant project information as well as extensive information on SC technologies and equipment available in the four island-partners. The website has registered more than 100.000 hits during 2008 (see below – website statistics).
- Seven electronic newsletters first produced by ISLENET in English and then translated to Italian, Spanish and Greek by the partners
- A promotional leaflet in four languages (English, Greek, Italian and Spanish) and
- A technical brochure

In addition to the above tools the partners were involved in the following activities:

- participation in technical conferences and presentation of the SOLCO activities
- several visits to local SC plants, such as in Palermo, Italy and the SC installation of the ITC - Canary Islands Institute of Technology
- meetings with partners of similar projects, such as SOLAIR and SOLARCOMBI+, in order to exchange information and share know-how, and
- publication of articles in local newspapers and technical journals for the dissemination of the SOLCO work and the SC technology

5.1 SOLCO website

The project website www.solcoproject.net has been designed, built and maintained by ISLENET.

All project deliverables and results have been uploaded into this website which is available in English. Specific pages are also available in the national languages of the partners of the project.

The website represents one of the primary means of obtaining information about the project. Its visual impact and accessible information has raised public awareness on solar heating/cooling technologies as manifested by the

significant number of hits and volume of downloaded material (see below – website statistics).

Regularly updated, the website is the most cost-effective communication tool.

The website contains the following information about the project including:

- Objectives
- Organisation
- Tasks
- Participants
- Expected results
- Information about the partners and links to their web pages
- Information on the activities of the Local Action Committees (LACs)
- Project specific information and a detailed presentation of the project deliverables.
- A page with project News
- A publications page where visitors can download all of the project's publications (Brochure, Leaflet, Newsletters) and other information/articles relevant to solar cooling technologies
- Links to the web pages of the partners, of European organisations dealing with solar cooling technologies, as well as to the web pages of similar projects
- Contact points for comments, advice, suggestions, exchange of experiences etc.

Among the project deliverables a data base of solar panels and chillers has been built and presented (see above - Market Analysis). The database, in addition to useful technical data on various commercial types of collectors and chillers available in the four island locations covered by the project, it also presents the names and addresses of local installers, suppliers, greatly facilitating the task if potential users interested in a solar cooling installation.

SOLCO

SOLCO > HOME

[HOME](#)

SOLCO is a project of 24 months that started in January 2007.

Its full title is "Removal of non-technological barriers to Solar Cooling technology across southern European islands".

The project is co-financed by the Intelligent Energy - Europe (IEE) programme.

Intelligent Energy Europe

SOLCO EU CONFERENCE
 SOLCO participated in the EU Sustainable Energy Week / 9-13 February 2009 in Brussels. SOLCO's event was on Tuesday 10 February 2009 in the afternoon. [More](#)

NEW SOLCO PUBLICATION
 An overview of the non-technological barriers of the adoption of solar cooling technologies and recommendations how to overcome them.
[Click here to download this brochure](#)

NEWS
[Press Release SOLCO EU event in ...](#)
[End of project results : Overview ...](#)

PUBLICATIONS
[SOLCO Newsletter no 4 English Solar Cooling in Greece](#)

The sole responsibility for the content of this webpage lies with the authors. It does not necessarily reflect the opinion of the European Communities. The European Commission is not responsible for any use that may be made of the information contained therein.

www.solcoproject.net - The homepage

Website Statistics (2009)

Monthly history January – March 2009

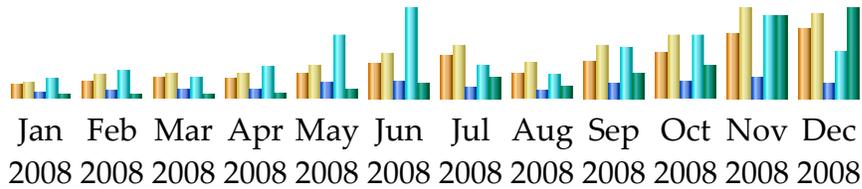


Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
2009 2009 2009 2009 2009 2009 2009 2009 2009 2009 2009 2009

Month	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Jan 2009	1326	1724	5034	17620	2.09 GB
Feb 2009	1476	1979	7182	28318	2.69 GB
Mar 2009	1952	2416	6903	25878	3.72 GB
Total	4754	6119	19119	71816	8.50 GB

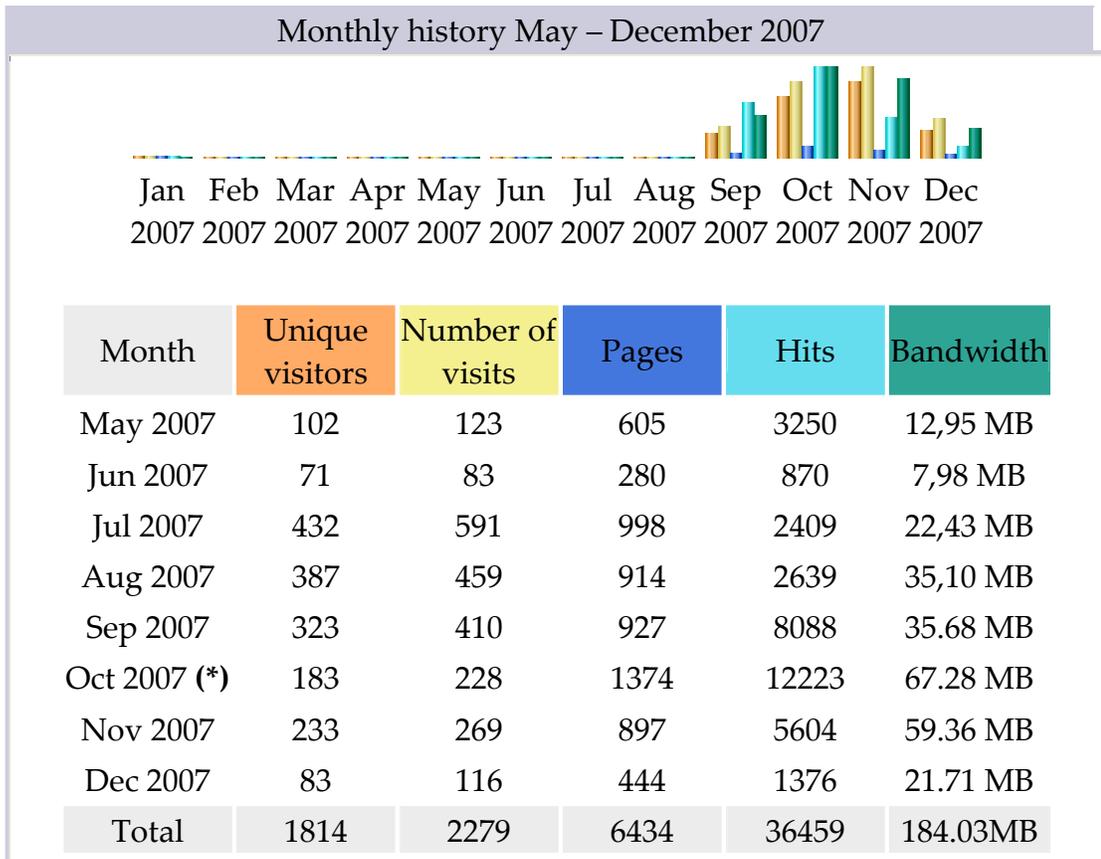
Website Statistics (2008)

Monthly history Jan – Dec 2008



Month	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Jan 2008	162	203	876	3339	40.84 MB
Feb 2008	215	285	1406	4774	60.12 MB
Mar 2008	262	314	1495	3868	52.19 MB
Apr 2008	235	319	1541	5617	95.19 MB
May 2008	317	417	2562	11660	138.23 MB
Jun 2008	450	572	3216	16402	258.82 MB
Jul 2008	558	682	1936	5945	334.67 MB
Aug 2008	329	440	1212	4156	196.02 MB
Sep 2008	462	677	2653	9134	408.09 MB
Oct 2008	586	811	3045	11662	545.76 MB
Nov 2008	838	1152	3684	15236	1.31 GB
Dec 2008	883	1100	2615	8515	1.44 GB
Total	5297	6972	26241	100308	4.83 GB

Website Statistics (200)



(*) ISLENET 2007 Conference where the SOLCO Project was extensively disseminated

The following observations can be made regarding website traffic:

1. The website became operational in April 2007
2. During 2007, at the initial stages of the project, the volume of the information available for downloading and the number of hits was low averaging 150 hits per day
3. In 2008, there is a steady and significant increase in the traffic of the site, reaching 500 hits per day. The monthly volume of downloaded information (bandwidth) sees a significant increase in the last 4

months of 2008, reaching volumes in excess of 1 Gigabyte in November & December 2008

- The same trend continues into 2009 where we see during the first 3 months of 2009 the volume to go over 3 Gigabytes per month in March 2009 (one month after the SOLCO Conference and the end of the project), the hits to go to over 800 per day and to average over 80 visitors per day.

The above data lead to two important conclusions regarding the website:

- The data indicate that there is strong interest in solar cooling technologies
- The data also indicate that there was a strong impact of the dissemination and communication activities of the project in promoting solar cooling technologies.

5.2 SOLCO newsletters

In total seven Newsletters were produced during the life of the project, one more than the six that were initially planned.



The first pages of the planned issues of SOLCO Newsletter n.1-2-3



The first pages of the planned issues of SOLCO Newsletter n.4-5-6



The first pages of the additional SOLCO Newsletter n.7

The Newsletters were produced, with the contribution of all the partners and are available in English, Italian, Spanish and Greek.

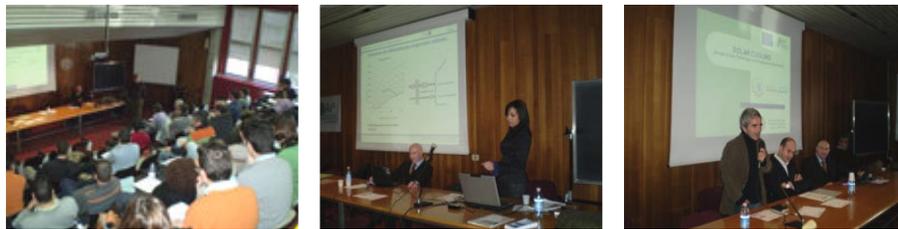
All Newsletters and their translations have been uploaded on the website

All Newsletters were also e-mailed out to the extensive mailing lists of all the partners.

5.3 Seminars and workshops

One of the dissemination main objectives was to develop and implement local targeted campaigns in order to support the successful implementation of the project in the Islands involved. More specifically, the local campaigns consisted of the organisation of a local event (Info Days) on each island in the form of an information day in order to promote the goals of the SOLCO project and increase the awareness of the public and the local media on solar cooling technologies.

All dissemination material and presentations of the Info Days have been uploaded on the project website, "Dissemination activities - Info days".



Pictures of the Sicilian info day



Pictures of the info day in Gran Canaria

5.4 European SOLCO Conference

The European event was organised in order to present the results of the project and to raise awareness on the possibilities offered by this technology. In order to get a certain level of attendance to this event as well as to reduce the costs, the SOLCO European event was organised during the European Union's Sustainable Energy Week 2009 (EUSEW 2009).

The conference was organised on the 10th of February 2009 in the form of a day of Solar Cooling related activities with the cooperation of two other EIE funded projects dedicated to solar cooling, Solair and Solarcombi+. Solair and Solarcombi+ were presented in the morning and SOLCO was presented in the afternoon. The solar cooling day closed with a round table discussion where representatives of all three projects made brief statements and participated in an exchange of views with the participants of the conference.

MANAGENERGY was invited to promote the event and to cover the event by taping it and making the event available on their web site as video on demand, but unfortunately, due to limited resources and a high demand for their services during EUSEW 2009, they were not able to do so.

The Spanish press and TV were present at the event, however, and they taped part of the conference. Ms Pilar Navarro, from ITC was interviewed on Spanish TV Channel ACFI TV from the Canary Islands and the Canary Islands press published an one page article on the event (see below)

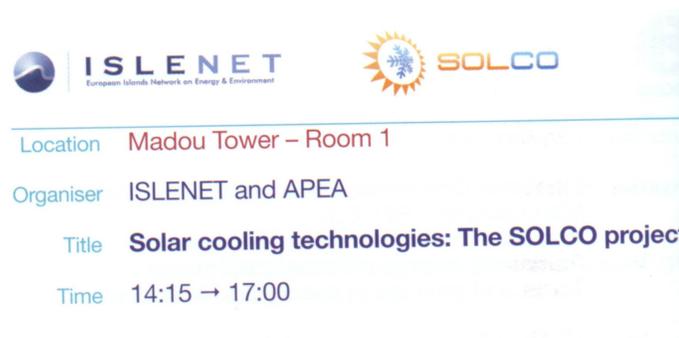
ISLENET was mainly responsible for the promotion and the organisation of the event. ISLENET also chaired the event. All partners also promoted the

European event at local, regional and national level and fully participated and contributed in the event.

Conference presentations are hereafter listed:

- *Overview of the SOLCO Project and Analysis of the Insular Market of Southern Europe* - Stefano Rugginenti, Agrigento Provincial Energy Agency (APEA), Italy, project coordinator
- *Critical technology issues - The experience in Crete* - Theocharis Tsoutsos, Technical University of Crete, Greece
- *Analysis of non-technological barriers* - Pilar Navarro, Canary Islands Institute of Technology, Spain
- *How to overcome cultural barriers: Training Actions* - Salvatore Castaldo, Agrigento Provincial Energy Agency (APEA), Italy
- *How to overcome non-technological barriers* - Marios Manolis, Cyprus Institute of Energy
- *Passing the message to the local society* - Panos Coroyannakis, ISLENET

All the Conference presentations are available on the project website www.solcoproject.net.



The announcement of the SOLCO Conference from the EUSEW2009 catalogue

5.5 The promotional leaflets

A project-specific promotional leaflet was designed in order to inform the general public and island communities about the objectives and the main expected outcomes of the SOLCO project. The leaflet has been made available in each of the 4 languages (E, I, ES and GR) and has been distributed at local level during the project workshops or other related events and at European level in related European Conferences, Workshops, Information Days, and other similar events. All linguistic versions of the leaflet are also available for downloading from the website.



The SOLCO promotional leaflet (A Side)

The SOLCO Project

The SOLCO project, «Removal of nontechnological barriers to Solar Cooling technology across Southern European Islands», is a two-year project, January 2007-December 2008. It is supported by the Intelligent Energy – Europe programme of the European Commission.

Project Objectives

Cooling from renewables represents a key issue within the European Union energy policy. SOLCO's global aim is the removal of the non-technological barriers in using solar cooling technologies and chilling systems.

In order to meet this objective the project is aiming at:

- identifying the nontechnological barriers that hamper the use and implementation of solar technology and chilling systems,
- training the market actors and potential users, and
- raising awareness about these technologies through targeted dissemination of information and results.

The long term objective is to encourage and facilitate the use of solar technology particularly in insular areas of Southern Europe and areas that are associated with a high amount of solar radiation.

Expected Results

The expected results of the project are:

- increased awareness in opportunities offered through the utilisation of solar cooling technologies;
- comprehensive evaluation of solar technologies;
- presentation and analysis of market barriers relative to both heating and cooling technologies,
- the development of a training system addressed to various categories of professionals involved in solar cooling and chilling systems on the islands.

A database will be available at the end of the project on line on the project web site which will allow potential users to search for information, exchange experience and ask for advice.

The Partners



The project coordinator is APEA, the Agency for Energy and Environment of the Province of Agrigento in Sicily.

APEA's main activities are: provision of information and promotion of RES (Renewable Energy Sources) and RUE (Rational Use of Energy), energy management for public and private bodies, training, development of environmentally friendly projects, performance of studies in the field of energy and environment management, support to municipalities and enterprises.



The Renewable and Sustainable Energy Unit of the Environmental Engineering Department, Technical University of Crete (ENV/TUC), which covers a wide range of knowledge subjects, such as the field of Applied Research and Technology Development, Energy Planning and Sustainable Energy Management.

These activities include the following modules:

- Management of Renewable Energy and Energy Saving Systems
- Biofuels
- Solar Cooling
- Sustainable Energy Systems appraisal

www.enveng.tuc.gr



The Cyprus Institute of Energy (CIE) was established in year 2000, by the Minister of Commerce, Industry and Tourism as a non-governmental organisation in accordance with the provisions of the «Societies and Institutions Law». It is administered by a five member board of Directors appointed by the Council of Ministers.

CIE's activities aim for:

- the development and promotion of renewable energy sources,
- the promotion of energy conservation and rational use of energy;
- the utilisation of financially and environmentally viable energy technologies.

www.cie.org.cy



The Canary Islands Institute of Technology (ITC) is a public company of the Canary Islands Regional Government attached to the Regional Ministry of Industry, Trade and New Technologies with a staff of 189 employees. Its main goal is to promote the industrial development of the region, fostering research, development and innovation in emerging technological fields, in close collaboration with regional SMEs, the regional government, the regional administration and institutions, the universities, other R&D centers and public and private companies.

www.itccanarias.org



ISLENET is a network of European Island Authorities, which promotes sustainable and efficient energy and environmental management. It actively promotes the adoption of local energy management strategies, the development of renewable energy projects and environmental policies. These activities have an important effect on local economic development and promote a balanced approach to sustainable development.

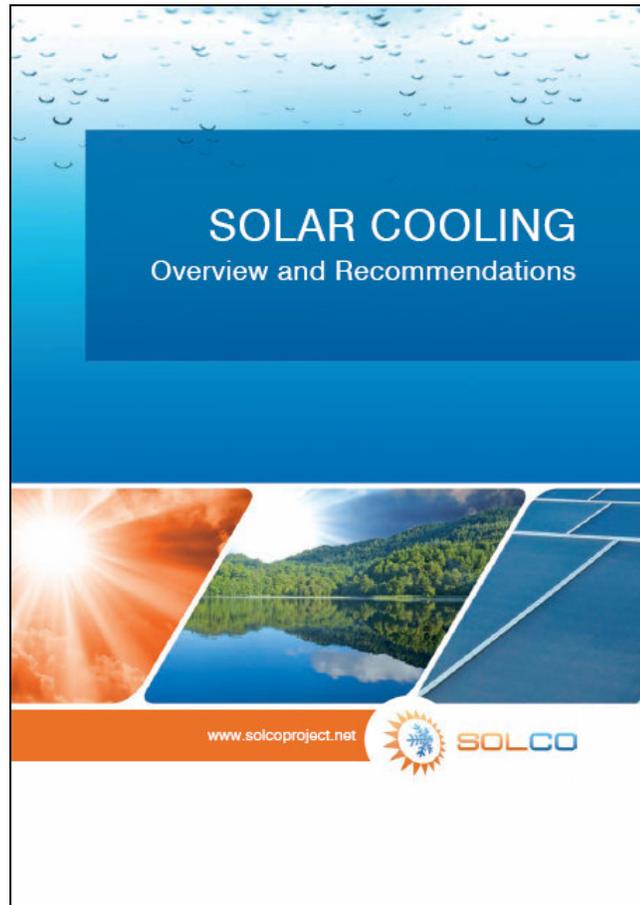
www.islenet.net

The SOLCO promotional leaflet (B Side)

5.6 The technical brochure

A SOLCO Technical Brochure at the end of the project where all the objectives, the outcomes, the results, the main achievements and the recommendations resulting from the project has been produced in a comprehensive, non-scientific, easy to understand language.

The SOLCO Technical Brochure, initially estimated to be 20 pages long was designed and produced by ISLENET and is 28 pages long. Local partners were responsible for the translation of the Technical brochure in Greek, Italian and Spanish. All linguistic versions of the Technical Brochure are also available for downloading from the website.



The cover of the English edition of the SOLCO technical brochure

6. Conclusions

Nowadays, Solar Cooling is both possible and reliable. Exploitation of solar thermal energy for cooling is an efficient, intelligent and environmentally friendly way to use renewable energy sources to meet our air conditioning needs.

However, applications of solar cooling are actually too few. This is both the cause and the result of the low levels of penetration of this technology, even in markets where solar radiation is relatively high, namely those of southern Europe.

SOLCO is reporting the following major findings in the diffusion of solar cooling technologies:

- At local level there is a real need for the implementation of solar cooling and the public is willing to use the technology for air conditioning applications in the residential, commercial and public sector, including private enterprises, hotels and hospitals.
- The investment cost of solar cooling installations is higher than conventional air conditioning systems. As a result, relatively few installations are in place and this in turn keeps the cost of components (such as chillers) relatively high due to the absence of economies of scale.
- There is a lack of widespread specialised knowledge of solar cooling technologies amongst designers, installers and maintainers who in their majority continue to design and promote conventional non-solar installations.

In order to overcome existing non-technical barriers and improve the penetration of solar cooling technologies in the European market, SOLCO's main recommendations are:

- Training of technical market actors (designers, installers, maintainers) is crucial in order to overcome the knowledge barrier.
- Financial support schemes at national and European level are essential in order to overcome the financial barrier and make solar cooling technologies competitive, improve market penetration and exploit economies of scale. These schemes can be in the form of grants, subsidised interest rate loans, and/or tax incentives.
- Dissemination of information on the advantages of solar cooling is vital. A Europe-wide campaign, with emphasis in Southern Europe, is central in order to improve the understanding and acceptance of solar cooling technologies by the general public.





Project Coordinator
Agency for Energy and Environment (APEA)
Province of Agrigento-Sicily
www.apea.it



Canary Islands Institute of Technology (ITC)
www.itccanarias.org



Cyprus Institute of Energy (CIE)
www.cie.org.cy



European Islands Network on Energy
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