L'Europe en Méditerranée
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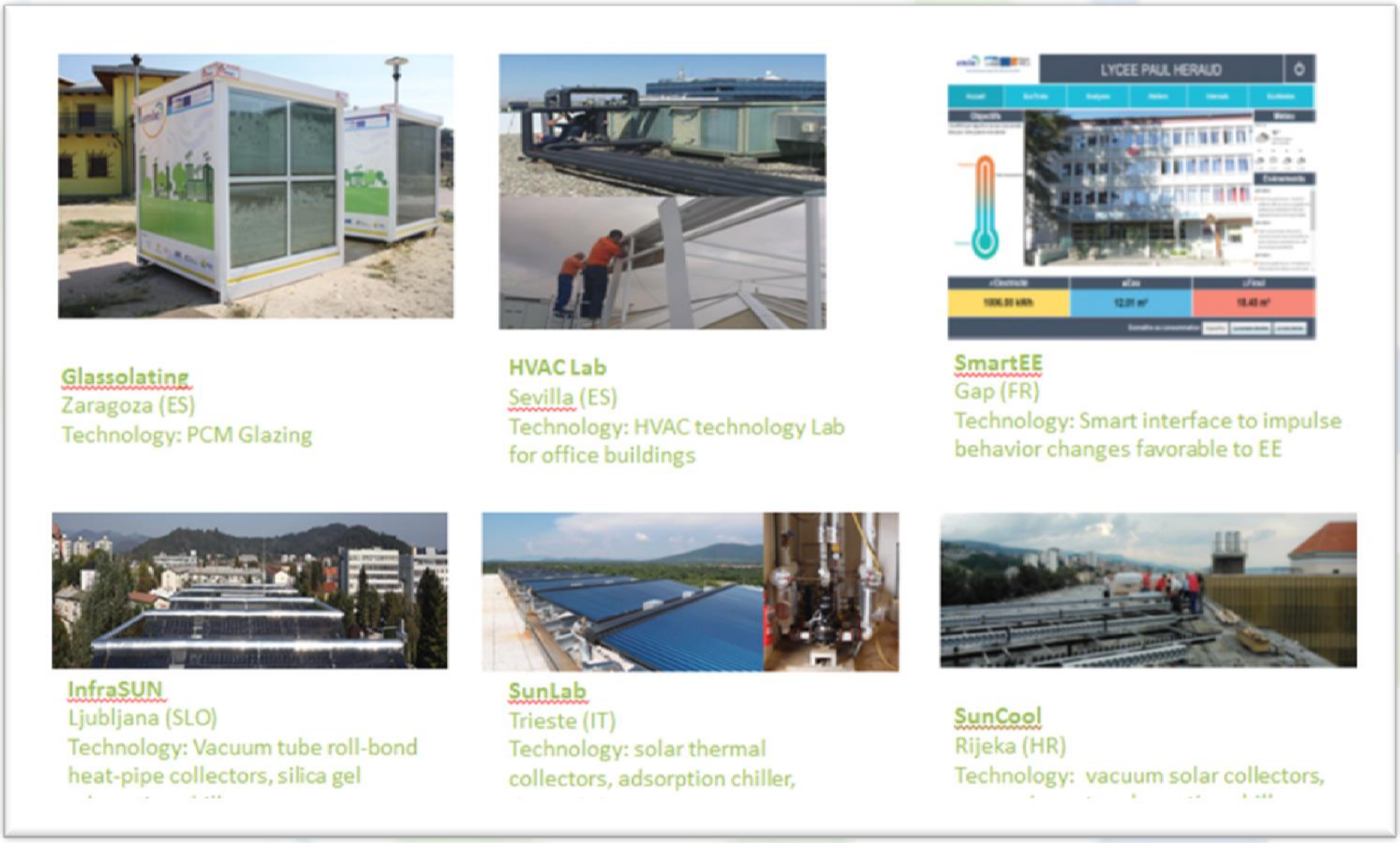
TECHNOLOGICAL COMPARISON OF EMILIE PILOT PLANTS



TECHNOLOGICAL COMPARISON OF EMILIE PILOT PLANTS

Energy sustainability requires modifications not only in how energy is provided, but also in the way it is distributed and used, thus dropping down the amount of energy necessary to deliver different goods or services is crucial. Prospects for enhancement on the demand side of the energy balance are as rich and various as those on the source side, and often offer substantial economic advantages.

Within Emilie project's objectives, a technology roadmap definition coupled with a multilevel analysis on main issues in the field of energy efficiency in buildings in the tertiary sector has led to choose and install six pilot plants in different Euro – Mediterranean regions. Thus, energy production, distribution and consumption related issues have been analyzed since the beginning of the project, in order to identify, test, and disseminate new products and technologies. The fields of interest arising by Emilie's technology roadmap are the following:

- SHC – Solar heating and cooling systems and technologies (*SunLab*, *SunCool*, *InfraSUN*)
- HVAC systems and technologies (*HVACLab*)
- Energy efficient transparent building envelops (*Glassolating*)
- Smart energy utilization (*SmartEE*)

In order to assess the potential influence of recent and innovative technologies on energy consumption in tertiary building sector, three SHC plants were designed and installed in Italy, Slovenia and Croatia respectively, the pipes of a complete HVAC system were better insulated in a building in Spain, innovative phase change material windows were installed and experimentally tested in Spain, and finally, a complete energy consumption remote monitoring system was developed, installed and web- tested in France.

After installation and a first tuning period, the pilot plants are now available as demonstrative sites and they will continue collecting experimental data during next years. In order to assess the performance of these different technologies, it is important to consider the impact that each of them have on three different stages: energy production, distribution and utilization. From this point of view, it is reasonable to analyze the performance of SHC power production pilot plants separately from those of the remaining systems presenting the first monitoring data in two different tables.

In the subfield of energy production, SHC demonstrative plants aim filling designers and SMEs lack of knowledge about absorption and adsorption solar cooling systems setting useful design guidelines.

In SHC plants, solar energy is used both to run an absorption/adsorption chiller to produce cold water in summer and to directly produce hot water during the whole year. On the basis of the first data collected by SHC plants' monitoring systems, it is possible to assess the amount of energy and CO2 emission savings achievable both in summer and winter periods by the exploitation of solar thermal power, as presented in the following table.

	Power Installed (kW)	Energy saving forecast based on experimental data (kWh/year)	€ invested/ Energy savings during a 15 years life time (€/kWh)	CO_2 emissions avoided (kg/year)	Chiller Coefficient of performance (%)	**Any useful additional data**
SunLab-TRIESTE-AREA	20 cooling/ 40 solar collectors	3500 (electric for cold TBC) 35000 (thermal HW TBC)	0,173	8600	65 (TBC)	**On the basis of first experimental results**, cooling energy saving is calculated with reference to typical compression chiller with average COP equal to 3,5. CO_2 emissions avoided are calculated taking into account both partners national electricity emission factors and a conventional gas emission factor of 202 gCO_2/kWh for Hot Water production.
SunCool-FIUME-REA	18,6 cooling/ 30 solar collectors	3700 (electric for cold TBC) 40000 (thermal HW TBC)	0,137	9442	71 (TBC)	
Infrasun-LUBIANA-JSI	20 cooling/ 44 solar collectors	5000 (electric for cold TBC) 35000 (thermal HW TBC)	0,224	8200	54 (TBC)	

On the basis of the first experimental data, it can be observed that, despite an indicators values differences, which are due to their size and geographical position, these systems allow a comparable reduction of the CO_2 emissions providing the expected amount of energy for cooling and heating. From an economical point of view, it is possible to observe that, using the hot water produced by solar panels during the whole year for spacer heating and domestic hot water production, the initial investment could be easily justified in particular applications such as hospitals or wellness centers with warm water swimming pools and other heat demanding services.

From an energy distribution and utilization point of view: **HVACLab** system pipes and valves insulation aims to reduce thermal energy losses in tertiary sector buildings which are often characterized by significant fuel and electricity consumptions; **Glassolating** windows replacement demonstrates the efficiency improvement obtainable by increasing latent heat capacity of transparent building envelop elements allowing a more constant temperature inside the building during summer and winter periods and consequently, less peak power demands for heating and cooling. Finally, **Smart EE** energy monitoring system and its web application allows to reduce fuel, electricity and water consumption raising awareness among younger generation towards the issue of energy saving. Unlike the SHC pilot plants performance comparison, it is not easy to directly compare emissions savings or investment costs for these last three systems. In the following table HVACLab, Glassolating and Smart EE first experimental results are shown to provide a more complete vision on systems' performance.

	Energy saving forecast based on experimental data (kWh/year)	€ invested/15 years Energy savings (€/kWh	CO_2 emissions avoided (kg/year)
HVAClab-SIVIGLIA-IAT	13828 (Electricity TBC)	0,141	11160
SmartEE-CAP	12000 (Electricity, fuel heating and cooling TBC)	0,461	3649
Glassolating-SARAGOZZA-CIRCE	1445 (heating and cooling TBC)	0,188	577

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