Trieste, October 29th 2013 Global Forum 2013– Shaping the Future Session 9 «Smart energy: the booming field»

Geothermal and solar driven innovative energy plants for conditioning residential and commercial buildings as ICT-based network of open laboratories

An AREA Science Park experience

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HOT TOPICS

➢How to fund and deploy at national level smart energy programmes ? The ENERPLAN experience with the LID concept as optimal demonstrative pilot scale

➢How to scale-up the LID concept? Territorial cooperation programmes useful to boost newly established international network of Open Labs specialised in Solar Cooling Technologies



KEY COMPETENCES

RESEARCH

- To validate your idea scientifically
- To enhance exploitation of your research results
- To find efficient alternatives to solutions already implemented
- To find reliable partners in order to realize your international projects

PRODUCT/SERVICE

- To find new materials that improve product performance
- To improve the ergonomic design of what is produced
- To perform specific tests on a new product
- To improve product quality

IDEA

- To come up with good ideas
- To ensure your idea is really unique and not already patented
- To find a good solution to your technical problem
- To defend your intellectual property
- To form a start-up using your innovative idea

DEVELOPMENT

- To enhance product development
- To elaborate new process or product engineering
- To promote your invention prototypes
- To discover new invention applications
- To turn your ideas into innovation projects

COMPANY

- To improve your business management
- To intervene where appropriate to boost your production efficiency
- To increase your productivity at a lower cost
- To identify other companies interested in collaboration

MARKET

- To identify new product markets
- To find potential buyers
- To recognise new business models and capture opportunities in advance
- To assist start-ups in finding potential investors



ENERPLAN



Develop and diffuse innovative solutions for energy efficiency and energy production from renewable sources and alternatives to fossil fuels

Make available demonstration plants (LID) to be used as laboratories for technological development and industrial trials

LID in place: High temperature heat pump; Building envelope active insulation; Energy recovery from waste air exhaust; PV systems; Micro gas turbines cogeneration plant CHP system; LED based road lighting; Ecological safety; Renewable District Heating)

Reduce energy management costs and at the same time radically cut harmful emissions in energy applications used in civil and industrial constructions



LIDs location







Smart LIDs

ICT systems to monitor the performance of PV modules (monocrystalline silicon, thin film modules) and cogeneration units (internal combustion engines and gas micro turbines) have been set up.

Enesylab (DIA UNITS) has also developed the software ENPAT-Energy Performance Analysis Tool aimed at designing and developing innovative energy systems for civil and industrial construction









Smart LIDs



Environmental impact

> 51.000 KgCO2 yearly saved(*)

Economic impact

> 11.500,00 € yearly saved (*)



(*) with the PV systems only



The Non-polluting boiler = La Caldaia che non inquina!

- <u>Environmental benefits:</u>
 - Zero emissions on site
- <u>Customer benefits:</u>
 - Economically competitive with traditional solutions;
 - Ecological: no emissions on site;
 - Energy: at least 70% of geothermic renewable energy;
 - Management benefits: lower maintenance and management costs.
- The Plug & Play system replaces existing boilers without costly refurbishments
- Traditional Heat pumps require completely new low temperature installations
- With the Innovative system you can keep your existing radiators and plumbing
 - Installing HTHP system with radiators is more economical than traditional floor systems and radiant ceilings.
 - The only requirement: is accessibility to water a 100% renewable source of energy already
 present in almost every urban area









PdL1: HTHP

PdL1: why invest in?



HTHPs is a patent pending solution for the *cleantech* market that is able to guarantee high economic return for the start up and is able to guarantee final users the following advantages:

Economic: payback of the initial investment within 2 years due to economy of system management and energy cost

<u>Managing</u>: low operating costs, dramatically reduced service needs, no requirement for administrative permits and verifications

Energy: at least 70% of energy necessary to produce the heat is extracted from nature and thus is completely renewable

Ecological: zero emissions, no impact on urban microclimate



How to scale up LIDs?

AREA has focused on demonstrative small plants using solar cooling technologies (< 50 kWf) and strived for getting adequate funds to scale up its LID concept. This action turned up in two EU funded projects aiming at newly established international network of Open Labs focused on Solar Cooling Technologies, namely:

Adriacold - Diffusion of Cooling and Refreshing Technologies using the Solar Energy Resource in the Adriatic Regions <u>www.area.trieste.it/opencms/opencms/area/en/projects_en/Adriacold.html</u>



Emilie – Enhancing Mediterranean Initiatives Leading SMEs to Innovation in building Energy efficiency technologies <u>www.emilieproject.eu/eng/the-project.aspx</u>

> L'Europe en Méditerraneen Europe in the Mediterranean

A cumulative budget of 4,8 Million Euro is going to be spent by June 2015!



What is solar cooling ?

is an innovative technology with a strong potential for development, since it combines two new technological systems: efficient solar panels (in particular, vacuum & concentration solar panels) and absorbtion (or adsorbtion) chillers.



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Why to deploy solar cooling ?

Solar Cooling Technology provides a proven advantage: the period of maximum solar energy use for air conditioning of buildings and premises corresponds to the period in which there is the maximum solar energy availability.



Single Family Home in Europe – Annual Energy Demand





ICT-driven monitoring sytems

The data will be collected from different sources and techniques: surveys, automatic data acquisition and communication, investment project data, equipment manufacturers' data, users' data, maintenance costs data etc.

The main energy flows must be properly and continuously measured as shown in Figure 1 as arrows.

Basic ICT required equipment

- sensors and meters:
- communication interfaces (LabView software or similar);
- PC computer with a communication interface for data collection, adequate software for data collection, basic handling and communication;
- programmable controller with software for monitoring, data management and communication, remote system management



Figure 1: Main energy flows in a generalised solar heating and cooling installation. The solar cooling device energy flows are enhanced with red arrows.



Why there is a market failure?

Technical barriers

- Lack of package-solutions for residential and small commercial applications. No adequate skills today among professionals
- Lack of standardised hydraulic schemes, planning guidelines, simple design tools, high standardization and proven guidelines as well

Lack of awareness

- More awareness raising about solar heating/cooling as energetic viable solutions in the near future (good for both winter and summer seasons)
- a larger number of demonstration projects is needed to have good references and showcases

<u>Costs</u>

High prices of small ab/adsorbers devices (< 50 kWf) Higher initial investment costs compared with conventional systems (long ROI-Return of Investment, if there are no public subsidies)



Technical challenges

identifying and testing innovative technologies, competences, knowledge and products representing effective solutions for energy efficiency in tertiary building sector by means of innovative ICT-connected network of pilot plants

in order to

- re-use of thermal energy otherwise dissipated (winter season);
- have a very low primary energy consumption (less power, gas)
- provide variable power depending on the heat load through an "intelligent" control;
- > assure high efficiency, high reliability and low maintenance;
- > introduce standardized procedures for the plants design and setting up
- ➤ drop fixed costs.



Impacts

- To facilitate the wider and faster adoption of alternative energy systems for air conditioning in public and private buildings, fostering collaboration between public authorities, scientific institutions, economic operators in the "cold" sector and end-users with small power devices (range 15 -50 kWf).
- to activate clusters of public authorities, manufacturers of equipment for environmental conditioning, tour operators, agricultural and agroindustrial products willing to increase innovation capacities at transnational level in the field of building energy efficiency
- ➢ to contribute to the EU 20-20-20 target





Thank you for your kind attention

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