



Project acronym: GROUND-MED

Project title: Advanced ground source heat pump systems for heating and cooling in Mediterranean climate

Start date of project: 1 January 2009

Duration: 60 months

Deliverable D9.6: First meeting with EC officials in Brussels

Version: Final

Due date of deliverable: 30 June 2010

Actual submission date: 26 October 2010

Organisation name of lead contractor for this deliverable:

European Heat Pump Association

Project co-funded by the European Commission within FP7 Programme		
Dissemination level		
PU	Public	
PP	Restricted to other programme participants (including the Commission Services)	X
RE	Restricted to a group specified by the Consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

Project
Advanced ground source heat pump systems for heating and cooling in the
Mediterranean region

»Ground-Med«

Grant Agreement No TREN/FP7EN/218895/



Event report Sheet

Work Package 9
Dissemination

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Event date:	26.10.2010
Event location:	Renewable Energy House Rue d'Arlon 63-67 BE-1040 Brussels
Event title:	Ground-Med dissemination meeting
Organiser:	European Heat Pump Association (EHPA)
Promotion (Invitations, information distribution)	Mailing <input checked="" type="checkbox"/> Press Releases <input type="checkbox"/> Phone Calls <input type="checkbox"/> Advertising <input checked="" type="checkbox"/> , on the EHPA and Ground-Med website Personal invitations <input checked="" type="checkbox"/>
Number of Participants:	About 30 (due to strikes, 5 people did not attend)
Target group(s):	Installers <input type="checkbox"/> End users <input type="checkbox"/> Policy makers <input checked="" type="checkbox"/> Architects <input type="checkbox"/>

Ground-Med dissemination meeting

On 26.10.2010 the Ground-Med consortium held a dissemination meeting in Brussels to present interim results to an audience of policy makers and industry specialist.

Thomas **Nowak** first gave an overview on the relation between EU policy goals and the Ground-Med project: Ground-Med can help lower energy demand by 50% contributing to energy savings, increase the use of RES up to 80% and be potentially 100% sustainable with green electricity, reduce greenhouse gas emission up to 68% – without local emission – reinforce energy dependence thanks to local products and local installation.

Heat pumps are thus a perfect technology fit for the third industrial revolution but “efficient heat pump based heating and cooling systems” need good design, efficient, reliable components, good installation of heat source, heat pumps, distribution and maintenance, knowledgeable planners/designers/ architects, high quality products (incl. A), knowledgeable drillers & installers.

The Ground-Med project will improve heat pump technology through R&D on HP & Component, Measurement setup and method, improvement and measurement.

Thomas Nowak also recalled that heat pumps for heating represent 592.322 units sold in Europe in 2009 – a decrease of 10,3% over 2008 sales figures.

Ground-Med results are expected to influence existing products, lead to new component/products/systems and to enhance the market for heat pumps into new segments and new geographic regions. Overall the project improves the contribution potential of heat pumps towards the EU's energy savings and climate protection targets.

Dimitrios **Mendrinis**, Coordinator of Ground-Med, Centre for Renewable Energy Sources and Savings (CRES), provided the audience with details on the 5-year project (Jan. 2009 - Dec. 2013). Ground-Med (composed of 9 Work Packages – WP) is implemented by a consortium of 24 organizations across Europe in charge of developing, constructing and demonstrating 8 buildings, as well as monitoring the next generation of ground source heat pump systems for heating and cooling with a measured year-round seasonal performance factor SPF higher than 5.

Ground-Med technology development focuses on both heating and cooling, advanced system control with ΔT matching the load, integrated ground source heat pump systems with:

- borehole heat exchanger (BHE) with design for fluid-T as close to ground-T as possible, prefabricated U-tube, thermally enhanced grout (or sand/gravel back-fill if allowed), deeper boreholes, water as heat transfer fluid instead of glycol, oversized BHE, thermal response test,
- water source heat pumps using SPF instead of COP, capacity control (inverter, multiple compressors, etc.) and heat exchangers in counter-flow operation,
- indoor heating-cooling systems with water circulating pumps of energy class A, low energy fan-coils of 25% power consumption and air handling units using condensing heat.

Mr **Mendrinis** stressed that a successful Ground-Med project will result in improved competitiveness and widen market opportunities for geothermal heat pumps, especially for cooling in South Europe. It will also contribute to knowledge and technology development of other heat pumps.

Eric **Auzenet**, Thermodynamic Systems Laboratory Manager at the Research and Innovation Centre of CIAT Group, showed the results of the **WP2** large capacity heat pumps and system components (Jan. 2009 - Oct 2010). The WP2 aims at developing new advanced large capacity heat pumps with higher energy efficiency. Three prototypes will be installed in demo sites in Portugal, Spain, and France. An additional focus of this WP is put on improving the buildings heating and cooling system by updating the efficiency of thermal storage, fan coils and air handling units (with low temperature heat storage nodules, a low energy consumption

FCU and an air handling unit).

Eric Auzenet insisted on considering the whole system of HVAC installations – from central control, devices selection & system design to HVAC devices optimization – and listed the different levers for an efficient HVAC system (control, building load profile calculation, efficient heat and cold production / distribution / emissions & comfort, use of free energy i.e. geocooling, latent heat storage), as well as design constraints.

As for technical choices, the WP2 opted for refrigerant R410A, heat exchangers with brazed plates manufactured by CIAT, an electronic expansion valve, the tandem On/Off compressor (with pressure ratio around 3), ceiling FCU with Coanda effect respecting comfort criteria, a hair handling unit designed for fresh air dehumidification and preheating, a variable speed fan to maintain available static pressure and reduce the fan consumption to a minimum, PCM storage from Cristopia.

Davide **del Col**, from the Dipartimento di Fisica Tecnica, University of Padova, presented the WP3 low/medium capacity heat pumps, their results and next steps. Firstly, the **WP3** contributed to further improve heat pumps efficiency by reporting on methods for improving heat pumps COP (SEER>5 using PrEN 14825:2009, and SCOP>5 using PrEN 14825:2009), in compliance with Eurovent class A specification.

The WP3 has then developed new advanced heat pumps in terms of energy efficiency (SPF>5 for heating and cooling):

- of medium capacity relying on Ochsner heat pumps (20-80 kWth using 3 prototypes of medium capacity with refrigerant R407C, zeotropic mixture, capacity control on/off and reversing modes on the water or refrigerant side) – in progress;
- of low capacity relying on Hiref heat pumps (10-30 kWth using 2 prototypes of low capacity, refrigerant R410A and the other with natural refrigerants, variable speed scroll compressor or scroll compressors in tandem – to be installed at UPV, reversing on refrigerant side, flow reversal for both refrigerant and water, variable speed water pumps) – almost completed.

Davide del Col underlined the next steps of the projects: complete equipment, complete tests for performance characterization before delivery, provide assistance for best tuning of equipment in the installation, monitor proper operation of equipment, monitor energy performance and provide feedbacks on the diverse design solutions.

Donal **Finn**, from the School of Electrical, Electronic and Mechanical Engineering, University College Dublin, reported on the mid-term review of the WP4 integrated system control aiming at:

- developing a generalized dynamic control model capable of predicting the integrated heat pump building dynamic behaviour [completed],
- testing, evaluating and validating this Dynamic Control Model [validation completed],
- developing integrated building/heat pump control strategies and a suite of control algorithms [completed, but ongoing developments for more comprehensive analysis and algorithm optimization],
- developing a data collection management system [ongoing, with two-level access rights to the DMS],
- developing a system microprocessor control board [in progress – control system architecture, DAQ minimal configuration and prices defined].

Jose M. **Corberan**, from the Institute for Energy Engineering, Universidad Politecnica de Valencia, presented the WP5 integrated system engineering design:

- evaluate year-round thermal loads for each demo site – with specific soil profile, thermally enhanced grout materials for partners with conductivity ≥ 2 W/mK (THERMOCEM), tests in situ on some demo sites, careful estimation of the operating conditions depending on the site singularities – and size the system for each building,

- design the ground source heat exchanger to maximize system efficiency at reasonable cost, also warranting long term efficiency and trouble free operation – high efficiency HP/chiller, fan coils with low noise, low consumption and low temperature lift, adaption of heat pump capacity to building thermal load, minimum time off / time on and number of starts up per h, temperature variation at fan coil unit....,
- design of integrated ground source heating and cooling system of each demonstration building.

For Jose M. Corberan, these will need to be adapted to the overall system modelling for operation optimization (Control strategies of WP4), modifications due to last moment changes (WP6), as well as modifications during commissioning and tuning up (WP7).

Thomas **Nowak** then emphasized the link between the Ground-Med project and other Heat pump research, such as SEPEMO and QualiCert.

The SEPEMO-Build results will help to:

- overcome market barriers to a wider application of HPs, namely the lack of robust data on the conditions “in real installations” influencing reliability and seasonal efficiency, i.e. the SPF of HP systems in Europe,
- develop a common methodology for field measurement of HP systems SPF,
- improve the understanding of key parameters influencing the reliability and efficiency of HP systems,
- apply to all types of HPs (air, water and ground) and heat distribution systems (air, water) in residential buildings,
- improve the understanding of key parameters influencing the reliability and efficiency of HP systems in residential buildings, by improved quality assurance for HP systems in the building sector,
- provide the named information for all types of HPs (air, water and ground) and heat distribution systems (air, water) in residential buildings.

SEPEMO therefore supports the RES Directive (Dir. 2009/28/EC) for both the implementation of Annex IV on the certification of installers and Annex VII to establish how Member States are to estimate the values of Q-usable and SPF. Another link was made to the QualiCert project that analyses existing certification and accreditation systems for installers of small-scale renewable energy systems” (July 2009 - Dec. 2011). Its results are expected to help EU Members States to better implement the RES Directive as it aims at developing a European approach for accreditation/ certification of small RES installers. EHPA is providing considerable input from the lessons learned of an earlier project (EUCERT) on training and certification of heat pump installers. In close collaboration with several stakeholders, QualiCert will ensure the easy application of the developed system in a first core of 5 countries, then disseminated to other European countries, towards a single, mutually accepted EU accreditation scheme.

Isabel M **Fernández Fuentes**, European Federation of Geologists (EFG) Office Director and Geotrained Coordinator, described the link between Ground-Med and Geotrained: “Geo-Education for a sustainable geothermal heating and cooling market”. This heat pump research project (Sept. 2008 - Feb. 2011), financed by the Intelligent Energy Europe program, aims to develop a European Education program to go towards the certification of geothermal heating and cooling installations targeting both designers and drillers (already working in the geothermal sector).

She reminded that research in Europe shows that one of the barriers to a sustainable and growing geothermal market is the lack of appropriate skilled personal, and quality of design and works are not always satisfactory.

Geotrained will therefore research into data currently useful for GSHP installers, evaluate skills required to design, drill and install GSHP, create curricula for GSHP designers and drillers, create training tools / test and optimization of the materials, launch training courses with and e-learning platform (for experienced drillers with a min. 3-year experience or students with a

mechanics background), suggest standards and codes to create a European market and finally propose a European certification framework.

The Geotrained final conference will be held in Brussels on 27 January 2011 and the training courses for designers and drillers will take place on 24-26 January.

Burkhard **Sanner**, EGEN and Coordinator of the European Technology Platform on Renewable Heating & Cooling, presented the RHC platform and the links with the Ground-Med project. The RHC platform's main objectives are:

- creating a Common Vision out of the individual sectorial visions (synergies),
- creating Strategic Research Agendas for the sectors, and a common one for renewable Heating and Cooling (incl. cross-cutting issues)
- preparing the implementation through a Technology Roadmap for Renewable heating and Cooling and European Industrial Initiatives.

EHPA is a member of the Geothermal Technology Panel and the Cross Cutting Technology Panel, which allows overcoming some incompatibilities that exist between the different sources and the demand side – e.g. unmatched temperature levels of source and demand with heat pump as a CCT solution.

Burkhard Sanner concluded that, from the Common Vision draft, R&D for heat pumps will have to focus on performance improvement and the ecological and economic aspects, both looking at the individual heat pump unit (“next generation heat pumps”) and at the intelligent integration of heat pump technology into heating and cooling systems including:

- advanced control systems,
- interface development for the integration of heat pump systems in “smart grids” and “smart cities”,
- more efficient compressors and heat exchangers,
- heat pumps with low refrigerant charge and refrigerants with a lower GWP,
- heat pumps with higher temperatures (70-90°C),
- cost and size optimization of thermally driven heat pumps (economies of scale will certainly help),
- optimization of support components of thermally driven heat pumps/chillers (heat rejection units, pumps, ...),
- enhancement of efficiency and temperature levels of sorption cycles, highly integrated, easy to install units for error free installations

Abstract of the discussions: (main messages, outcome of the event)

1. The contribution potential of heat pumps towards the EU renewable energy and climate reduction targets will improve due to the projects results.
2. The project consortium is on schedule with the execution of the project: initial considerations and development phase has finished. Next is the implementation of systems and measurement
3. Ground-Med ties in neatly with current legislation on the use of RES and energy efficiency.
4. Ground-Med is well connected (via other projects and through different associations) to the main stakeholder groups.
5. Participants were very satisfied with the high quality of data presented and voiced their interest in another meeting once the project has processed further.