



## Solar Combi+ - 4<sup>th</sup> project meeting

Bergamo 3<sup>rd</sup>-4<sup>th</sup> March 2009

### Minutes

3<sup>rd</sup> March 2009 - Solar Combi+

#### Participants:

Giuseppe Franchini	UNIBG
Francesco Besana	UNIBG
Ruth Fernandez	IKERLAN
Jose Maria Chavarri	Fagor
Franciska Klein	Solution
Lotta Koch	ISE
BjoernNienborg	ISE
Alexander Thuer	AEE-INTEC
Daniel Mugnier	TECSOL
Walter Mittelbach	Sortech
Volker Clauss	Sonnenklima
Myrto Theofillidi	CRES
Effie Korma	CRES
Alexandra Troi	EURAC
Patrizia Melograno	EURAC
Roberto Fedrizzi	EURAC
Monika Mutchlechner	EURAC

**Location: University of Bergamo - Dalmine (Bg)**

**Chairs: Alexandra Troi (EURAC)**



## **Salutation and Presentation of the Agenda for first day - A. Troi (EURAC)**

*("1\_Bergamo\_Agenda.pdf"; link see "Notes" below)*

Mrs. Alexandra Troi, as project coordinator, welcomed the participants and presented the agenda for the first day and the list of presentations to be given.

## **WP3 Virtual case studies - Simulation work report - B. Nienborg ISE**

*("13\_Bergamo\_WP3\_ISE.pdf"; link see "Notes" below)*

Bjorn Nienborg presented the activities exploited by ISE within the WP3. He highlighted the changes introduced into the decks since the last meeting for a better control strategy implementation. In particular:

- The return temperature from the fan coils was set to 12°C instead of 15°C
- The use of the hybrid cooler was introduced to allow the dry cooler work at temperature higher than 30°C. At temperatures higher than 30°C an adiabatic cooling starts.
- The reference chilling capacity is computed at 32°C return temperature (formerly 35°C). Daniel Mugnier suggested to use 34°C since there are not more than 200 hours/year at that temperature.
- The load file was modified: the cooling load is accumulated to minimum 15% of the maximum load.
- The water consumption of the heat rejection systems was brought to
  - o 30-50% (loss factor) in case of wet cooling tower
  - o 50-100% in case of hybrid cooler.

Bjorn Nienborg showed the excel file with visual basic macros for the data collection and elaboration from the TRNSYS files and discussed some energetic and economic figures to that were introduced into the files.

Two "pre-selection" figures were discussed among the participants:

- Total electrical COP that should higher than 5% for a given solution to be considered
- Stagnation time that should be lower than 50 hours.



Mr. Nienborg underlined the remaining tasks to be accomplished to complete the WP3:

- Final validation of the results
- Edition of the reports
- Sensitivity analysis for control strategy and configuration optimization.

Since a complete analysis of the results is foreseen within the WP4-Task1, it was decided that the last task should be performed outside the WP3.

Bjorn Nienborg then showed the results obtained by ISE with regard to the simulations on the Sortech chiller in terms of solar fraction for cooling, total electrical COP, specific collector yield and stagnation time.

The stagnation times computed for the simulations are most in the range 200-800 hours/year. With regard to the pre-selection figures, the office building in Naples and Toulouse do not reach an high enough electric efficiency. This is most probably due to the small loads in intermediate seasons and to their usage that is limited to the working hours. Alex Thuer and Daniel Mugnier suggested to lower the ambient temperature from 26°C to 23-22°C, for some hours, in order to reduce the stagnation time. Volker Clauss suggested to let the chiller work at a lower COP.

Alex Thuer highlighted the necessity of further simulation work to develop the control strategies. This will be done within the WP4.

### **WP3 - Simulation work report on the EAW chiller - A. Thuer AEE-INTEC**

*("13\_ Bergamo\_WP3\_AEE.pdf"; link see "Notes" below)*

Mr. Alex Thuer presented the results he obtained with regard to the SOLution/EAW SE15 chiller setup in configuration E1. It produces 13.39 kW cold with chilled ceiling distribution system, while 8.95 kW cold with the fan coil distribution system. EAW does not work with evacuated tubes collectors and with the dry cooler.

EAW reaches values of solar fraction for cooling between 0.4 and 0.9. The solar fraction for heating is varying between 0.15 and 0.9 (the highest values are obtained in Naples). The efficiency of the collectors is between 20 and 40% with better performance using fan coils instead of chilled ceiling distribution system. The reason why, could be a model associated to the chilled ceiling system that is too static. For the same reason maybe the thermal COP does not change with regard to the chilled ceiling technology (0.76) while it changes with the fan coils (0.65).



High stagnation times were recognized within this simulations too (between 400 and 1600 hours/year).

The storage volume has a minor effect on the performance of the chilling system, while the collectors area influences the problem to an higher extent.

Mr Alex Thuer underlined the necessity of a deeper investigation of the COP value variation during the chiller working periods.

### **WP3 - Simulation work report on the CLIMEWELL chiller - P. Melograno EURAC**

*("4\_ Bergamo\_WP3\_EURAC.pdf"; link see "Notes" below)*

Mrs Patrizia Melograno presented the results EURAC obtained with regard to the Climatewell chiller. After explaining the entire set of simulations performed, the results of the simulations in terms of reference power, solar fraction for cooling and heating, total electrical COP and stagnation time were showed:

- The reference power is in all cases much lower (4-5 kW) than the rated power (10 kW)
- The solar fraction is affected by the type of collector used; the differences resulted however less significant in case of larger collector area and storage volume. No large difference is noticed when using wet cooling tower instead of hybrid cooler.
- The total electrical COP resulted always higher than 5
- The stagnation time was lower than 50 only in a very few cases with this chiller too.

Even in this case a development of the control strategy is needed to reduce the stagnation time.

### **WP3 - Simulation work report on the ROTARTICA chiller - F. Besana UNIBG**

*("14\_ Bergamo\_WP3\_UNIBG.pdf"; link see "Notes" below)*

Mr. Francesco Besana showed the results obtained relative to the 990 simulation run with the ROTARTICA chiller. The stagnation time obtained is in between 150 and 900 hours/year. The total electrical COP is always higher than 5 even if, in general, quite low. The thermal COP is higher in the case of the chilled ceiling distribution system than in the case of a fan coil system.



## **WP4 - Tasks presentation - P. Melograno EURAC**

*("5\_ Bergamo\_WP4\_EURAC.pdf"; link see "Notes" below)*

Patrizia Melograno presented the tasks within the WP4, as a remainder of the work to be done in the following months, highlighting the expected time schedule for the activities:

- Task 1: identification of standard system configurations
- Task2: Package solutions
- Task3: Most promising applications
- Task 4: Online tool case summary
- Task 5: Key data, libraries & short info

## **WP4 - Approach to Tasks1 presentation - G. Franchini UNIBG**

*("9\_ Bergamo\_WP4\_UNIBG.pdf"; link see "Notes" below)*

Mr. Giuseppe Franchini presented the approach proposed by UNIBG for the identification of the standard system configurations. The work should be developed bearing in mind a twofold goal:

- Synthetic representation
- Complete information

The work has to be targeted on one side to engineers/HVAC planners/installers looking for an easy way for sizing SC+ systems, on the other to engineers/HVAC planners interested in a deeper comprehension of SC+ technology.

The approach is carried out performing a parametric analysis for each fixed parameter of the problem. With fixed parameter are meant:

- Location
- Building/application
- Chiller

Within each parametric analysis, the effect of semi-fixed parameters on free parameters is investigated. The semi-fixed parameters are in this problem:

- Distribution system
- Solar collector type
- Heat rejection system

While the free parameters are:

- Collectors area



- Storage tank volume

An optimization function is defined on the basis of techno-economical parameters to define which configurations performs best. The following parameters are taken into account into the optimization function:

- Solar fraction
- Primary energy saving (absolute or percentage)
- CPE (Cost per saved PE kWh).

For each best configuration (max SF, max PEsave, min CPE) a sensitivity analysis is carried out, varying the semi-fixed and free parameters (one at a time), to define a reduced number (3 ?) of "standard system configurations", which can be promoted with reasonably good results in typical/average working conditions (approach from Best to Good). In the lucky case the "GOOD" standard configurations are immediately determined since they all fit the entire range of studied chillers; in the case they are not chiller independent:

- Average values might be proposed in terms of free parameters
- Most common technology in case of semi-fixed parameters.

#### **WP4 - Approach to Tasks3 to 5 presentation - R. Fedrizzi EURAC**

*("6\_Bergamo\_WP4\_Task3-5\_EURAC.pdf"; link see "Notes" below)*

Mr. Roberto Fedrizzi showed the approach for the individuation of the most promising markets and application. EURAC is going to use a visual instrument GIS to define suitable areas for solar cooling use on the basis of the following figures:

- climatic information
- cold and heat demand
- electricity and fuel costs
- solar thermal market sharing
- traditional chiller's market.

The online tool for the development of the Task4 will be an inquiry tool based on the Oracle DB. It will allow choosing a chiller first, then a location and an application. The semi-fixed parameters will be chosen consequently. As a results a range of suitable "GOOD" configurations will be showed in table and graphical form. In order not to sell it as a pre-design tool, it is recommended to:

1. avoid direct comparison between chillers
2. avoid presenting it as design tool
3. avoid selection with optimization function

Mr. Mittelbach suggested that the tool should be updated in the years with new solutions and costs.

The database used in Task4 is going to be used also for Task5.



## Administrative session - M. Mutschlechner EURAC

*("3\_Bergamo\_Administrative\_Session.pdf"; link see "Notes" below)*

Mrs. Monika Mutschlechner remembered the times schedule and steps to be accomplished to edit:

- the interim report
- the financial statements
- the timesheets.

## Steering group meeting - A. Troi EURAC

*("2\_Bergamo\_SteeringGroup.pdf"; link see "Notes" below)*

Mrs. Alexandra Troi started the steering group meeting reporting on the state of the Rotartica-Fagor amendment procedure (actions already accomplished and to be undertaken) that will bring Fagor in the Consortium starting on the 1 March 2009.

### 4<sup>th</sup> March 2009 - Solar Combi+

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Monika Mutchlechner      EURAC

**Location: University of Bergamo - Dalmine (Bg)**

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### **Steering group meeting continued - A. Troi EURAC**

*("2\_Bergamo\_SteeringGroup.pdf"; link see "Notes" below)*

The translation of the dissemination material to Portuguese was discussed. Initially Solution was supposed to do that work, but since Mrs. Franciska Klein definitely preferred Solution not to go on, it was decided that Climatewell is in charge for that task since it was initially responsible for the translation to Swedish. It was suggested to propose to Climatewell the participation to Portuguese fairs and conferences since that is one of his suitable markets.

The delay in completing the tasks of the different WP's and the time schedule for recovering the delay was discussed.

A list of deliverables to be published within the end of the action has been revised. Mr. Mugnier proposed TECSOL could take care of the revision of the entire set of data obtained from the simulation work. TECSOL will also assist in the preparation of the online tool.

### **WP2 - Market Analysis - M. Theofilidi CRES**

*("10\_Bergamo\_WP2\_CRES.pdf"; link see "Notes" below)*

Mrs. Theofilidi presented the results contained in D2.4 and D2.5. The study is based onto a three steps process:

- Collection of actual cost data from industrial partners
- Economic Analysis
- Potential of future cost reductions

The last analysis is based on the method of the learning rate curve according to the cumulative multiplication of sales.

Remaining tasks of the WP are the edition of the deliverables D2.6 and D2.7.

### **WP5 - Training courses - D. Mugnier TECSOL**





*("12\_Bergamo\_WP5\_TEC SOL.pdf"; link see "Notes" below)*

Mr. Mugnier remembered the material already prepared for the training courses in collaboration with the industrial partners and reviewed the list of the actions to be planned and performed within this WP; mainly D5.7 was described which should consist of a 2-day training course (30-40 participants x 3 courses x 5 industrial partners). The course should be subdivided into a first day theoretical part and a second day practical experience part. Furthermore, he pointed out the importance of the questionnaire to be distributed among the participants of the training courses. Tecsol will provide these questionnaires to partners and evaluate them.

## **WP6 - Dissemination activities - A. Thuer AEE-INTEC**

*("8\_Bergamo\_WP6-AEE.pdf"; link see "Notes" below)*

Regarding the dissemination activities, Mr. Mugnier explained the presentation he is going to give in Munich at the ESTEC conference 23-24/5/2009, in which he is going to present the results of the standard configurations assessment and the online tool. Mr Thuer, as WP6 leader, reminded all partners what was foreseen in according to Annex1 of the project:

1. Web Site:  
Responsible: EURAC  
The web site has to be updated continuously. EURAC works on this task.
2. Newsletter:  
Responsible: AEE-INTEC + EURAC  
Creation of the addresses list for the newsletters. Alex Thuer emphasized the necessity for all partners to provide AEE-INTEC with updated addresses for sending the next newsletters. At least the number of addresses must be reported to AEE INTEC and further to EU. Splitted information on groups like governmental, industry, etc. is welcome. Newsletter II is going to be published as soon as the package solutions are ready.
3. Brochures on Package solutions:  
Responsible: AEE-INTEC + partners from WP4  
Alex Thuer suggested inserting after a general description ~4 pages, 2 pages for each chiller. The results from all tasks are waited. Translation is needed of about 14 pages in all languages.



Coordination with the development of generic systems in IEA SHC Task 38 and the respective chapter in the handbook should be thought. In particular AEE INTEC is responsible for chapter “prefabricated systems”. If they are interested, industrial and institutional partners can “promote” their work on the book.

4. Publication in magazines:

Responsible: Institutional partners

At least 3 per country, more than 20 in total, with summary of virtual case study results, coupled with announcement of trainings, content of the brochure, details about one of the chillers, etc.

Alexander Thuer asked partners look for possible (national and international) magazines and check deadlines. AEE INTEC will circulate a form for documentation when and which magazine is presenting which article.

5. Leaflets and Posters:

Responsible: All

Leaflet and Poster III and IV will disseminate the results of WP4 (standard configurations, package solutions and most promising applications). All partners are responsible to PRINT and USE them. AEE INTEC will circulate a form for documentation when, where and how many poster/leaflets were presented/distributed.

6. Promotion in fairs:

Responsible: Industrial partners

Alex Thür asked all partners to propose fairs in which it will be possible to promote Solar Combi+.

He asked who was interested to take part in the following events:

- Energiesparmesse Wels
- Intersolar Munich
- ISH-Frankfurt
- Derbi conference and fair
- SolarExpo (Climatewell)?

We have to announce the fair presentations on SCS+ homepage. AEE INTEC will circulate a form for documentation when, where and which fair was used for presentation.

7. Conference presentations:

Responsible: Institutional partners

Alex Thür asked all partners to propose conferences in which it will be possible to promote Solar Combi+:

- Eurosun2008



- Gleisdorf Solar 2008
- OTTI-Palermo 2009
- AICARR 2009
- CISBAT 2009
- Ökosan 2009
- NOEST Arsenal (Preisler)
- Solarwärme events
- ASTTP
- ESTEC 2009

AEE INTEC will circulate a form for documentation when, where and which presentations were presented

8. Presentations to professionals:

Responsible: Institutional partners

15 presentations, covering all countries are expected, national Workshops etc. should be used. Presentation for SOLAIR at EUSEW 2009 has been one contribution. In Austria:

- ASTTP workshops, NOEST “energy lunch”
- Austria Solar “annual board meeting”
- Educational programme within SOLARWÄRME, arsenal workshops (Preisler).

AEE-INTEC will circulate a form for documentation when, where and which presentations were presented.

9. Authority Guide:

Responsible: AEE-INTEC + Institutional partners

AEE-INTEC will prepare a common guideline for the negotiation with authorities. Each partner will be responsible for contacting and meeting the authorities in its country. Alternative approaches, as e.g. the organisation of round tables can be chosen by single partners.

10. Information to 15 bodies:

Responsible: Institutional partners

Personal contacts/meetings with authorities for consultation on results relevant for support & subsidy schemes, implementation of EPBD and future renewable heat and cooling directive and support programmes.

AEE-INTEC will circulate a form for documentation when and which bodies were contacted.

11. Recommendations to EPBD:

Responsible: AEE\_INTEC

1 page in .pdf for each of the following topics:



- Recommendations on SCS+ systems to be included within EPBD
- Short info for inspectors of air-conditioning systems EPBD

#### 12. Feasibility Studies:

Responsible: Institutional + Industrial partners

Feasibility studies for possible customers (preferably national and local authorities in order to get high visibility) for promotion of demonstration plants. 3 studies in each participating country =>10 pilot systems “shall” be initiated.

#### 13. Press releases

Responsible: AEE\_INTEC + local partner

3 press releases and contact (at least 6 contact protocols) with local media in most promising regions for promotion of Solar Combi+.

#### Notes

- The Minutes and the .pdf presentations can be downloaded on the webdav under the “meetings” folder or on the intranet area of the SC+ website.
- Next meeting has already decided:
  - 5<sup>th</sup> Meeting: on 10<sup>th</sup> to 12<sup>th</sup> June in Perpignan (France)