Legal Text IEA HPP ANNEX 32

Economical heating and cooling systems for low energy houses

1. Description of Technical Sector

Due to a notable reduction of the space heating requirements in low energy houses and the introduction of low-temperature heating systems, heat pumps have become an attractive heating system. Currently, heat pump system developments tend to be more integrated with the heat pump and a storage as core components which are used for the production of different energy needs of the building like space heating, domestic hot water and cooling/air-conditioning. Therefore, the heat pump is also combined with the ventilation system, as it is the case in so-called compact units for ultra-low energy houses.

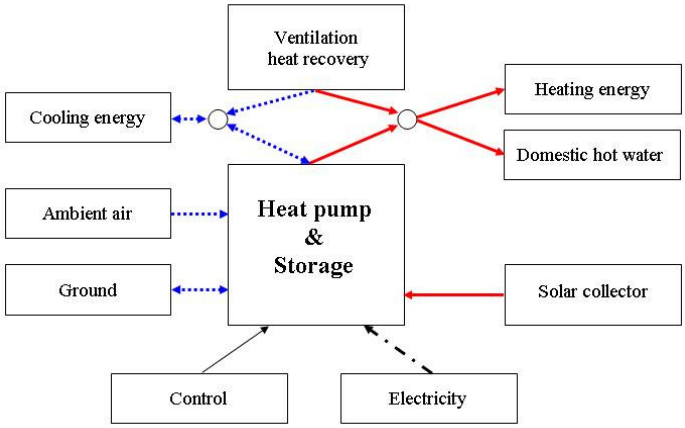

Figure 1: General system layout with core components heat pump and storage

Comfort cooling in summertime may also become a more and more important topic, and the heat pump as generator has the unique feature in comparison to other generators, that heating and cooling energy can be produced with the same generator and even at the same time. Besides air-cooling, surface heating and cooling systems are an interesting option. The humidity in the building also plays an important role for thermal comfort and is, on the other hand, a boundary condition for the surface cooling system with regard to the dew point. Actually, first heat pump compact units with de-/humidification function in connection with the thermal conditioning are under development.

Another issue is the cost aspect: Due to the low heating energy requirement of these buildings the maximum investment for the heat pump system may be restricted, i.e. systems may have to be designed simpler, cheaper, more flexible and in an adequate range of the required output capacity for heating and cooling.

The Annex shall investigate integrated heat pump systems for different applications with two key aspects:

On the one hand, the integration of the cooling function: Concepts like free cooling with ground coupled systems in combination with thermally activated building structures on the one hand or cooling operation with reverse operation of an air-source heat pump in compact units on the other hand shall be calculated, assessed and compared for different building types, different climates and energy cost structures.

On the other hand, a focus is the improved design with regard to costs to enhance market penetration and competitiveness. Energy efficiency as well as multifunctional system layout can both lead to more cost-effective systems for the low-energy dwelling sector. These advantages can be used for marketing to increase the number of residential heat pump installations.

The objective of the evaluation is to find the optimum of the overall energy use for the different building needs under the boundary condition of hygienic conditions and thermal comfort. The results shall be transferred to design guidelines including adequate control of the system.
Since there are quite different system layouts, the Annex shall start with a categorisation of systems on the market and under development to define the scope of the most relevant systems.

2. Objective/Deliverables

- Survey of system solutions for integrated heat pump systems with combined heating/ cooling/ ventilation/ DHW/ humidification
- System assessment with regard to overall energy use and costs under the boundary condition of thermal comfort
- Comprehensive design guidelines for integrated heat pump systems including its control

3. Means

The Participants shall co-ordinate their respective work by a national team leader to carry out the following task-sharing activities:

Task 1 – Systems to be investigated

(a) Evaluation of different system configurations of integrated heat pump systems for heating and cooling applications in the market and under development including an

(b) Analysis of different demand structures (DHW, space heating, cooling, ventilation, de-/humidification) under consideration of possibilities of passive cooling, shading etc.

(c) Ambient sources for heating and cooling energy (outside air, exhaust air, ground, combination of the former mentioned)

(d) distribution systems attached to the generator unit (surface heating and cooling systems, air distribution, ground-coupled cooling)

Task 2 – Calculation, Comparison and Assessment of system solutions

(a) Evaluation and/or development of simplified/dynamic calculation methods for the systems to be investigated

(b) Comparison of the different systems with regard to the overall energy performance for the different building services among each other and with non-heat pump system solutions

(c) Evaluation of the control of the systems

(d) Economic evaluation of the systems solutions for heating and cooling

(e) Testing and rating of system components

Task 3 – Field testing of integrated heat pump systems

(a) Establishing of an appropriate measuring concept and instrumentation for comparison with the assessment carried out in Task 2

(b) Functionality check and commissioning of test plants and derivation of key values for system performance

(c) Summarising and comparison of results for best practice samples in the design guidelines to be developed in task 4

(d) Evaluation of monitoring techniques with regard to operation control

Task 4 – Design guidelines for integrated heat pump systems for low energy houses

(a) Derivation of design guidelines of the results of Task 2 and Task 3 with regards to the requirements

(b) Derivation of standard system solutions based on the results of Task 2 and Task 3

(c) Best practice samples of investigated systems to promote heat pump image/acceptance

(d) Transfer of the results to standardisation committees to be integrated in standard testing/calculation

4. Time Schedule

This Annex shall enter into force on 1 January 2006 and shall continue for a period of 36 months. The work schedule shall be as follows:

January 2006	Start of the assessment and analysis of the systems to be investigated
March 2006	Kick-off meeting with presentation of national contributions and objective of the upcoming tasks
October 2006	Country reports on Task 1 to be delivered to the Operating Agent
November 2006	Second meeting – discussion of Task 1 results, preparation of Task 2&3
May 2007	Third meeting – discussion of Task 2&3 interim results
September 2007	Country report on Task 2&3 to be delivered to Operating Agent
October 2007	Fourth meeting – discussion of Task 2&3 results, preparation of Task 4
November 2007	Presentation of an Annex interim report to Executive Committee.
June 2008	Country reports on Task 4 to be delivered to the Operating Agent
September 2008	Fifth meeting – principal focus of Task 4 and discussion of final report
November 2008	Workshop for presentation of Annex results draft of annex final report Presentation to Executive Committee.
December 2008	Delivery of Final Report to Executive Committee

5. Specific Obligations and Responsibilities of the Participants

(a) Each Participant shall nominate a representative to participate in the work under this Annex.

(b) Each Participant shall carry out the equivalent of total 24 person months of task-sharing work during the programme period unless otherwise agreed by the Participants.

(c) Each Participant will conduct its own Task 1 system analysis, Task 2 system assessments and Task 4 design guideline work. Participants with field monitoring installations will contribute to Task 3.

(d) Each Participant shall identify the specific system options for which it will provide system analysis and design guidelines.

(e) Each Participant shall submit a country report covering the results of the Task 1 analysis, Task 2 system assessments and Task 4 design guidelines. Task 3 results of field monitoring shall be integrated in the reports of Task 2 and Task 4.

(f) Each Participant shall contribute to the working meetings and to a workshop on the results achieved through the activities conducted under this Annex, including the identification of speakers and participants.

(g) Additionally, each Participant shall make a direct financial contribution to the Operating Agent to cover co-ordination and report preparation expenses and other Annex related (e.g. Workshop) costs.

6. Specific Obligations and Responsibilities of the Operating Agent

The Operating Agent shall:

(a) Develop, in co-operation with the Participants, a detailed work programme, a framework for the Final Country Report and a budget for all the activities carried out under this Annex, including methodology and time schedule;

(b) Provide the Executive Committee with periodic reports describing the progress of the work being accomplished under the Annex;

(c) Deliver the results as described in Section 2. More specifically, this will include surveys on the existing systems and demands as well as the assessment and design for the most important systems within the framework of the Country Reports as described in paragraph 5 above;

(d) Provide to the Executive Committee, within six months after completion of all work under the Task, a Final Report for its approval and transmittal to the Agency;

(e) In co-ordination with the Participants, use its best efforts to avoid duplication with activities of other related programs and projects implemented by or under the auspices of the Agency or by other competent bodies;

(f) Provide the Participants with necessary guidelines for the work they carry out, assuring minimum duplication of effort;

(g) Co-ordinate the efforts of all Participants (and their National Teams as defined in paragraph 5 above) and ensure the flow of information within the Task;

Organise one workshop in order to review the progress and to co-ordinate the activities with the assistance of the IEA Heat Pump Centre;

(h) Gather the country reports produced by the Participants and edit an executive summary report covering the main results of the country reports;

(i) Provide general administration;

The IEA Heat Pump Centre will be responsible for assisting in the establishment of the Annex, in the organisation of the workshop and the publication of the proceedings, as well as of the Final Report.

7. Funding

(a) ***Working Meetings****.* The working meetings shall be hosted in turn by the several Participants. The costs of organizing and hosting meetings shall be borne by the host Participant.

(b) ***Publications:*** The cost of publishing the Final Report and summary assessments described in paragraph 5 above shall be equally shared by all the Participants.

(c) ***Individual Financial Obligations****.* Each Participant shall bear all the costs incurring in carrying out the Task activities, including reporting and travel expenses. Additionally, each Participant shall make a direct financial contribution to the Operating Agent to cover co-ordination and report preparation expenses and other Annex-related (e.g. Workshop) costs. ***Tab. 1*** shows the fees per Participant, based upon varying numbers of Participants.

Tab. 1 Annual Participant fee for varying numbers of Participants

No of part.	**Participants' fees**		
	2006	**2007**	**2008**
4	€ 3 400	€ 3 400	€ 3 400
5	€ 3 200	€ 3 200	€ 3 200
6	€ 3 000	€ 3 000	€ 3 000
7	€ 2 900	€ 2 900	€ 2 900
8	€ 2 800	€ 2 800	€ 2 800
9	€ 2 700	€ 2 700	€ 2 700
10	€ 2 600	€ 2 600	€ 2 600

Each Participant's fee shall be paid in 3 annual installments, as shown in the above Tab. 1.

8. Operating Agent

Swiss Federal Office of Energy

9. Information and Intellectual Property

(a) Executive Committee's Powers. The publication, distribution, handling, protection and ownership of information and intellectual property arising from this Annex shall be determined by the Executive Committee, acting by unanimity, in conformity with this Annex.

(b) Right to Publish. The Participants shall have the right to publish information provided to or arising from their Task, except for proprietary information, as defined in paragraph (c) below.

(c) *Proprietary Information.* For the purposes of this Annex, proprietary information shall mean information of a confidential nature such as trade secrets and know-how (for example, computer programmes, design procedures and techniques, chemical compositions of materials, or manufacturing methods, processes or treatments) which is appropriately marked provided that such information:

(1) Is not generally known or publicly available from other sources;

(2) Has not previously been made available by its owner(s) to others without obligation concerning its confidentiality; and

(3) Is not already in the possession of the recipient Participant(s) without obligation concerning its confidentiality.

It shall be the responsibility of each Participant supplying proprietary information, and of the Operating Agent, to identify such information as proprietary and to ensure that it is appropriately marked.
The Participants and the Operating Agent shall take all necessary measures in accordance with this paragraph, the laws of their respective countries and international law to protect the proprietary information provided to or arising from this Task.

(d) *Production of Relevant Information by Governments.* The Operating Agent should encourage the governments of all Agency Participating Countries to make available or identify to the Operating Agent all published or otherwise freely available information known to them that is relevant to the Task.

(e) *Production of Relevant Information by Participants.* Each participant agrees to provide to the Operating Agent all previously existing information, and information developed independently of the Task, which can assist or is needed by the Operating Agent to carry out its functions in this Task, which is freely at the disposal of the Participants, and the transmission of which is not subject to any contractual and/or legal limitations, under the following conditions:

(1) The Participant will make such information available, at its own costs, provided that such costs are not substantial;

(2) If substantial costs are necessary for the Participant to make such information available, the Operating Agent and all Participants will determine the charge of the costs for each participant, upon approval of the Executive Committee.

(f) *Use of Confidential Information.* If a Participant has access to confidential information which would be useful to the Operating Agent in carrying out the studies, assessments, analysis or evaluations described in this Annex, such information may be communicated to the Operating Agent but shall not become part of any report or other form of documentation issued as part of this Task, nor shall it be communicated to the other Participants, except as may be agreed between the Operating Agent and the Participant who supplies such information. This information has to be <u>marked clearly as "confidential"</u>.

(g) *Acquisition of Information for the Task.* Each Participant shall inform the Operating Agent of the existence of information that can be of value to the Task, but which is not freely available, and each Participant shall endeavour to make such information available to the Task under reasonable conditions, in which event the Executive Committee may, acting unanimity, decide to acquire each information.

(h) Reports on Work Performed under the Task. The Operating Agent shall prepare reports on all work performed under the Task and the result thereof, including studies, assessments, analysis, evaluations and other documentation, but excluding proprietary information, in accordance with paragraph 9(*c*) above.

(i) Copyright. The Operating Agent, or each Participant for its own results, may take appropriate measures necessary to protect copyrightable material generated under this Task. Copyright obtained shall be the property of the Operating Agent, for the benefit of the Participants provided, however, that Participants may reproduce and distribute such material, but shall not publish it with a view to profit, except as otherwise provided by the Executive Committee.

The Contracting Parties understand and agree that the name, acronym and emblem of the IEA has been notified to the World Intellectual Property Organisation (WIPO) Secretariat according to Article 6 of the Paris Convention for the Protection of Industrial Property, as amended on 28 September 1979. The Contracting Parties further understand and agree that the OECD/IEA shall retain the copyright to all IEA deliverables, materials or publications published or to be published by the IEA or jointly by the IEA and a third party to this Annex. Should the Contracting Parties use any such deliverables, materials or publications they shall give full acknowledgement to the OECD/IEA as being the source of the material with a copyright notice in the following form: © OECD/IEA, (year of publication).

(j) Authors. Each Participant shall, without prejudice to any rights of authors under its national laws, take necessary steps to provide the co-operation from its authors required to carry out the provisions in this paragraph. Each Participant shall assume the responsibility to pay awards or compensation required to be paid to its employees according to the laws of its country.

10. Participants in this Task

The Contracting Parties which are Participants in this Task are:

The Federal Ministry of Transport, Innovation and Technology, Austria
The National Research Council, Canada
The Federal Ministry of Economics and Technology Federal Republic of Germany
New Energy and Industrial Technology Development Organization, Japan
SenterNovem, The Netherlands
Enova SF, Norway
The Swedish National Energy Administration, Sweden
The Swiss Federal Office of Energy (Operating Agent), Switzerland
The United States Department of Energy, United States of America