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IEA HPP Annex 32
«Economical heating and cooling systems for low energy houses»

Participants

Since the autumn ExCo meeting 2006 the nine countries AT, CA, CH, DE, JP, NL, NO, SE and US are participating in the Annex 32.

AT, CH, DE, NL, JP, SE, US have sent the letter to the director of the IEA, from the participants CA and NO, the OA has not yet received a copy of the letter. The national team leaders have been informed to enquire the state of the letter and to initiate the sending in case.

AT and NO joined the Annex 32 on the ExCo meeting in November 2006. CA and SE had funding problems and had therefore not started the work in Annex 32 before the beginning of 2007.

Activities in the national projectsAustria (AT)

Austria has finished the Task 1 state-of-the-art survey in July 2007. In Task 2 a prototype of an integrated heat pump will be developed for the capacity range of 3-5 kW. The development is divided into the steps:

- definition of 3 promising layout
- analysis of best suited refrigerant cycles, among other CO₂
- simulation of the entire system and building
- selection of best performing solution for prototyping and lab-testing

Currently, the cycle analysis is on-going. In the end of November, a national workshop will take place and specify the further steps in more detail.

Canada (CA)

The state-of-the-art report Task 1 has been delivered in June 2007. The national project of Canada comprises the design, construction and field test of low energy houses according to the building label NOVOCLIMAT of the Canadian province Quebec and the respective system technology for the Eastern climate region of Canada. The construction of the first house including the system is finished and monitoring will start in December 2007. A second house for field-testing is in construction. The Canadian contribution is actively supported by the Canadian Solar Building Research Network (SBRN) that aims at developing solar-optimized buildings approaching net zero energy houses (NZEH).

Switzerland (CH)

Task 1 was finished in November 2006. The focus of the Swiss national project is the integration of passive and active cooling function in heat pumps systems for low energy houses. A first system with ground-coupled heat pump and low temperature floor heating distribution system, which is also used for space cooling in summer time has been investigated by simulations and design guidelines have been derived. Presently, models for further system configurations are updated and amended.

In parallel, a field monitoring system with ground-coupled direct cooling with borehole heat exchanger and additional ground-to-air heat exchanger in the ventilation system in the first residential multi-family ultra low energy house in canton Basel has been instrumented. Field-monitoring has started in the end of September 2007 and will continue at least for one entire year to evaluate both the heating and the cooling season.

Germany (DE)

Germany has finished the Task 1 report in Dec. 2006. The main activity of Germany is the field testing in Task 3. A field test of 140 heat pump systems is conducted in two steps in co-operation with 7 heat pump manufacturers and 2 utilities. System layouts are up-to-date systems of the manufacturers and results shall serve to optimise systems as well as to give hints for heat pumps in the capacity range of 3-10 kW. Another field test in co-operation with the German utility E.ON is dedicated to retrofitting of boilers with heat pumps in dwellings with high supply temperature requirements. Currently, the first 70 units are in field-monitoring, while in 2008, the other 70 system will be field-monitored. First evaluations will be presented on the next Annex 32 working meeting in December 2007.

Japan (JP)

Japan finished the Task 1 in November 2006. In the Task 2 system evaluation by field testing for a ground-coupled heat pump in cold climate has been performed. The systems performed well in the cold climate region of Sapporo, but some optimisation potentials have been identified. Moreover, loads of the Tokyo climate region have been analysed and possible system improvements have been deduced, which will be investigated in more detail in the follow-up work in Task 2.

Netherlands (NL)

Netherlands delivered a draft report on Task 1 in summer 2007, which will be finished by November. In October 2007 a meeting of different market players in the low energy field took place defining the further steps in the Dutch national project, which comprise the following items:

- Analysis of calculation models and development of new models (on-going)
- Development of subsidy scheme and setting up demonstration projects.
- certification scheme for systems and integrated developments
- Technology development with two Dutch heat pumps and ventilation systems manufacturers
- Evaluation of monitoring technology as well as building processes
- Information and guideline dissemination for project developers and building companies
- Development of a set of standard details for buildings.

Norway (NO)

Norway has finished Task 1 by April 2007 including a first comparison of possible system solutions of integrated heat pump systems for low and ultra low energy houses. In Task 2 a further evaluation of ventilation compact units, which combine a mechanical ventilation system and an exhaust-air heat pump for space heating and domestic hot water operation, will be performed in cooperation with the Norwegian technical university NTNU in Trondheim. In focus is the evaluation of the performance of systems which are established in ultra-low energy houses in central Europe under Norwegian boundary conditions of cold outside air temperatures. Moreover, in Task 3, a novel design of an integrated water-to-water propane heat pump has been installed in an ultra-low energy house and is field monitored for an entire year. Further investigations on the storage system will be included.

Sweden (SE)

Sweden is terminating Task 1. In Task 2, Sweden is analysing and redesigning the systems of the Swedish heat pump manufacturers for the use in low energy dwellings. Starting points are exhaust-air heat pumps. Extensions are combined DHW and space cooling for summer operation, use of a second source (hybrid source), increased efficiency of auxiliaries (pump, fan) and change in the control of the system. Further steps are prototyping and field testing of one or two units, which are specified on a national team meeting in the mid of November.

USA (US)

The USA has finished the Task 1 report in November 2006. The long-term objective of the DOE are so-called Net Zero Energy Houses (NZEH). Presently, only pilot NZEH houses exist. The focus for Task 2 is the development of an integrated heat pump system for space heating and cooling, DHW production, ventilation as well as humidification and dehumidification. A market study has been carried out, leading to configuration of a heat pump system. Test of the components have been carried out and are on-going. A prototype shall be built in cooperation with manufacturers. Field testing of the prototype unit is meant to start in 2008.

Time schedule

Due to the different state of the national projects described above, the system assessment in Task 2 has been extended. Task 3 comprising the field testing and best practice systems is accomplished in parallel to Task 2 and will go on in 2008. The time schedule will be discussed on the next working meeting in Dec. 2007 based on the present state of the national projects.

Date and Venue of next meeting

The next working meeting of Annex 32 is a 3-day meeting, which will be held in Kyoto, Japan in Dec. 5-7, 2007.

The topics of the meeting are:

- an exchange of the results of Task 2, the system evaluation and Task 3, the field testing
- preparation of the workshop on the 9th IEA Heat Pump Conference in Zurich in May 2008
- organisational issues comprising work planning and adaptation of time schedule

The meeting will include a full-day workshop for an exchange of information of activities of the national Japanese team in Annex 32, which comprises more than 20 institutions/companies and the other participants.

Moreover, the meeting schedule comprises a technical tour to Daikin company and Sekisui house industry.

Workshop at 9th IEA Heat pump conference 2008 in Zurich

Annex 32 will organise a half-day workshop on the 9th IEA Heat pump conference in Zürich.

The workshop will take place on Monday, May 19, 2008 in the afternoon.

The draft programme of the workshop comprises

- a summarising introduction to the state-of-the-art of heat pumps for low energy dwellings
- interim results on system designs, field monitoring and design guideline worked out in Task 2 and Task 3
- an outlook to the follow-up work to be accomplished within the Annex 32