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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 declared their participation 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.

Third working meeting Annex 32

The third working meeting of Annex 32 took place at ARI, the Air Conditioning and Refrigeration Technology Institute, in Arlington, VA, USA on May 14-15, 2007. On May 16, 2007 a technical visit to NIST, the National Institute of Standards and Technology, has been accomplished. CA and NL had to cancel the attendance shortly before the meeting, so project state will be enquired by email.
The meeting was to present the results of Task 1, the state-of-the-art analysis of the building and systems market in the low energy sector, and interim results of Task 2, a comparison of the systems found and new developments. Task 1 has been extended due to the above mentioned late joining of AT and NO in the end of 2006 and the funding problems of CA and SE. The presented results of the national projects are shortly described in the following.

Austria (AT)

Austria has nearly finished the Task 1 market survey. About 30% of the Austrian energy consumption is due to residential heating, DHW production and climatisation. Average per capita flat sizes and number of per capita apartments are increasing. In Austria, about 1800 buildings are built according to the passive houses standard with a strong market increase in the recent years. Moreover, the interest in cooling in residential sector is increasing. Concerning the systems mostly hydronic heat systems are installed. Mechnical ventilation systems are not yet very common in Austria, even though a market growth is expected with the further market growth of low energy houses. The heat pump market is growing in the recent years with a number of 10000 sold heat pumps in 2005, of which ~30% are heat pump water heaters.
Concerning Task 2 three system configurations have been defined for a closer investigation of the heat pump cycle and the system performance in the low energy capacity range of 3-5 kW.

Canada (CA)

The national project of Canada comprises the design, construction and field test of a low energy houses according to the Canadian standards NOVOCLIMAT and the respective system technology for the cold climate region of Canada.

Switzerland (CH)

Task 1 is finished and has been presented on the 2nd working meeting in Alkmaar. The low energy standard MINERGIE® makes up 15% of the newly built residential houses, while further 15% are estimated to comply to MINERGIE without being certified. MINERGIE-P® dwellings similar to passive houses are more a niche market with ~100 buildings. Heat pumps are the market leading heating system in the new building sector with a market share of 72% in 2005.
The Swiss national contribution refers to the integration of cooling options in multifunctional heat pump systems. Therefore, in Task 2, a categorisation of passive cooling options has been performed. In focus are natural (windows) and mechanical nighttime ventilation, free-cooling by vertical borehole heat exchangers and air-cooling by ground-to-air heat exchangers, since not all components for dessicant cooling systems are available on the market for the small capacity range, yet. Often components needed for the passive cooling are already installed in common system designs for the space heating. First design and control concepts have been evaluated by simulations for free-cooling with vertical borehole heat exchangers. The next step is an analysis of the other possiblities and a comparison with regard to the performance, the reachable comfort and additional costs for the cooling operation.

Germany (DE)

In Germany the passive house standard has been defined and meanwhile, 5000 passive houses have been realised. Moreove, so-called KfW40 (ultra-low energy houses) and KfW60 (low energy houses) are financially supported. Heat pump markets are growing. As heating system for the passive houses, so-called ventilation compact units with exhaust air heat pump have been established, which combine space heating, DHW production and ventilation function in one unit. Some manufacturers have also integrated cooling options.
Germany in mainly active in Task 3, the field testing. A field test of 140 heat pump systems is conducted in two steps in cooperation with 7 heat pump manufacturers and 2 utilities. Currently 70 units are instrumented and the data acquisition is established. System layouts are best practice by the manufacturer and results shall serve to optimise systems as well as to give hints for heat pumps in the capacity range of 3-10 kW.

Japan (JP)

Japan finished the Task 1 and results have been presented on the 2nd working meeting. In the Task 2 system evaluation by field testing for a ground-coupled heat pump in cold climate have been performed proving that the systems performed well in the cold climate region of Sapporo. Moreover, loads of the Tokyo climate region have been analysed and principle system layouts have been deduced, which will be investigated in more detail in the follow-up work in Task 2.

Netherlands (NL)

Netherland is about to finish Task 1. At ECN, systems for low energy houses are developed and compared in the frame of Task 2.

Norway (NO)

Norway has finished Task 1. According to the Norway State Housing bank (Husbanken) about 10000 low energy houses have are built, in construction or in the design phase, so low energy houses experience a strong market growth (comparison: 2000 houses in 2005). Heat pumps stabilized at about 55000 units/year, however, comprising all capacities of heat pumps, as well quite large units of several MW. Moreover, a detailed system categorisation of the heat pumps used in residential buildings and first comparison of the system solutions has been accomplished, which will be performed in more detail in Task 2.

Sweden (SE)

Sweden is terminating Task 1. In Sweden low energy houses are still in the pilot phase, e.g. as the ultra-low energy dwellings in Lindås. Systems are similar to the systems presented by Norway. In Task 2, Sweden will analyse and redesign the systems of the Swedish heat pump manufacturers for the use in low energy dwellings. Moreover, in Task 3, one or two field test are to be performed.

USA (US)
The USA has finished the Task 1. The long-term objective of the DOE are so-called Net Zero Energy Houses (NZEH), which would required a drastical reduction of the energy requirements and the use of photovoltaic to compensate the remaining energy demand. 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 of cooling and DHW operation have been carried out. A prototype shall be built in cooperation with manufacturers.

Time schedule
Due to the different state of the countries described above, the system assessment in Task 2 has been extended to the end of 2007. Task 3 comprising the field testing and best practice systems will be accomplished in parallel to Task 2 and will go on in 2008.

Website Annex 32
Concerning a website of the Annex 32 the domain http://www.annex32.net has been assigned, but there are delays with regard to the hosting of the Website at the server of the FHNW. However, it seems probable to establish the website until the end of June 2006.

Date and Venue of next meeting
The next working meeting will be held on Dec 5-7, 2007 in Kyoto, Japan.
Results of Task 2, the system evaluation, and Task 3, the field testing are in focus of the meeting as well as the preparation of the workshop to be held at the 9th IEA Heat Pump Conference in Zuerich in May 2008.