IEA Heat Pump CENTRE
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Heat pumps are renewable

Heat pumps are renewable, Are they not?
– A European Perspective –

Renewable energy and heat pumps in Japan

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NEWSLETTER
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In this issue

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Heat pumps are renewable! Well, heat pumps are not renewable per se, but the heat they supply is to a large extent renewable. The perception of heat pumps differs in different parts of the world, but many policy makers now realise that heat pumps are an efficient means for increasing renewable energy. Read about how different regions have approached heat pumps in this issue.

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COLOPHON

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EU policies on renewable energy

Ferran Tarradellas
Energy Spokesman

The IEA World Energy Outlook published in November 2009 demonstrates that continuing on today's energy path would mean increasing dependence on fossil fuels with alarming consequences for the global climate and energy security. In Europe, the recognition of the need to change direction has long been growing. In 2007 the Heads of State and Governments agreed on a renewed, ambitious energy policy based on the three pillars of sustainability, security of supply and competitiveness. Targets for greenhouse gas reductions, increasing the share of renewable energy and for energy efficiency were agreed at the highest political level. In January 2008 the European Commission followed up this agreement by presenting a range of draft legislative measures. The so-called "energy-climate package" was designed to put in place the regulatory framework required to meet the targets. Less than a year after – in December 2008 – the package was agreed politically and following its publication on 5 June 2009 the legislation must now be transposed into national law in the EU Member States.

While the so-called "20-20-20" targets are known to many, few are probably aware of the significant role that heat pumps played in these discussions. The new legislation in fact acknowledges heat captured from ambient media by heat pumps as renewable energy that under certain conditions, may count towards a Member State's target. The legislation defines aerothermal, geothermal and hydrothermal energy as energy stored in the form of heat in ambient air, surface water or beneath the surface of solid earth, respectively.

The recognition of heat harnessed by heat pumps as renewable energy has the potential to boost deployment in Europe. However, in order to reliably quantify the contribution of heat pumps to the targets, appropriate data and statistics must be developed. Annex VII of the new Directive establishes a basic methodology for calculating the amount of renewable energy from heat pumps for the purposes of the Directive, but currently few, if any, Member States have the data necessary to apply it. The Commission shall establish guidelines on how to estimate certain necessary parameters, but cooperation between Member States and industry to develop the necessary data and methodologies is needed. This has begun with the setting up of a Eurostat task force on heat pumps. Methods for assessing seasonal heat pump efficiency are currently developed under the "Ecodesign" and "Energy labelling" policies, and these may be the first important steps also in this respect.

Heat pumps can provide significant benefits for the new energy and climate agenda, but measuring their contribution is not always straightforward. In better demonstrating their value to energy systems by helping to make reliable data more widely available, the sector has an important challenge to face in the years ahead.

[1] More precisely Directive 2009/28/EC of 23 April 2009 on the promotion of the use of energy from renewable sources

General

DOE Documents How Commercial Buildings Can Achieve 50 Percent Energy Savings

The U.S. Department of Energy (DOE) and DOE national laboratories have released technical support documents that indicate how to achieve 50 percent energy savings in four commercial building sectors: general merchandise, grocery stores, lodgings, and medium office buildings. The documents were created under the direction of DOE's Building Technologies Program. They describe the assumptions, methodologies, and analyses used to reach 50 percent energy savings over ASHRAE/IESNA Standard 90.1-2004.

DOE said the technical support documents demonstrate that higher levels of energy performance can be achieved in the commercial building industry. These reports are often the basis for Advanced Energy Design Guides — "how to" guides that target architects, engineers, and other practitioners.

Report data is also shared with members of DOE's Commercial Building Energy Alliances, which are comprised of commercial building owners and operators. Each alliance works with DOE to reduce its energy use and environmental footprint in the retail, commercial real estate, and hospital sectors, as well as to help disseminate building information within each sector.

The four technical support documents are available for download in PDF format:

• General Merchandise — www.nrel.gov/docs/fy09osti/46100.pdf

• Grocery Store — www.nrel.gov/docs/fy09osti/46101.pdf

• Lodging — www.pnl.gov/main/publications/external/technical_reports/PNNL-18773.pdf

• Medium Office — www.pnl.gov/main/publications/external/technical_reports/PNNL-18774.pdf

U.S. President Calls for Energy-Efficiency Tax Incentives

President Barack Obama has called on Congress to provide consumers with tax incentives to make their homes more energy efficient. He said the proposal would create jobs, stimulate consumer spending and reduce greenhouse gas emissions. The so-called "cash for caulkers" proposal would provide federal tax incentives to people who insulate their homes or purchase energy-efficient appliances. It is being considered for inclusion in jobs legislation now being crafted.
Source: The HVAC&R Industry

UK Air conditioning and heat pump institute launches

The Air Conditioning and Heat Pump Institute (ACHPI) is to launch this month.
The specialist group is being set up by the Institute of Refrigeration to offer independent technical information for individuals who install, service or maintains air conditioning and heat pump equipment.
The ACHPI aims to bring together the technical expertise of manufacturers' support services with the experience of the Institute of Refrigeration (IOR) in providing practical guidance and keeping individuals up-to-date with good industry practice and standards.
John Ellis, chairman of the IOR ACHPI technical panel said: "The Heat Pump and Air Conditioning sector is one of the ongoing major advancements of the refrigeration cycle. This burgeoning sector of our industry has its own different technical needs and the ACHPI can help develop this growing area where engineers are thirsty for reliable and independent information."
To find out more about membership, go to www.ior.org.uk/achpi

Working Fluids

Refrigerant helps convert sun's heat into power

Honeywell has announced that its Genetron® R-245fa refrigerant is being used to help homeowners generate electricity from the sun's heat. The refrigerant is being utilized in an organic Rankine cycle (ORC) called the 35Z Micro Power Plant, manufactured by Germany-based Turbolina GmbH & Co. KG. The unit is designed to use water heated by thermal solar panels to evaporate the refrigerant, which in turn drives a turbine to generate electricity. Because no fuel is burned to create the electricity, the unit does not produce any carbon dioxide emissions. The remaining heat from the 35Z can be used to supply heating and hot water.
Source: AHCR News, http://www.achrnews.com/Articles/Breaking_News/BNP_GUID_9-5-2006_A_10000000000000702287

HFCs picked and squeezed as 'low hanging fruit' in climate battle

A NEW scientific paper claims that HFCs, if left unchecked, could contribute to 45% of global greenhouse gas emissions by 2050.

The scientific paper written by an international team of scientists puts further pressure on fluorocarbons and argues that, unless action is taken, HFC use could climb sharply in the coming years.

Under a scenario where carbon dioxide emissions are pegged to 450ppm HFCs could equal 9Gt – equivalent to around 45% of total C02 emissions – by 2050 if their growth is unchecked.
Source: http://www.acr-news.com/news/news.asp?id=1550
Report: http://www.pnas.org/content/early/2009/06/19/0902817106.full.pdf+html

Technology

HVAC manufacturers, efficiency advocates in historic efficiency standards agreement

The US leading manufacturers of residential central air conditioners, furnaces, and heat pumps have signed an historic, voluntary agreement with the nation's leading energy-efficiency advocacy organizations supporting new federal standards for those products. For the first time, the agreement calls for regional efficiency standards to replace a quarter century of national standards, and it also recommends more stringent building code provisions for new construction.

The agreement for the first time sets different standard levels in three climate regions – North, South, and Southwest – recognizing that appropriate investments in heating and cooling efficiency depend on usage. Such regional standards are allowed under the Energy Independence and Security Act of 2007.

The agreement also allows states to include even higher efficiency levels for heating and cooling systems in new homes. New houses can be built without physical restrictions that might hinder installation of highly efficient equipment – as there might be when replacing equipment in an existing home. This new approach strikes a balance between the desire for greater state and regional flexibility and the need for a uniform marketplace, and it looks to the nation's long-term energy future by supporting the most efficient new systems where they are most cost-effective.

The new standards are projected to save U.S. consumers about $13 billion in today's dollars between 2013, when the new standards begin to take effect, and 2030 – taking into account the incremental cost of the more efficient equipment.

Between now and 2030, the agreement also will save 3.7 quadrillion Btu of energy nationwide, which is equivalent to all the energy consumed by approximately 18 million households in a single year, or enough to meet the annual energy needs of either Georgia, Massachusetts, Michigan, Missouri, North Carolina, or Virginia. The new standards would raise the minimum efficiency of residential central air conditioning systems by about 8 percent and furnaces by about 13 percent and would result in a 5 percent reduction of the total heating energy load and a 6 percent reduction of the total cooling energy load in 2030.

These energy savings will result in annual greenhouse gas emission reductions of 23 million metric tons of CO2 in 2030, an amount equal to that produced by approximately 4 million cars every year.

Executives of the Air-Conditioning, Heating, and Refrigeration Institute (AHRI), the American Council for an Energy Efficient Economy (ACEEE), the Alliance to Save Energy (Alliance), the Natural Resources Defense Council (NRDC), Northeast Energy Efficiency Partnerships (NEEP), the Appliance Standards Awareness Project (ASAP), the California Energy Commission (CEC), the Northwest Power and Conservation Council (NWPCC), and more than a dozen individual furnace and air conditioner manufacturers signed the agreement following months of negotiations.

The signatories agreed to submit their agreement jointly as a legislative proposal to Congress for inclusion in the energy legislation currently under consideration. The groups will also recommend that the Department of Energy promulgate a rule adopting the agreed-upon regions and efficiency standards.

"In addition to saving significant amounts of energy for the nation – and saving consumers considerable money – this agreement provides industry with greater certainty in the marketplace, which enables more investment, enhances global competitiveness, and preserves jobs," said Stephen Yurek, president of the Air-Conditioning, Heating, and Refrigeration Institute, the industry's trade association.

Steven Nadel, executive director of ACEEE, observed "We believe this proposal represents a large leap forward in improving our nation's energy efficiency, while also reducing consumer energy bills and helping to clean our environment. Regional standards are a major step for cost-effective savings and will help manufacturers meet the very different needs of homes in cold, hot-humid, and hot-dry climates."

"We all know that constructing buildings efficiently 'from the ground up' is the best way to maximize savings of energy, money, and emissions," said Alliance to Save Energy President Kateri Callahan. "This is particularly critical in homes, where heating and cooling typically account for the largest single chunk – about 40 percent – of monthly energy bills. So the building codes provision of today's agreement is especially significant, as it allows states to adopt codes that will ensure major savings for new homeowners while also taking a bite out of global warming."

Markets

R-22 ban and Canada mandates condensing furnaces

The day Jan. 1, 2010 will bring many changes to the HVAC industry. As of that date, R-22 will no longer be available in new cooling systems manufactured in the United States or Canada, and our neighbours to the north will have a new national minimum energy performance standard for gas furnaces. After the New Year, gas furnaces manufactured for most Canadian residential applications must have a minimum fuel efficiency level of 90 percent AFUE.

Source: AHCR News

Danish project provides heat pump subsidies

The Danish Energy Agency has announced a research project aiming to measure the effectiveness of energy-labelled heat pumps. The project will award grants of up to DKK 15,000 (about €2,000) to 300 households for the installation of heat pumps that are energy-labelled, while additional funding will be available for metering equipment.

The Danish Energy Agreement of 21 February 2008 allocated DKK 30 million (about €4 million) for a two-year effort that seeks to promote the most efficient heat pumps, and ensure their proper use. The effort is targeted to heat consumers located in areas without an opportunity for collective heating, (i.e. natural gas or district heating) and will include information campaigns, labelling of efficient heat pumps, small grants, etc.

Source: R744.com

Heat pump market growing fast in China

An article by Japan Air Conditioning, Heating & Refrigeration News (JARN) reports that the Chinese market for heat pump water heaters in 2008 reached an estimated 250,000 units, which corresponds to an estimated RMB 1.3 billion (about US$ 190 million), while the market is expected to exceed RMB 1.5 billion (about US$ 220 million) in 2009. These figures compare to RMB 360 million (€37 million) in 2005 and RMB 1.20 billion (€106 million) in 2007.

To put this into perspective, the overall water heater market in China is about 18.7 million units each year, which could provide a huge potential market for heat pump water heaters.

Chinese companies develop CO_2 technology

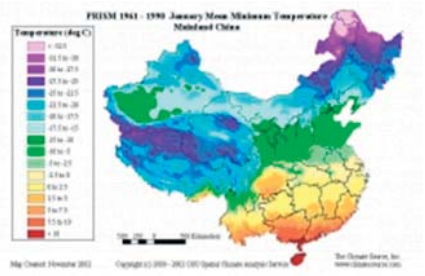
JARN reports that while issues such as high-production cost and the requirement for water quality (the hard water in most cities in China would block pipes when heated) have prevented Japanese companies from selling their CO_2 heat pump water heaters in China, some Chinese companies have recently begun to develop CO_2 compressors and heat pump systems. Nonetheless, R22 is still the main refrigerant of choice for heat pump water heaters, while products adopting R410A have increased in recent years.

Heat pump water heaters mainly for commercial applications

According to the JARN article, heat pump water heaters in China are currently used mostly for commercial applications, such as hotels, recreational venues, schools and villas. The smallest capacity that can be found is 2 hp (appr. 1.5 kW).

Plethora of heat pump water heater manufacturers indicates immature market

A highly competitive market of heat pump water heater manufacturers exists in China, with the number exceeding 300 and small OEM manufacturers accounting for more than 80% of the total. The manufacturers can be roughly classified into four types, including central air conditioners , residential air conditioners, solar energy products and energy-saving equipment . However, the large number of manufacturers in this industry indicates that the market is still in its infancy.



Heat pump incentives and standards in China

Although there are no incentive policies for heat pump water heaters at the national level, some local governments provide financial support for such products. For example, the local government of Ningbo, a city in Zhejiang Province, gives a 20% rebate for heat pump water heater projects. In terms of technical standards, one concerning commercial products was put into force on 1 May 2008, while another for residential products is expected to be released this year.

Japanese Ministry initiates research on Next Generation Heat Pumps

The Japanese Ministry of Economy, Trade and Industry (METI) set up the Next Generation Heat Pump Council to support and expand research on advanced energy technology followed by practical tests to reduce CO2 emissions. Two important goals are doubling current heat pump efficiency and to halving installation costs by 2050.

According to the Japanese trade magazine JARN, the Ministry of Economy, Trade and Industry (METI) in Japan has initiated a research project on next generation heat pump systems. For this purpose a research council was created within the New Energy and Industrial Technology Development Organization (NEDO). A working group prepared a 3-years plan that foresees studies of model system feasibility this year aiming to identify barriers to the adoption of next generation heat pumps. The next step, starting in 2010, will include research on model cases and redefining solutions and directions. In 2011, full-scale tests on model systems will be conducted to finally determine the energy efficiency and reliability of the new technology.

Doubling heat pump efficiency, halving the costs
Besides the overall goal of reducing CO_2 emissions, the two main targets of the Next Generation Heat Pump Council are the doubling of heat pump efficiency and a 50% reduction in installation costs by 2050.
Source: HPTCJ

China heat pump industrial union founded

The China Heat Pump Industrial Union officially announced its foundation by the China Energy Conservation Association, International Copper Association (China) and ten major air-to-water heat pump water heater manufacturers, including Midea, Chigo and industrial media on July.
Source: JARN Magazine

IEA HPP

Heat pumps as renewable in IEA HPP member countries

A number of questions regarding the perception of heat pumps as providers of renewable energy were posed to members of the Heat Pump Programme Executive Committee. The questions and answers are shown for three countries below.

Country: Japan
Are HP's generally accepted as renewable energy in the country?
Yes they are considered renewable energy.

Please describe how, and when HPs became considered renewable. Provide supporting documentation, or decision.

The decision was made at a Cabinet meeting held on 25 Aug, 2009

Does your country include heat delivered by heat pumps in national energy statistics?
If Y, please describe how this is done.
If N, please explain why not.

We haven't yet had any statistics since HPs became considered renewable by government in Aug 2009.

Are heat pumps known to the public? To what extent are heat pumps known?

Approximately 30% of the population according to a survey done by HPTCJ in Dec, 2008 know about heat pumps.

Are heat pumps sold in your country with environmental arguments like " …reduces carbon footprint …", "… less CO_2 emissions …"?

Some are sold with these catchphrases.

Does your country have targets on CO_2 emissions reductions? If so, how much, and by what year? What year is baseline?

Yes, the target is to achieve a 25% reduction by 2020 compared with the 1990 level

Country: SWEDEN
Are HPs generally accepted as renewable energy in the country?

Yes, but not generally or officially declared. It means that Sweden has to follow European legislation which in RE-directive /DIRECTIVE 2009/28/EC stipulates that aerothermal, geothermal and hydrothermal energy captured by heat pumps is to be considered renewable. The directive stipulates a requirement of 49% for Sweden as the EU target.

Please describe how and when HPs became considered renewable. Provide supporting documentation, or decision.

Decision of the European Parliament and Council 29 April 2009, (DIRECTIVE 2009/28/EC); Article 2 (a-d), Article 5 (4), Article 5 (7), which refers to regulation on Energy statistics EC/1099/2008, and stipulates development of energy statistic on renewables, etc), and Annex VII.

Describe how much HP-delivered energy is considered renewable.
Please provide documents that sup-

port this (Government or agency declarations).

Regarding Energy Indicators – Renewable Energy by the Swedish Energy Agency 2008, The Swedish Energy Agency has as a rule of thumb which estimates that 100% of geothermal and hydrothermal heat pumps deliver compliant renewable heat, that 50% of aerothermal heat pumps deliver compliant heat and that 40% of heat pumps in district heating systems deliver compliant heat. These proportions will also be used in a forthcoming forecast in accordance with Article 4(3) of the Directive 2009/28/EC.

Is there a difference in how different heat sources are considered renewable?
Which of the heat sources below are considered renewable?

- Aerothermal heat source (outside air, exhaust air)
- Hydrothermal heat source (sea, lake, and aquifer)
- Geothermal (rock, soil)
- Industrial waste heat Sewage water Other, please specify:

Please discuss briefly the different heat sources, and the reasons why a particular heat source is
considered renewable or not.

- **Aerothermal heat source (outside air, exhaust air) Yes, but under the provisions of Annex VII**
- **Hydrothermal heat source (sea, lake, and aquifer) Yes, but under the provisions of Annex VII**
- **Geothermal (rock, soil) Yes, but under the provisions of Annex VII**
- **Industrial waste heat No**
- **Sewage water No**
- **Other, please specify: No for exhaust air**

Yes, regarding to Directive 2009/28/EC .The directive only gives a clear definition on how renewable heat from aerothermal, geothermal and hydrothermal sources is treated. All other heat sources still lack a clear statement as to whether they should be considered as renewable energy or not and how such energy should be taken into account.

Does your country include heat delivered by heat pumps in the national energy statistics?
If Y, please describe how this is done.
If N, please describe why not.

Yes, at present only heat delivered by heat pumps distributed in district heating networks is included in national energy statistics. Heat delivered by other heat pumps is only included as energy consumption in Energy Balances, but is recalculated for other purposes to estimate total heat delivery, e.g. in unofficial statistics such as the Swedish Energy Agency publication Energy in Sweden, and for forecasting in accordance with REDirective Article 4(3)

Are heat pumps known to the public? To what extent are heat pumps known? Please elaborate, provide more than just a value between 0 - 100%.

Yes, heat pumps are very well known. Heat pumps are the most common source of heating for new construction single-family houses (market share exceeds 80%) as well as retrofitting in older houses.

Are heat pumps sold in your country with environmental arguments like "… reduces carbon footprint …", "… lower CO_2 emissions …"?

The strongest sales arguments for heat pumps in Sweden are their economical and environmental benefits. The positive environmental aspects are in most cases considered to be more than a bonus, almost an absolute condition.

Does your country have targets on CO_2 emissions reductions? If so, how much, and by what year? What year is baseline?

Yes, As an EU member state, +4% 2008-2012 (but national target –4%) for those years. Until 2020, –21% in the EU ETS sector (common EU target) and –17% in non-ETS (base year 2005) and the national target is –40% (base year 1990), eq. to 20 Mtons (see government bill 2008/09:162)

Are heat pumps considered a means of reducing CO_2 emissions in a cost efficient way?
If yes, please describe how this is expressed.

Yes, but the answer depends on who is asked. People in favour of the technology consider heat pumps to be a very cost efficient way of reducing energy use and achieving substantial CO_2-savings, whereas representatives for competing technologies tend to underestimate the potential for CO_2-savings.

Country: Switzerland

Are HPs generally accepted as renewable energy in the country?
YES

Please describe how and when HPs became considered renewable. Provide supporting document, or decision.

At the Swiss Federal Office of Energy, the HP domain is administrates by the section renewable energy (http://www.bfe.admin.ch/themen/00490/index.html?lang=en).

Furthermore HPs are also represented by the AEE (Swiss agency for renewable energy http://www.aee.ch/de/home.html).

Is there a difference in how different heat sources are considered s renewable? (Y/N)
Which of the heat sources below are considered renewable?

- Aerothermal heat source (outside air, exhaust air) (Y/N)
- Hydrothermal heat source (sea, lake, and aquifer) (Y/N)
- Geothermal (rock, soil) (Y/N)
- Industrial waste heat (Y/N)

- Sewage water (Y/N)
- Other, please specify:

Please discuss briefly the different heat sources, and the reasons why a particular heat source is considered renewable or not.

Actually all the sources are used (see the statistics from the Swiss Heat Pump Agency www.fws.ch). However aerothermal and geothermal are the two most used technologies having yearly sales percentages of 58% and 39% respectively. The other heat sources have a much smaller percentage (< 3%). One obstacle is training (sewage water & industrial waste heat requires specific skills) and another accessibility and access authorisation to heat sources (e.g. underground water).

Does your country include heat delivered by heat pumps in national energy statistics?
If yes, please describe how this is done. If no, please explain why not.

Yes, you can find it on the internet at: http://www.bfe.admin.ch/themen/00526/00541/00542/00631/index.html?lang=en&dossier_id=00763 under "Umweltwärme" on page 44 in the 2008 edition.

Are heat pumps known to the public?
To what extent are heat pumps known? Please elaborate; provide more than just a value between 0-100%.

Yes, they are known due to the excellent job done by the Swiss HP agency in the field of marketing and communication (see www.fws.ch). As a result HPs have a market share of 78% in new homes. Furthermore, a Swiss HP symposium is organized every year.

Are heat pumps sold in your country with environmental arguments like "… reduces carbon footprint …", "… lower CO_2 emissions …"?

The major sales arguments are: Energy efficiency (= also lower functional costs and fast ROI) and CO_2 reduction.

Does your country have targets on CO_2 emissions reductions? If so, how much, and by what year? What year is baseline?

We have a program named "SwissEnergy" whose objective for combustibles is a CO_2 emissions reduction of 15% by 2012 (ref. 1990). The statistics are also issued once a year (http://www.bfe.admin.ch/energie/00556/index.html?lang=de&dossier_id=04235).

Are heat pumps considered a means of reducing CO_2 emissions in a cost efficient way?
If yes, please describe how this is expressed.

Heat pumps are effectively seen as CO_2 relevant. This will be more actively communicated through the national building renovation program that starts next year and continues until 2020 (http://www.news.admin.ch/message/index.html?lang=de&msg-id=25533). Consequently, more regional subsidy programs will be launched (e.g. such as in Luzern http://www.axpo.ch/axpo/de/home_multi/medien/medienmitteilungen/2009/november/ckw_lanciert_energieeffizienz-initiativemit5miochf.html). More information will be available in the beginning of next year.

Ongoing Annexes

Bold text indicates Operating Agent.

Annex 29 Ground-Source Heat Pumps - Overcoming Market and Technical Barriers	29	AT, CA, JP, NO, SE, US
Annex 30 Retrofit heat pumps for buildings	30	DE, FR, NL
Annex 31 Advanced modelling and tools for analysis of energy use in supermarkets.	31	CA, DE, SE, UK, US
Annex 32 Economical heating and cooling systems for low-energy houses.	32	CA, CH, DE, NL, SE, US, JP, AT, NO
Annex 33 Compact Heat Exchangers In Heat Pumping Equipment	33	UK, SE, US, JP
Annex 34 Thermally Driven Heat Pumps for Heating and Cooling	34	AT, **DE**, NL, US

IEA Heat Pump Programme participating countries: Austria (AT), Canada (CA), France (FR), Finland (FI) Germany (DE), Japan (JP), The Netherlands (NL), Italy (IT), Norway (NO), South Korea (KR), Sweden (SE), Switzerland (CH), United States (US). All countries are members of the IEA Heat Pump Centre (HPC). Sweden is Operating Agent of the HPC.

Heat pumps are renewable, Are they not? – A European Perspective –

Thomas Nowak, Secretary General, EHPA

This question dominates the discussion on support for the more widespread use of heat pump technology in general and on their recognition in all legislation dealing with the promotion of renewable energy use in particular. It has been raised both on the European and national levels. As such, it was also repeatedly asked during the preparation of the RES Directive (Directive on the promotion of use of renewable energy sources | 2009/28/EC).
While the intensity of the discussion varies throughout Europe, it is by and large governed by the fact that most heat pumps use electricity in their operation. The individual stakeholder's position towards heat pumps is then shaped by his or her perception of the use of electricity for heating, by the way electricity is used in the country/region concerned and by the proportion of renewable sources used to produce it.

This article provides an overview of typical questions raised and the answers provided. The arguments presented have been used in EHPA presentations and meetings. They summarize the virtues and potential contributions of this technology.

1. Are heat pumps renewable?

EHPA and its member associations have always stressed that **heat pump technology per se is not "renewable" but uses renewable energy** from ambient sources such as air, water and ground. While this distinction is minor, it adds precision to the debate. As an aside it should be understood, that the distinction applies to all other technologies that use renewables. It is not the windmill that is renewable, but the wind, not the photovoltaic or solar thermal panel, but solar radiation, not the biomass burner, but the biofuel.

The RES-Directive has acknowledged this understanding by adding aerothermal and hydrothermal sources (geothermal was already part of it) to its definition of renewable energy sources. It also makes reference to heat pumps being the technology of choice in making these energy sources usable.

2. Do heat pumps use enough renewable energy to reduce overall energy demand?

An answer to this question can be given on the primary and final energy levels. The basic energy flow in a heat pump system illustrates this relationship (see figure 1).

The figure should be read from right to left. It starts with the **energy demand of a building (100%).** For comparison it is assumed that the energy demand is either provided by a traditional gas/oil boiler or an electric heat pump (Electrical units dominate today's heat pump markets while thermally driven heat pumps are available and it is expected that they will have a larger market penetration in the future). It is further assumed that the fossil fuel burner has an average efficiency of 85% (oil) /95% (gas) and that the heat pump system has an efficiency of 3.3, meaning that one unit of electricity is needed to provide 3.3 units of usable heat. This ratio is known as the seasonal performance factor (SPF). In our example: 30.3% of the **building's energy**

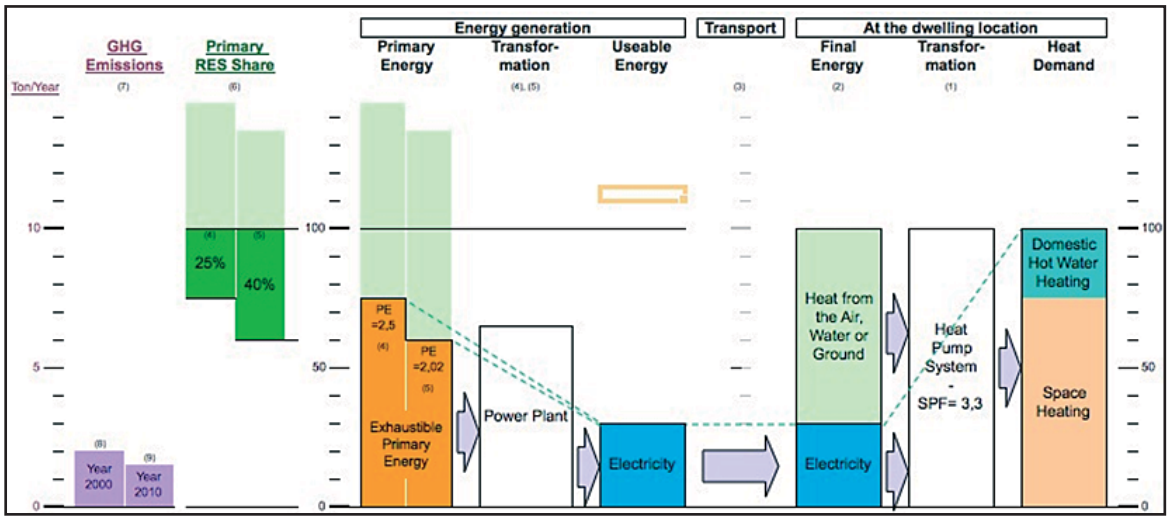


Figure 1: Energy flow in a heat pump system

Table 1: Comparison of energy demands as a result of different energy sources

	Oil boiler (85% eff.)	Gas condensing boiler (95% efficiency)	Heat Pump (SPF 3.3)	Heat Pump (SPF 3.3); 100% green electricity
Building energy demand	100%	100%	100%	100%
Final energy demand	117%	105%	30.3%	30.3%
Non-renewable primary energy demand	124 % (upstream losses 6%)	110 % (upstream losses 6%)	75.75%	0%

demand is required as electricity to operate the heat pump and to fully cover the buildings heat demand. The remaining 69.7% is from renewable sources. This compares to 117% of final energy from fossil sources in the traditional boiler (see table 1).

The comparison shows that heat pumps use renewable energy thus saving non-renewable final energy.

The transposition from **final to primary energy** is made in the next step. The largest impact on non-fossil final energy demand in a heat pump system results from the efficiency of electricity production and the sources used. This ratio is described as the primary energy factor (PEF). It defines the amount of primary energy (kWh) necessary to produce one unit of electricity. It is the reciprocal value of the production efficiency of the average electricity mix. Current Eurostat figures show an average conversion efficiency in the European Electricity mix of 39.6% (PEF of 2.51).

Using a **primary energy factor** of 2.5 – as suggested in the EU Energy Services Directive -- for the calculation, the 30.3% proportion of electricity (final energy) needed transforms to 75.75% of non-renewable primary energy to cover the heat demand of the building.

Comparing this to the average oil or gas-fired boiler with a non-renewable primary energy demand of 124% (oil)/ 110% (gas condensing) it becomes apparent that the use of heat pumps **also saves a considerable amount of non-renewable primary energy and reduces related emissions**.

Additional benefit: Load balancing

Heat pumps are often used with low temperature heating systems that provide a large mass for thermal storage. Storage tanks for the heating system and domestic hot water add capacity to this storage. In sum, such systems can be "charged" by operating heat pumps in off-peak hours and switching them off during peak-demand. The required heat is then delivered from the thermal mass and storages. Consequently, peak electric load demand will be shifted to off-peak hours, thus levelling out electricity demand. When large groups of heat pumps are combined to form "virtual load blocks" they constitute an even more powerful load balancing tool for the utility. Today, utilities in countries like Germany and Austria offer special heat pump tariffs that allow the utility to switch off heat pumps for up to 2 hours, 3 times a day. In the future, such load balancing can be made even more precise through the use of smart meters.

Additional benefit: Reduced greenhouse gas emissions

The average emission resulting from the European electricity mix is estimated at 411 g GHG equ./kWhel for the year 2010 (Source: Gemis 4.5). National emission values vary from country to country ranging from 15 g GHG equ./kWhel in Norway up to 900 g GHGequ./kWhel in Poland. As a result of the positive energy balance presented above, heat pump systems also reduce greenhouse gas (GHG) emissions. The more the primary energy saved, the less the greenhouse gas emitted. Taking an emission factor (including upstream losses) of 402 g GHG/kWhel for electricity production, and 248 g GHG /kWh for gas and of 318 g GHG / kWh for oil, the average residential building with an energy demand of 15.000 kWh/a will provide emission reductions from heat pump systems of 50% to 70% of GHG emissions compared to gas and oil burner emissions.

This table is based on a set of assumptions. Introducing some variation in terms of building energy demand and the efficiency of the systems used, results in the determination of ranges that provide a better overview of the potential contribution.

Table 2: Comparison of energy demand and emissions

	Oil boiler (85% eff.)	Gas condensing boiler (95% efficiency)	Heat Pump (SPF 3.3)	Heat Pump (SPF 3.3); 100% green electricity
Non-renewable primary energy required	18,705.88	16,736.84	4,545.45	0,00
Non-renewable final energy required	17,647.06	15,789.47	4,545.45	0
GHG emission (kg)	5,628.30	3,927.28	1,868.43	0,00
delta to a heat pump	3,759.86 +301%	2,058.85 +210%		-1,868.43 -100%

Table 3 shows that savings in non-renewable primary energy can range from 20% to 50%, while savings in non-renewable final energy range from 35% to nearly 80%; the RES contribution is rather stable at around 66% to 80% and GHG savings nearly always exceed 50%.

With an increase in the efficiency of electricity production and the use of ever more renewable energy sources in the electricity mix, emissions from heat pump systems will be even lower in the future. The advantage of this development is that all heat pumps – even those already installed – will benefit from it. To illustrate this development in the extreme, an electricity supply from 100% green sources is added for comparison. Running a heat pump system from 100% green electricity creates a **100% emission-free source for heating, cooling and domestic hot water production**. However this is not a future option but a choice that can already be made today.

The calculation clearly shows that heat pumps reduce energy demand and related emissions. With the RES-Directive in place, how should this contribution be calculated?

Calculating RES contributions from heat pumps

Only heat pumps that use a sufficient amount of renewable energy are accepted as contributors to the RES share in final total energy demand. The RES Directive prescribes the following approach to count this contribution in statistics.

In a first step the Directive defines which heat pumps are considered as using sufficient renewable energy to avoid a negative energy balance. This criterion of "substantial use of renewable energy" requires a heat pump to show 115% efficiency in its use of non-renewable primary energy and is described as

(1) SPF > 1.15 * 1/eta

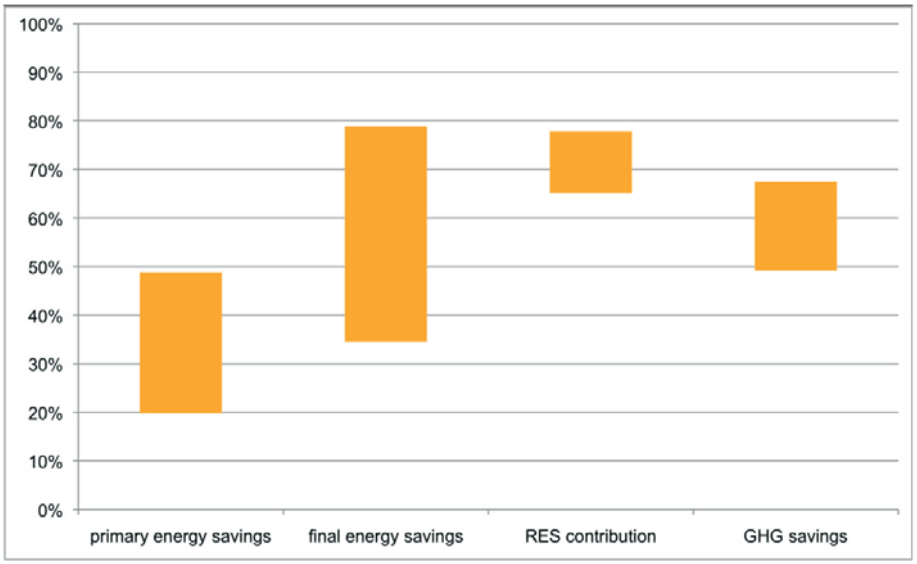


Table 3: Energy savings and GHG emission reduction ranges for heat pumps.

Once this criterion is met, the renewable energy contribution is calculated based on final energy and all energy taken from the environment is taken into account. Renewables are calculated as a proportion of the total amount of useful energy provided by the heat pump using the formula:

(2) $E_{RES} = Q_{usable} * (1 - 1/SPF)$

A EUROSTAT working group is currently developing the details to collect the data necessary for eta, SPF values and Qusable in the European context. It is particularly concerned with the development of a measure on the Qusable and SPF values for this equation. As only very few studies/statistics exist for both values, additional work is necessary to fill this gap.

It can be concluded that heat technology provides a triple dividend:

1. heat pumps use renewable energy from air (aerothermal), water (hydrothermal) and ground (geothermal);
2. they significantly reduce final and primary energy demand, and
3. they significantly reduce greenhouse gas (GHG) emissions.

This triple dividend is too good to be ignored. It should adopted by political agendas on global, European, national and even regional basis. In the light of current political developments, a quick uptake of heat pump technology in all possible fields of application will contribute significantly towards reaching European and global energy saving targets, the use of renewables and GHG emission reductions – but we must start now.

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"The European Heat Pump Association works mainly in Brussels with legislators, policy makers and other stakeholders to establish heat pumps as a widely acknowledged technology using renewable energy for the reduction of emissions and energy demand. All activities are aimed at overcoming market barriers and disseminating information in order to speed up market development in respect of heat pumps for heating, cooling and hot water production."

Renewable energy and heat pumps in Japan

Masanobu Sasaki, HPTCJ, Japan

Introduction

The Heat Pump & Thermal Storage Technology Center of Japan estimates that we could potentially reduce 130 million tons of CO_2 annually if all residential, commercial and industrial cooling, heating, hot water supply equipment and heating/drying operated by under 100 degrees Celsius were replaced with heat pump systems. Notably, this figure is equivalent to about 10% of current annual CO_2 emissions. It is 3 times more than possible emissions were we to fit all the detached houses in Japan with 4 kW solar PV systems. Because of its high efficiency in CO_2 reductions and its potential, heat pump technology has drawn attention as an efficient technology for measures against global warming. However, when it comes to the efficient use of renewable energy, heat pump technology had not been mainstream until EU Directives defined aerothermal , geothermal and hydrothermal energy as being renewable . Such energy is used as heat-sources by heat pump systems. A similar understanding is spreading in Japan under the influence of the EU Directives. This report presents the latest status of renewable energy and heat pump technology in Japan.

Definition of renewable energy

Thus far we have neither rules nor regulations that comprehensively define renewable energy in Japan although it is specifically described in the "Act on Special Measures to Promote the Use of New Energy", known as the New Energy Law. It covers renewable energy that can replace oil but which has not become widespread due to lack of funds, but which is worth promoting. [4] However, it excludes some items e.g. large-scale geothermal power generation except binary-cycle plants and large-scale hydroelectric power generation with energy outputs of 1,000kW or more. The Act includes the following;

Fig.1 CO_2 Heat Pump Water Heater

(i) the production of fuel from organic substances derived from plants and animals which can be used as a source of energy (excluding crude oil, petroleum gas, combustible natural gas and coal and their products; referred to as "biomass" in the following item and item (vi));

(ii) the use of biomass or fuel made from biomass to generate heat (excluding those listed in item (vi));

(iii) the use of solar thermal energy for heating water, heating and cooling space or other purposes;

(iv) the use of heat from seawater, river water or other water sources utilizing a refrigeration facility;

(v) the use of heat from snow or ice (excluding ice produced utilizing refrigeration equipment) for refrigeration, cooling space or other purposes;

(vi) the use of biomass or fuel made from biomass to generate electric power;

(vii) the use of geothermal energy to generate electric power (limited to electric power generation using ammonia-water, pentane or other liquids with boiling points below

100 degrees at atmospheric pressure);

(viii) the use of wind energy to generate electric power;

(ix) the use of hydraulic energy to generate electric power (limited to electric power generation using a power generation facility which is installed in a structure used for irrigation, water-utilization, sediment control or other purposes other than electric power generation, having an output capacity of 1,000 kilowatts or less);

(x) the use of solar cells to generate electricity.

Although hydrothermal energy – a heat pump energy-source – is defined in (iv), it is not widely recognized as renewable energy. This may reflect the reality of a restriction on its use for limited district heating and cooling due to legal obstacles against river water use. In addition to the New Energy Law, the "Act on the promotion of use of non-fossil energy sources and effective use of fossil energy by energy suppliers" was passed by the Diet on 1 July 2009 targeted at suppliers of electric power , heat , oil and gas . The cabinet order of the Act defines aerothermal, hydrothermal and geothermal heat as being renewable energy sources existing in nature along with wind power and solar heat.

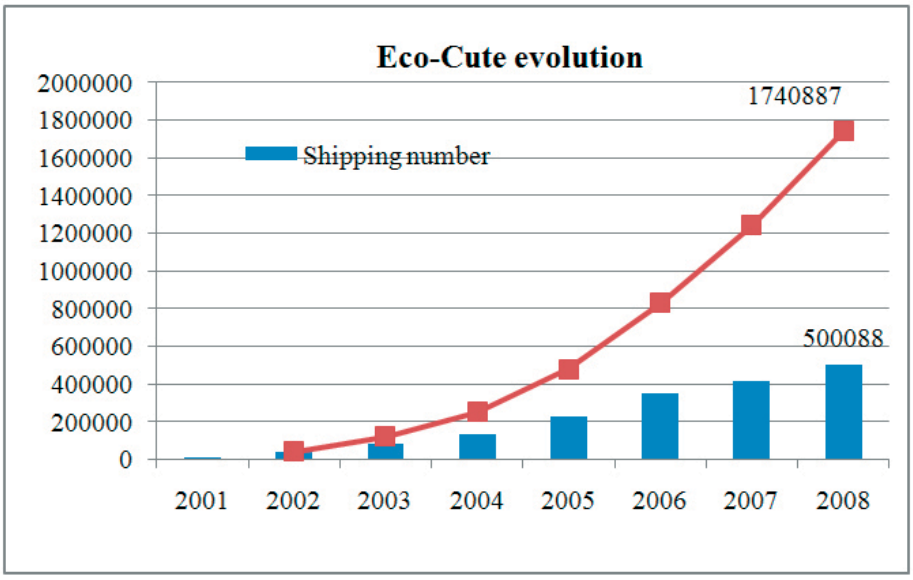

Fig.2 Total number and shipped number of Heat Pump Water Heaters

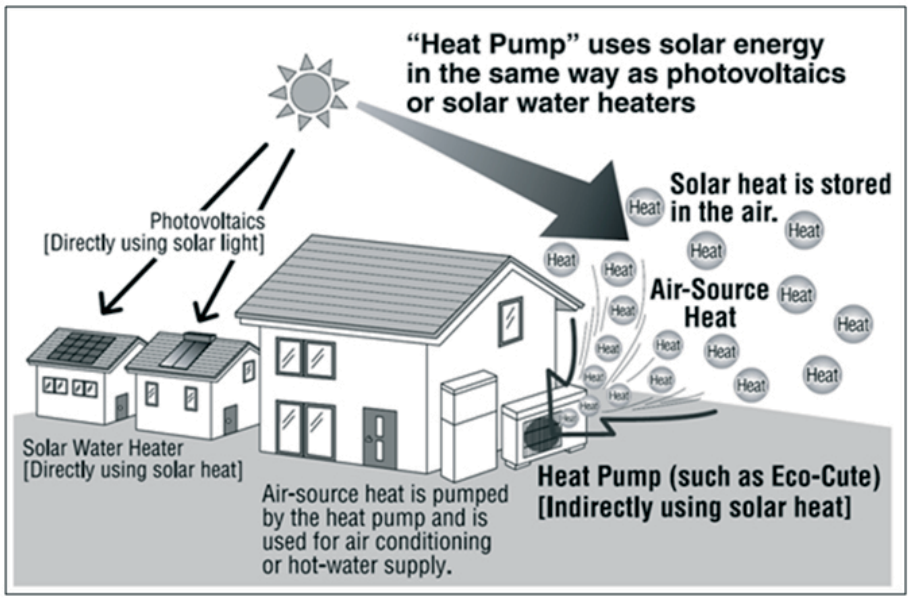

Fig. 3 Heat Pump System with Solar Energy

Current status of heat pumps

Eco Cute (Fig. 1) is a nickname commonly used for heat pump water heaters that use CO_2 refrigerant. Total sales have reached 1.7 million units since Eco Cute was launched in Japan in 2001. (Fig. 2)(1) As its catchphrase states "Eco Cute boils water by harnessing heat from air".

Eco Cute's appeal is that it uses indirect solar heat. (Fig. 5) Solar heat utilization has the advantage of high-efficiency in energy exchange compared with photovoltaic generation. Furthermore, indirect solar heat has another advantage by enabling us to use inexhaustible solar heat energy any time day or night, while direct solar heat is collected only during daylight hours.

Renewable energy was defined for the first time in PM Aso's speech entitled, "Future of the Japanese Economy – New Growth Strategy," on April 9th 2009. (2) In his speech, medium-term target about renewable energy was mentioned. He is quoted as saying, "By 2020, I call for the percentage of our total energy consumption accounted for by renewable energy to double, and to increase to 20%, the highest level in the world."

Following the PM Aso's speech, The J Recovery Plan was drawn up by the Cabinet Office and the Ministry of Economy, Trade, and Industry or METI on April 17, 2009. It uses the term, 'heat pump' and states that we set the target for the overall share of energy from renewable sources including heat pump sources in gross final energy consumption at 20 per

cent by around 2020.

Moreover, the New Energy Subcommittee under the Advisory Committee on Natural Resources and Energy, – the consultative body to the Economy, Trade and Industry Minister – states in its medium-term report (Fig. 4) that the EU Directives defines heat from air and other-sources that are pumped by heat pump as being renewable energy. It also says that to achieve this high target level of 20%, there is a need to expand a demand for heat pumps and similar so that we can count several kinds of heat sources as renewable energy. According to an estimate by the Heat Pump & Thermal Storage Technology Center of Japan, 30 per cent of the targeted 20 per cent would consist of heat pump energy sources and would constitute the largest single share.

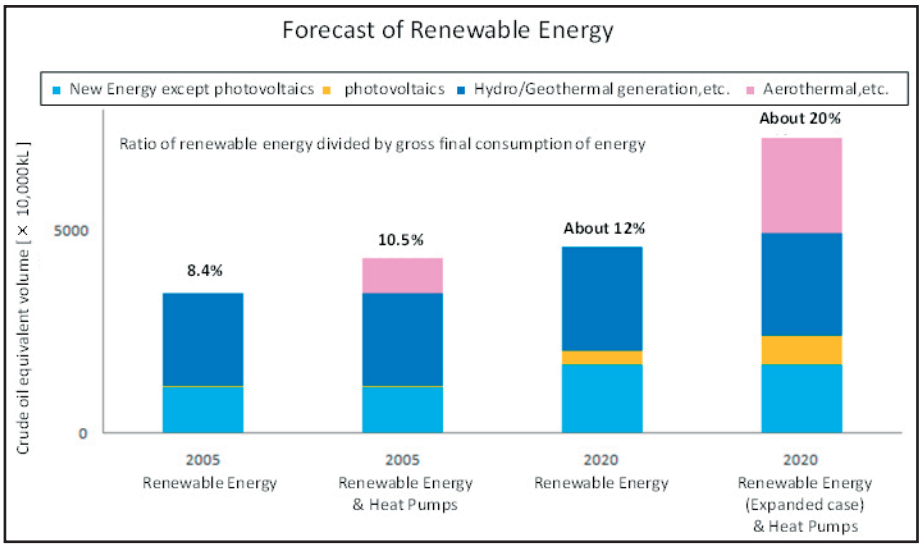

Fig.4 Forecast of Renewable Energy

Impact from future improvements in heat pump technology

The Cool Earth-Innovative Energy Technology Program published by METI in 2008 presents a roadmap for the development of an "Ultra high-efficiency heat pump". In the road map, SPF is targeted at 1.5 times more by 2030 and 2 times more by 2050 than current figures, while initial cost is set to be reduced by 3/4 by 2030 and 1/2 by 2050 in comparison to current levels. The Japan Society of Mechanical Engineers drew up its JSME Technical Roadmaps, which estimate improvements in energy consumption efficiency (Fig.6) as a result of breakthroughs in technology (Fig.5). It is estimated that APF willsurge from 3 to 6 owing to technology breakthroughs. We expect a 25 per cent increase in aerothermal energy consumption if we reach APF 6.

2001～2010	・Development of CO_2 refrigerant Heat Pump Water Heater
	④ High-efficiency ejector cycles
	⑤ Optimum design of high-efficiency. Small-size DC motors
	⑥ SiC power devices
	⑨ Vacum heat insulators
	⑬ Utilization of underground heat
2010～2020	① High-efficiency refrigerant circuit design technology
	⑥ High-efficiency matrix converter
	⑫ Exhaust heat recovery
	⑩ Load forecast control
	⑬ Using solar heat panels together
	① Advanced refrigerant control technology
	② Further size reduction using surface tension
	③ Micro-channel type heat exchangers
	④ Power recovery compressors with integrated expanders
	⑬ Decompressed-boiling solar panel evaporators
2020～2030	① Development of new refrigerant
	⑤ Next-generation sensor-less PM motors
	⑨ High-density thermal storage and latent thermal storage
	① Water refrigerant double-bundle condenser hot water supply systems (heat recovery systems)
	⑫ Heat recovery from wastewater

Reference ① ~ ⑬

① Improvement of high-performance refrigerant technology
② Improvement of gas/liquid separator technology
③ Improvement of heat exchanger technology
Reducing air resistance of heat exchangers and improving heat transmission of fins and heat transfer pipes
④ Improvement of expansion valve technology
Improving efficiency and recovering expansion power
⑤ Improvement of motor technology
⑥ Improvement of inverter technology
⑦ Improvement of compressor technology
Reducing mechanical losses and internal leak losses, increasing compression ratio, increasing capacities, and reducing noises
⑧ Improvement of fan technology
Improving efficiency and reducing noises
⑨ Improvement of hot water storage technology
⑩ Improvement of control technology
Quantity control, outlet temperature control, thermal storage and radiation control, and defrosting control
⑪ Improvement of simulation design technology
⑫ Improvement of waste heat utilization technology
⑬ Improvement of hybrid technology

Fig. 5 Technology Breakthroughs

Conclusions

Most of the energy consumed by individuals is used to meet the demand

for heating.
In order to maintain a sustainable society, there is a need to shift as far away as possible from finite fossil fuel energy toward renewable energy. Heat pumps help increase the proportion of renewable energy consumption and can be applied not only to heating, cooling and hot water supply for domestic and commercial buildings but also to heating PVC greenhouses in agriculture and to industrial processes. Slowly but surely heat pumps are being acknowledged as renewable energy in Japan as in the EU. However, in foreseeable future, we can expect many other countries to acknowledge heat pumps, e.g. through discussions at the International Renewable Energy Agency, IRENA.

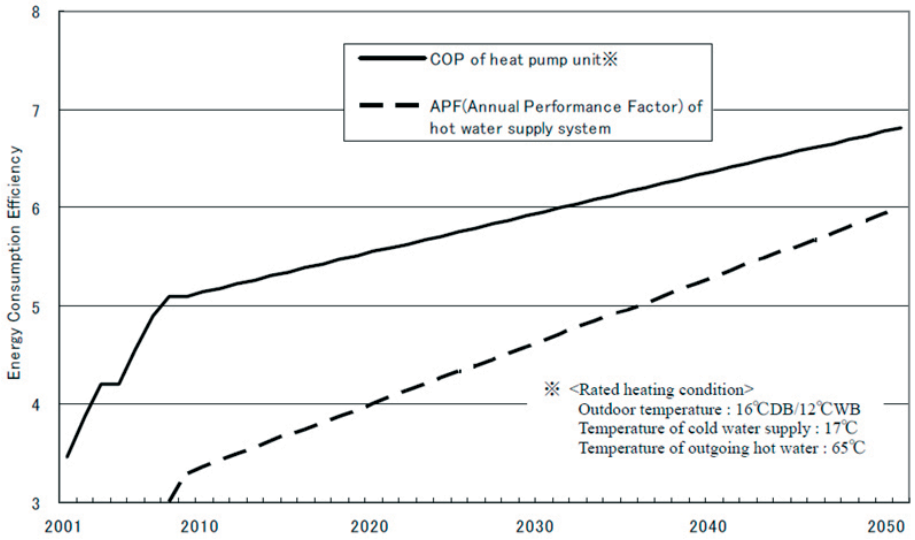

Fig. 6 Energy Consumption Forecast

Reference

[1] The Japan Refrigeration and Air Conditioning Industry Association
[2] Office of Prime Minister
[3] The Council on Economic and Fiscal Policy

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Heat Pump Efficiency? Measured!

A new IEE project on seasonal performance factor and monitoring of heat pump systems in the building sector (SEPEMO-Build) has begun

Thomas Nowak, EHPA & SEPEMO

The background

Heat pump technology can be used to efficiently heat and cool buildings as well as to provide domestic hot water. It does so by using renewable energy from air, water or ground with an additional need for electric or thermal energy to operate the unit. Heat pumps can be employed in all kinds of buildings – from individual residential homes to office buildings and even factories. The use of heat pumps offers a tremendous potential for energy savings and emission reductions. On average, heat pumps can cut CO_2 emissions by 50%. The technology's benefits are a perfect match for the EU targets for the more widespread use of renewable energy, emission reductions, energy efficiency and supply security. The technology is proven, available and reliable. The only limit to exploiting the potential immediately is the need for stronger support in the development of its market.

In order to make use of the maximum impact of heat pumps, it is of key importance that units are highly efficient and that they are designed and installed by trained installers.
The current European market is around 600,000 sold units in 2008; the market has been expanding by an average of 30% per year since 2003. It is of the utmost importance that installed HPs perform optimally, since bad installations could negate much of the energy saving potential. Measurements by independent testing institutes – in accordance with European Standard EN 14511 – show that HP units in themselves are very efficient (high COP). However, system efficiency inside buildings will only be as good as the design. Influencing factors are the energy demand of the building, the type of heat distribution system used, climate conditions and user behaviour, as well as the quality of the installation.

The project

As little is known about the direct relation of measured COP values and systems efficiency in different European regions , one part of SEPEMO focuses on the development of a harmonized approach to the execution of field measurements in Europe. This method will be developed in cooperation with several partners from industry currently involved in carrying out such measurements. If successful, this method will contribute greatly towards measurement comparability. Methodology development will be followed by a 1-year field measurement study. This experiment will measure about 44 heat pump installations using geother-

mal, hydrothermal and aerothermal energy sources. As measurements of air-source units have rarely been performed in the past, the results will be particularly important.

Installations are in located in all participating countries, thus covering all European climate zones. Evaluation of results will be used to improve both the measurement approach and the installed systems. Lessons learned from this task will be used to contribute towards overall systems optimization and installer training.

The second main SEPEMO goal is also directly related to measurements , i.e. the development of a calculation method for the seasonal efficiency of heat pump systems (often referred to as SPF) that can be used towards estimating the RES contribution of heat pumps in European energy statistics. This part of the project is planned to finish early enough to provide some input to the implementation of the RES Directive by the Member States of the EU.

This method could also be used to support installers in their daily work by enabling them to predict the efficiency of heat pump installations before they are installed. It could also prove beneficial in supporting manufacturers and legislators in the development and implementation of labelling and public support schemes. As such, there is a link to current developments in the finalisation of the implementing measure on the Eco-design of energy consuming products (Lot 1: boilers including heat pumps). Overall, the project is designed to provide a better understanding of the relation between heat pump units and heat pump system efficiency with a particular focus on factors influencing the latter. European field tests of heat pumps installations will be performed on the basis of a joint measuring approach. Results will most likely have an impact on current policy making. Indirectly, the results are expected to positively influence the quality of heat pump systems leading to a more widespread use of this technology.

The project team

The SEPEMO project is coordinated by SP – Technical Research Institute of Sweden. It has 10 partners from 7 countries, a budget of Euro 1.5 million. and a duration of 36 months (starting 01 June, 2009). It is supported by the Intelligent Energy Europe programme.

Input to the project is gathered through participants and their professional networks. These networks will also be used to disseminate the results. Special attention is paid to those professional groups crucial for market development – installers, heating engineers, architects – as they represent a grey area between supply and demand. . New players in the market are Energy Service Companies. These groups are targeted in individual events.

More information can be found at www.sepemo.eu

Technology Roadmap: Wind Energy
We are pleased to provide a free link to the latest IEA work on wind energy:
Technology Roadmap: Wind Energy

What steps are needed to facilitate the major energy technology transitions required if climate and energy security issues are to be addressed? What should our priorities be in the near term?
Source: www.iea.org

Energy Statistics of OECD Countries – 2009 Edition
This volume contains data on energy supply and consumption in original units for coal, oil, gas, electricity, heat, renewables and waste. Complete data are available for 2006 and 2007 and supply estimates are available for the most recent year (i.e. 2008). Historical tables summarise data on production, trade and final consumption. The book also includes definitions of products and flows and explanatory notes on the individual country data.
Source: www.iea.org

Energy Balances of OECD Countries – 2009 Edition
This volume contains data on the supply and consumption of coal, oil, gas, electricity, heat, renewables and waste presented as comprehensive energy balances expressed in million tonnes of oil equivalent. Complete data are available for 2006 and 2007 and supply estimates are available for the most recent year (i.e. 2008). Historical tables summarise production, trade and final consumption data as well as key energy and economic indicators. The book also includes definitions of products and flows, explanatory notes on the individual country data and conversion factors from original units to energy units.
Source: www.iea.org

Electricity Information 2009
Electricity Information provides a comprehensive review of historical and current market trends in the OECD electricity sector, including 2008 preliminary data. This reference document brings together essential statistics on electricity and heat. It therefore provides a strong foundation for policy and market analysis, which in turn can better inform the policy decision process toward selecting policy instruments best suited to meet domestic and international objectives.
Source: www.iea.org

Renewables Information 2009
Renewables Information provides a comprehensive review of historical and current market trends in OECD countries. This reference document brings together essential statistics on renewable and waste energy sources. It therefore provides a strong foundation for policy and market analysis, which in turn can better inform the policy decision process to select policy instruments best suited to meet domestic and international objectives.
Source: www.iea.org

Energy Statistics of Non-OECD Countries - 2009 Edition
This volume contains data for 2006 and 2007 on energy supply and consumption in original units for coal, oil, gas, electricity, heat, renewables and waste for over 100 non-OECD countries. Historical tables summarise data on production, trade, final consumption and oil demand by product. The book includes definitions of products and flows and explanatory notes on the individual country data.
Source: www.iea.org

Energy Technology Transitions for Industry – Strategies for the Next Industrial Revolution,
Industry accounts for one-third of global energy use and almost 40% of worldwide CO2 emissions. Achieving substantial emissions reduction in the future will require urgent action from industry. What are the likely future trends in energy use and CO2 emissions from industry? What impact could the application of best available technologies have on these trends? Which new technologies are needed if these sectors are to fully play their role in a more secure and sustainable energy future?
Source: www.iea.org

World Energy Outlook 2009
What will the credit crunch and economic recession mean for energy markets? Will investment cutbacks lead us towards a supply crunch a few years down the line? How could the transition to a clean global energy system be financed?
These are just three of the questions that World Energy Outlook 2009 addresses. Incorporating recent developments in energy and environmental policy, this year.
Source: www.iea.org

2010

10–11 March GEOENER 2010
Madrid, Spain
www.geoener.es/pages/geoener-english.html

14–17 March IIAR 2010 Industrial Refrigeration Conference & Exhibition
San Diego, CA, USA
https://www.iiar.org/conferences/exhibitinfo.cfm

15–17 March 10th China International Heating, Ventilation and Air-conditioning Expo (CIHE & HVAC 2010)
Theme: Reducing Building Energy Consumption, Promoting Energy-saving & Emission Reduction
Beijing, China
www.cihe-hvac.com/en

22–26 March EU Sustainable Energy Week
http://www.sustenergy.org/tpl/page.cfm?pageName=home

23–27 March Mostra Convegno Expocomfort
Milan, Italy
www.mcexpocomfort.it/en/aspx/ShowFolder.aspx?idFolder=156

29–31 March 1st IIR Conference on Sustainability and the Cold Chain
Cambridge, UK
www.ior.org.uk/ior_general.php?r=2BEYI4EPAE

In the next Issue

The role of heat pumps in future energy systems

Volume 27 - No. 4/2009

International Energy Agency

The International Energy Agency (IEA) was established in 1974 within the framework of the Organisation for Economic Co-operation and Development (OECD) to implement an International Energy Programme. A basic aim of the IEA is to foster co-operation among its participating countries, to increase energy security through energy conservation, development of alternative energy sources, new energy technology and research and development.

IEA Heat Pump Programme

International collaboration for energy efficient heating, refrigeration and air-conditioning

Vision

The Programme is the foremost worldwide source of independent information and expertise on environmental and energy conservation benefits of heat pumping technologies (including refrigeration and air conditioning).

The Programme conducts high value international collaborative activities to improve energy effi ciency and minimise adverse environmental impact.

Mission

The Programme strives to achieve widespread deployment of appropriate high quality heat pumping technologies to obtain energy conservation and environmental benefi ts from these technologies. It serves policy makers, national and international energy and environmental agencies, utilities, manufacturers, designers and researchers.

IEA Heat Pump Centre

A central role within the programme is played by the IEA Heat Pump Centre (HPC). The HPC contributes to the general aim of the IEA Heat Pump Programme, through information exchange and promotion. In the member countries (see right), activities are coordinated by National Teams. For further information on HPC products and activities, or for general enquiries on heat pumps and the IEA Heat Pump Programme, contact your National Team or the address below.

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