

EHPA NEWS

This newsletter describes the status of various directives under discussion within the EU and their relevance to heat pump systems. It also reflects on the rising price of oil and gas and the acceptance of renewable energy sources.

Renewable energy directive

The background to this directive was described in our March newsletter. The aspect that has attracted most publicity is the 10% target for biofuels which poses the global dilemma of the competition between food supplies for populations unable to feed themselves and fuel for transport.

In the European Parliament, which is reviewing the Commission's proposal, attention has focussed on the contribution that renewable heating systems can make to the renewable energy target of 20% by 2020. The opponents of heat pump technology question whether these systems can be considered as using renewable

energy sources because heat pumps require auxiliary energy (electricity or less often gas) to run the compressor that concentrates the low grade heat that is present in air, ground or water. They are also concerned that inefficient heat pump models may use more primary energy than concentrate renewable energy.

While EHPA welcomes the fact that the RES-Directive is focussing on final energy, it suggests a general criterion, in line with the stated argument, that will allow heat pumps to contribute to savings in primary energy. It believes that all heat pumps should qualify as renewable provided that the exhaustible (non-renewable) primary energy input is less than the final energy output. This is in our opinion a simple principle, which will be easy to implement at the national level (See Figure 1). This will recognise the principal advantage of heat pump systems which is to concentrate renewable energy present in the air, water or ground to provide useful energy in the form of heating and cooling for buildings.

EHPA believes that in future all heat pump models will comply with this minimum efficiency requirement which will ensure that heat pump systems will supply significant amounts of renewable heat so contributing to the reduction in greenhouse gas emissions.

Impact of legislative initiatives

The two other directives which will encourage the use of renewable energy sources are listed in Table 1 together with their status. The EHPA believes that the minimum energy efficiency requirement on a seasonal basis should be incorporated into the eco-design regulation for heating systems.

Figure 1: Renewable criterion for heat pumps

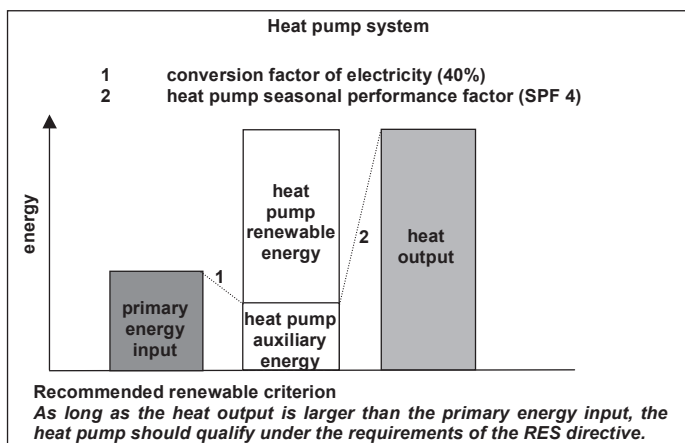


Table 1: Additional directives that encourage the use of renewable energy sources

	Status	Requirement	Comment
Eco Design of energy using products 2005/32/EC	Regulation for heating systems under preparation Final vote foreseen for autumn 2008	Proposed: from 2011 onwards, all small central heating systems must reach a primary energy efficiency of at least 56% (label class D)	Proposed that heat pump systems operate with an efficiency (seasonal performance factor) of greater 2.5 when using electricity with an assumed primary energy conversion efficiency of at least 40%
Energy end-use efficiency and energy services directive (2006/32/EC)			The current EU average conversion efficiency is approx. 48% with individual countries showing significant differences.

Air source heat pumps

The EHPA recognises the benefits that all types of heat pumps contribute to renewable energy sources. Arguments against air source heat pumps are based on the fact that heat demand increases with decreasing outside temperature. When the air temperature drops so does the efficiency as the temperature difference between source and sink ('uplift' temperature) increases. This affects the economics and carbon emissions rather than the principle of concentrating low grade heat. In moderate climates air source heat pumps are efficient devices to provide heating and cooling from renewable energy whilst recent technological advancements in combination with improved building envelopes have made their use in cooler climates more efficient – both from a primary energy and an economic perspective.

So the EHPA reaffirms that the renewable energy contribution of ALL sources of heat pumps should be included in calculating a Member State's renewable energy target provided that they comply with the stated renewable criterion.

Status of directive

The proposed Directive on the promotion of the use of energy from renewable sources (RES-Directive) was published on 23rd of January, 2008 by the European Commission. In the meantime several bodies have discussed it and it is currently the turn of the Committee of the European Parliament on Industry, Research and Energy (ITRE) to prepare and present an opinion to the whole Parliament. A preliminary report by the rapporteur of this committee, Mr. Claude Turmes (Greens, Luxemburg) is available as well as several explanatory documents listing more than 1000 amendments which have been tabled. Due to the complexity of organizing the final document, the vote in the ITRE committee has been postponed to September.

As this Directive is legally based on the co-decision process it requires approval of Council of Ministers and the Regions to be adopted. Discussions in the Council are currently taking place.

EHPA has discussed the Directive and its impact on the heat pump market with several actors involved. Our initial perception is mixed: We have received a lot of support from prominent MEPs that see heat pumps as a promising technology and as a contribution in the effort to reach the 20–20–20 targets. We have also seen critique that is mainly based on the fact that heat pumps require auxiliary energy.

In our current effort to achieve positive support towards our position, we continue to address the concerns of various MEPs and Member State representatives. We need to ensure that there is an understanding at political level that heat pump technology can contribute towards the renewable energy targets contained in the proposed

RES directive. Excluding this technology from the renewable energy options will only increase the pressure on the other technologies which may be less efficient and more expensive.

Key messages of EPHA communication

- All types of heat pumps use renewable energy from air, water and shallow ground and therefore they should be included in the Directive.
- As long as the final energy output from the heat pump is GREATER than the exhaustible (i.e. non-renewable) primary energy input required to operate the unit, they save primary energy. (This process can be used indefinitely in the future. It is renewable!)
- The Directive shall set a single threshold efficiency for those heat pumps that are to be included in the contribution to the renewable energy target of each Member State. This criterion shall be related to the seasonal performance factor of the heat pump system and the reciprocal of the average electricity conversion efficiency.
- The Directive should foresee a European Certification Scheme for the education and training of heat pump installers and employees of drilling companies.
- Certification should be transparent and in line with European Norms such as EN 17 024. It should be available to all installers of renewable energy heating systems. This would include biomass, heat pump, solar photovoltaic and solar thermal installers, installers of horizontal or vertical heat collectors (that is drilling and construction). The certification should include proof of the successful installation of biomass boilers or stoves, heat pump systems, solar photovoltaic or solar thermal installations by the installer (cf. amendments 4 to 9 of directive)
- The Directive should take a future orientated perspective and the requirements set in the Directive should consider that electricity will be largely de-carbonized (as foreseen by Eurelectric in their report »The role of electricity in a carbon constrained world«) and that heat pump systems will be subject to efficiency improvements.

Rising price of oil

The price of oil has risen steadily since 2002 and is now a factor of 6 higher. The reason behind this price increase is associated with the decline in some of the major oil provinces including the North Sea and the north slopes of Alaska. In fact of 100 oil producing countries, some 60 have experienced their peak production and are in decline.

The most recent calculations are by Colin Campbell who also wrote the key paper with Jean Laherrere in Scientific

American in January 1998. His predictions show that the world's oil supply is close to peaking whilst demand is continuing to rise and this is the prime cause of the steep rise in price.

However, the inability to meet the demand will get progressively worse as the supply is predicted post peak to decline by 3–4% per year. So the oil price will continue to rise and the Chair of Gazprom, the principal Russian gas supplier, is predicting \$250/barrel by the end of 2009.

Switch to gas

This can only be a short term solution as the world's gas production will peak within 15 years. Any large scale switch from oil to gas will simply bring forward the peak in the world's gas supply.

Most sustainable heating solution

This will involve heat pumps as they provide the most efficient heating/cooling system. Unlike other energy efficient technologies which still require development, heat pumps are a mature technology with a large variety of models and capacities. Improvements in efficiency are still possible as the Sherpha project has demonstrated (see November 2007 issue). The price of electricity is rising much slower than that of gas or oil because it can be produced by various sources as can be seen in Table 2.

Table 2: Projected costs of gas and electricity due to rising oil prices

Year	oil (\$/bbl)	gas (€cents/kWh)	Electricity (€cents/kWh)	Electricity/gas
2002	20	2.2	10	4.5
2007	100	4.4	15	3.5
2012	200 (?)	8.0	20	2.5

Such price rises will make heat pump systems much more cost effective than fossil fuel boilers as is illustrated in Table 3. It can be seen by the time the oil price reaches \$200/barrel, the benefit to the consumer could be as high as €380 per year for the average EU household.

Table 3: Potential savings per household per year

Heat source	Efficiency (%)	Annual energy demand (MWh)	Annual 2002	Cost 2007	(€) 2012
Gas	90	11	242	484	880
Heat pump/ electricity	400	2.5	250	375	500
Difference			+8	-111	-380

The corresponding savings in carbon are illustrated in Table 4.

Table 4: Potential savings in CO2 emissions per household per year

Heat source	Annual energy demand (MWh)	CO2 emissions (kg/kWh)	CO2 emissions per year (tonnes)	Reduction compared with oil
Oil	14	0.28	3.9	–
Gas	11	0.19	2.1	1.8
Heat pump electricity	2.5	0.44	1.1	2.8

So if heat pumps were installed in 1,000,000 homes (as the UK plans to do by 2020), then the annual carbon savings would be about 3 million tonnes which is a considerable benefit to society and to reducing global emissions of greenhouse gases.

Geothermal 2008

The extension of the Geothermal exhibition and conference in Peterborough to cover ground source heat pumps was a great success. For the first time heat pumps have found a suitable forum for raising awareness of the potential benefits of such heating and cooling systems. Also on display were a very wide range of equipment for geothermal drilling including dedicated rigs for drilling and lining boreholes up to 100 metres in depth.

Karl Ochsner (EHPA chair) gave a talk on carbon dioxide ground loops in which the collector fluid is carbon dioxide rather than brine and Rayner Mayer described recent developments in heat pump systems.

UK renewable energy strategy consultation

The Department for Business Enterprise and Regulatory Reform published the UK strategy consultation document on 26 June 2008. This sets out options as to how the UK will meet its target of 15% renewable energy by 2020 starting from the current level of 1.5%. This will require a ten-fold increase over a period of 12 years and could require an annual investment of up to £8 billion/year until 2020.

The 2007 total of 25 TWh/year is divided into heating, transport and electricity as shown in Table 5 and is required to rise to 265 TWh by 2020 in order to meet the UK RES target.

Table 5: Existing renewable energy production in UK and projected by 2020

	2007 (TWh)	2020
heating	4	90
transport	2	55
electricity	19.	120

Renewable heating

The projected division between the principal sources in 2020 is illustrated in Table 6 together with the associated resource cost.

Table 6: Projected renewable heating outputs and costs in UK by 2020

	heat production (TWh/year)	resource cost (€ billion)	unit cost (€/kWh)
biomass	40	0.2	0.01
biogas	14	0.9	0.07
heat pumps	11	0.3	0.03
solar heat	25	1.7	0.07

This breakdown shows that heat pumps would contribute 11 TWh. Assuming an average energy demand of 20 MWh per household, this would require the installation of 500,000 heat pumps by 2020, equivalent to a compound growth rate of 40% per year for the next 12 years! By comparison, the installation rate in 2007 is estimated at 2,000 units. The unit heating cost shows that heat pumps are cheaper than biogas or solar heat, but more expensive than biomass. However, large scale use of biomass will have to include the pollution cost associated with transporting the biomass from source to boiler.

Type of heat pumps

The various sources of heat (air, ground or water) are not differentiated in the consultation document. The report makes the following comment about efficiency.

'All heat pumps require electricity to operate and their coefficient of performance (COP) is crucial in determining how much carbon abatement can be achieved by a heat pump. Grid electricity will have been produced from fossil fuels at an efficiency of around 50% or less, so to represent a genuine energy and carbon saving, heat pumps need to have a COP of 2.0 or greater. Typical figures of 3.0-4.0 are quoted implying significant savings.'

Redesign of EHPA Website

The new EHPA website went live just before this year's general assembly in Zurich. The main visible difference is the new logo and top picture representing the three energy sources used for heat pumps. The home page also shows pictures of examples of successful heat pump use. All members are asked to provide input to this data base from their own work.

The navigation structure has been revised in order to better reflect EHPA's main activities: European Heat Pump Statistics, EHPA quality label for heat pumps, and European certified heat pump installer program. A news section, "About EHPA", "Publications and other activities (e.g. projects)" are additional navigation points. Advertising is open to members. The logos are displayed in a random order.

Geothermal heat pumps) – a guide for planning and installing – by Karl Ochsner, 5th edition, Earthscan, 2008

This handbook is one of the few guides in English that describes clearly how to plan, select and install heat pump systems which can provide heating, cooling and hot water. It contains essential information for heating and ventilation engineers and installers and provides sound advice based on many years of practical experience on all aspects of system selection and design. The various types of collector and distribution systems are described in a systematic way together with their respective advantages and disadvantages. It explains how to obtain the highest efficiency from any system including advice on commissioning. The production of domestic hot water is considered either as a by product of space heating or as a separate heating and storage unit. The book ends with a discussion of the options for controlling ventilation and recovery of heat from exhaust air in modern air tight buildings. The book is highly recommended.

EHPA meeting dates:

Quality label Committee:

August 19th to 22nd, Offenbach (DE)

Executive Committee:

September 9th, Brussels (BE); 9.30 to 15.00
September 11th, Brussels (BE); 9.30 to 15.00

Education Committee:

October 30th, Vienna (AT); 9.30 to 16.00

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Next issue: Closing date for contributions to the next issue is 1 September 2008.