



Project

Promotion of efficient heat pumps for  
heating

( ProHeatPump)

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**Deliverable N° 12**

**Report on review and adaptation of guidelines for  
decision on heating with heat pumps for end  
users**

**swb**

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Work Package 6  
Basic guidelines for endusers

**Intelligent Energy**  **Europe**

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## 1 Introduction

Customers behaviour and decisions are influenced by politic statements, trust and neutral information. “Neutral” in this case means independent from manufacturers. The deeper the information goes into detail the less neutral it gets.

There are different drivers for customers to get information about heatpumps

- houseowners should concentrate on decreasing energy costs in a new or existing house “which heating system is the best solution?”
- the technology itself is interesting for technical freaks “how does a heatpump work?”

The survey was based on specimen of end user guidelines from Sweden, UK and Germany. The French partner did not provide any customer related information material. In Bulgaria such material was not available. For this reason the Bulgarian partner took the opportunity offered by ProHeatPump to develop an own end user guideline based on the discussions with the project partners and the material provided from the above mentioned countries as an additional result of the project.

## 2 Guiding material Germany (swb)

Customers in Germany can choose from a broad range of information material. The focus has been laid on neutral material to compare different heating systems to give general information and to enable the customer to the best solution for his specific situation.

In addition every manufacturer has product brochures that are aimed to installers or customers who are technical interested.

### 2.1 Reviewed material

The following neutral material has been reviewed:

- dena (German energy agency)
  - Der Wärmepumpen-Berater (the Heatpump-advisor)
- dena (German energy agency)
  - Wärme aus Erneuerbaren Energien (Heat from renewable energy sources)

- Geothermische Vereinigung (geothermal association)
  - Tipps für Häuslebauer (hints for homeowners)
- ProHeatPump-coordinator swb Netze (self-made leaflet)
  - Die Wärmepumpe – Heizen mit Erdwärme (heatpump – heating with ground source)
- EnergieAgentur.NRW (energy agency of North Rhine-Westphalia)
  - Der Wärmepumpen Marktführer (heatpump market guide)
- HEA (association of efficient energy application)
  - 10 Fragen und Antworten zur Wärmepumpe (10 questions and answers to heatpumps)
- crea (center for rational energy application)
  - two leaflets referring heatpumps including fieldmeasurements and best practice example
- swb
  - Wärmepumpen und swb thermo proNatur (heatpumps and green-electricity)

All reviewed materials recommend to look for neutral energy consultants to get assistance for choosing the adequate heating technology in a certain case. In addition should be assured that there are no gaps between offers from different professions to avoid additional costs during the period of realisation. For further information the companies could be contacted directly or their websites could be explored.

The guidelines from energy agencies include very much information on a general level and are well structured. They are separated in different chapters and give very detailed information that could be important for customers. The customer could decide how much and detailed information he would like to know. The brochures include the following chapters:

- consulting,
- planning,
- financial aspects
- best practice examples
- frequently asked questions

Other reviewed small brochures or leaflets include of course less material but are very good opportunities to get appropriate information referring to customers for

example frequently asked questions or specific hints for a special situation for example how to find experienced installers.

Based on the experiences from the project and the evaluation of the different Guidelines for endusers in Germany as well as on the information from project partners, especially from Sweden an own Guideline has been developed by swb in order to give relevant customer information and guidance for investing in a heat pump. This brochure produced by swb Netze during the ProHeatPump-project has been made for homeowners. It is kept very short and small. An overview of the content of the project is given as well as an answer to the question why the customer should not go to the installer in the first step and better to go to an independent energy consultant before. To clarify this information there are designated different tasks for each of the three target groups (homeowner, energy consultant and installer). Heatpumps are quite expensive in relation to traditional heating systems and in this specific market under strong competition with condensed gas boilers. Beyond this background "green" house owners have been identified as the main target group for heat pumps in Bremen. For this reason swb offers a small grant for a heat pump installation which is coupled with a supply contract on electricity which is certified as produced by renewable energy sources.

The brochure has been developed for the market in the cities of Bremen and Bremerhaven since swb Netze is not active with electricity sales in the target area of Osterholz. Anyhow the brochure will be adapted also to the specific conditions there and given as a project result to local disseminators like installers, local authorities and utilities.

## **2.2 Conclusion**

In Germany there is a lot of information available as well as printed material and via internet. The level of information varies from general overview to detailed and very specific information. The customers should think about how trustworthy the reviewed material is or could be compared to the economical interest of the information source. The customer should start on a general level to collect information. A key problem identified during the project is that the closer it gets to make a decision on investment less neutral is the advice. General information about heatpumps is available from a lot of sources of which most a really neutral. However the most precise information comes from the producers and installers of heat pumps which

are generally driven from a selling position with the intention to contract a new customer. Therefore the challenge was to develop a material which is as detailed as possible but as understandable and looking trustworthy.

### **3 Guiding material Sweden (sp)**

Customers in Germany can choose from a broad range of information material. The focus has been laid on neutral material to compare different heating systems to give general information and to enable the customer to the best solution for his specific situation.

In addition every manufacturer has product brochures that are aimed to installers or customers who are technical interested.

#### **3.1 reviewed material**

This paper summarise the contents from guidelines available for both end-users and installers in Sweden. The material is by no means complete, but it contains information from the most important sources of information for these groups.

The material was collected during November 2008. The following organisations provided material:

- Energimyndigheten (The Swedish Energy Administration)
  - "Villavärmepumpar" (Heat pumps for domestic houses)
  - "Hot and cool, heat pumping technologies for a modern society"
- Energikontor Sydost (Energy advisor, Southern Sweden office)
  - "Trygg med värmepump" (Safe with heat pump)
- Enertech (Manufacturer of Heat Pumps)
  - "Bra att veta innan du skaffar värmepump" (Good to know before you buy a heat pump)
  - "CTC EcoAir" (Product brochure)
  - "CTC EcoPart" (Product brochure)
  - "CTC EcoHeat" (Product brochure)
  - "Solenergi för vanligt folk" (Solar energy for ordinary people)
  - "CTC Värmepumpar" (CTC Heat Pumps)
- NIBE (Manufacturer of Heat Pumps)
  - "Bergvärmepumpar" (Ground Source Heat Pumps)

- “MONTERINGS- OCH SKÖTSELANVISNING FIGHTER 1225”  
(Assembly and maintenance of the Fighter 1225 model)
- IVT (Manufacturer of Heat Pumps)
  - “Din nya värme”, (your new heat)
- Thermia (Manufacturer of Heat Pumps)
  - Stora värmepumpboken (The large heat pump book)
- Svep, Svenska värmepumpföreningen (Swedish heat pump association)
  - ”Att köpa värmepump” (To buy a heat pump)
  - Fakta om vattenvärme (facts about water source heat)
  - Fakta om luftvärme (facts about air source heat)
  - Fakta om värmepumpar och anläggningar (facts about heat pumps)
  - Fakta om bergvärme (facts about GSHP)

The main websites are:

- Manufacturers websites (non-neutral material)
  - Contains product specific material, and information material similar to information sheets.
- SVEP, the Swedish Heat Pump Association. ([www.svepinfo.se](http://www.svepinfo.se))
  - Have contact details on member installers, a discussion forum and information about the conditions in specific communities, in addition to downloadable fact sheets. They also have contact info to the branch operated complaint board.
- The Swedish Energy Administration ([www.energimyndigheten.se](http://www.energimyndigheten.se))
  - A very large site, but when searching for heat pumps, detailed information is displayed, including test results from performance tests on specific products.
- Various energy agencies (e.g. [www.energikontor-so.com](http://www.energikontor-so.com))
  - Also very broad information, but downloadable brochures about heat pumps are often available.
- SP Technical Research Institute of Sweden ([www.sp.se](http://www.sp.se))
  - Test results from tested products , list of certified products according to different labelling schemes, and information on what requirements are set in different labels. A lot of information about ongoing research available, but this is not presented to reach end consumers.

The guidelines were reviewed according to the following criteria for D12:

*Review and adaptation of guideline(s) for decision on heating with heat pumps (target group: end users)*

*Existing material for end users will be reviewed. According to the dissemination activities (Information campaigns / road shows / etc) suitable material will be selected and if necessary redesigned. Additional information will be provided on heat pumps and Renewables (see WP 5).*

*Focus is laid on easy to understand best practice examples, photographs of heat pumps installed in houses, etc.*

## **D12 End user guidelines**

**Manufacturer brochures** focus on three things specifically; economy, reliability and environment, and in that order.

First, the economy, the brochures give a lot of examples on how much you can save as house owner. Less is said on the investment cost, but this is reasonable in Sweden, where there has always been easy to get bank loans for this type of investments.

Reliability is still an important issue, even if the heat pump market in Sweden is very well developed. Most heat pumps are sold with a guarantee on the compressor of at least six years, and a number of installers provide a ten year insurance for the whole system. Lots of photos and sketches of installations.

**Brochures from the Energy administration** look on the system boundary as well as on the products in itself. They also stress the importance to look after the building envelope before installing a heat pump, since efficiency measures will affect the heat pump performance. The brochures discuss the environmental performance, the possible applications depending on type of house, type of heat pump and climate zone. Typical costs are described, and non-technical issues are described, such as e.g. noise.

**Energy agencies' brochures** are often compilations of material from the heat pump association and the energy administration. Additionally, they list region specific issues that must be taken under consideration.

**Material from the Swedish Heat pump association** is describing the technology itself, application areas (where for example GSHP's have the largest potential), some notes on how the installation is made, typical efficiency figures (SPF), words

on the economy, and some things that should be considered when buying a heat pump. These fact sheets are available for each type of heat pump.

## **3.2 Conclusion**

As a general conclusion, Agencies, energy administration and the HPA have trustworthy information, but generally not very detailed for the end consumer. Manufacturer information is not neutral but detailed, often product specific. Therefore the end consumer has a benefit of reading material from all sources, starting with the more general material from agencies, energy administration and HPA to have a broad picture of what could be a good choice, and to learn what to ask for when approaching installers. Then, manufacturer information is of interest to make a choice between different products. At this stage, information from SP and Energy administration websites is important to give a view of the performance, both regarding capacity and cost performance.

## **4 Guiding material UK (UEDIN)**

This section examines the general material on GSHPs available in the UK largely aimed at end users and the general public. Some are directed at particular market segments – for example, the explanatory page from the *Completing the Loop* project, which was aimed at social housing organisations. Some, like the GSHP page from Heating and Plumbing Central, are aimed at the HVAC or building industries, but are included in this review because they are also informing in general terms an important audience largely unfamiliar with the technology.

The material reviewed here consists mostly of single pages or sets of pages on websites, and print or downloadable leaflets, dedicated to GSHPs. The most substantial item is the 2008 EST booklet *Heat Pumps*.

We have excluded manufacturers and installers advertising material. This is dealt with in PHP.

### **4.1 reviewed material**

Material reviewed:

Heat pump industry organisations:

Heat Pump Association, set of webpages:

- ‘How Does a Heat Pump Work?’  
<http://www.heatpumps.org.uk/HowDoesAHeatPumpWork.htm>
- ‘Types of Heat Pump Systems’  
<http://www.heatpumps.org.uk/TypesOfHeatPumpSystems.htm>
- Heat Pump Applications  
<http://www.heatpumps.org.uk/HeatPumpApplications.htm>
- Facts about Heat Pumps  
<http://www.heatpumps.org.uk/FactsAboutHeatPumps.htm>
- Glossary of Technical Terms  
<http://www.heatpumps.org.uk/GlossaryOfTechnicalTerms.htm>

#### Ground Source Heat Pump Association:

- ‘What are Ground Source Heat Pumps?’  
<http://www.gshp.org.uk/gshp.htm>
- Frequently Asked Questions (list of 22)  
<http://www.gshp.org.uk/faqs.htm>
- *Introduction to Ground Source Heat Pumps* (print and downloadable leaflet 2pp.)

#### Other industry organisations:

- Institute of Domestic Heating and Environmental Engineers (IDHEE):  
<http://www.idhee.org.uk/renewables/index.html>
- Heating and Plumbing Central:  
<http://www.heatingcentral.com/boilers/plumbers/heat-pumps>

#### Public energy and similar agencies:

##### Energy Saving Trust:

- *Renewable Energy Fact Sheet 5: Ground Source Heat Pumps* (print and downloadable leaflet 2pp.)
- <http://www.energysavingtrust.org.uk/Generate-your-own-energy/Types-of-renewables/Ground-source-heat-pumps>
- *Heat Pumps: a Guide for Householders*, 2008 (print booklet, 13pp.)

#### Multi-technology suppliers:

##### Greenworks:

<http://www.greenworks-energy.co.uk/ground-source-heat-pump.php>

Projects:

Completing the Loop, 'About GSHPs'

[http://www.completingtheloop.org.uk/about\\_GSHPs.htm](http://www.completingtheloop.org.uk/about_GSHPs.htm)

Consumer agencies:

Which (Consumer Association):

<http://www.which.co.uk/advice/home-heating-systems/ground-source-heat-pumps/index.jsp>

Most of the items cover the issues briefly but reasonably comprehensively: operation; types of HPs and applications; environmental benefits; and availability of subsidies. Most point to the cost structure – high capital costs but low running costs. A few stress system design considerations like sizing.

The items vary in clarity, but most are pitched appropriately for their intended audiences, and many point to sources of more detailed technical information and explanations, in the form of FAQ pages or the more specialised websites of other organisations.

The items from HP organisations not surprisingly stress the efficacy, cost-effectiveness, and environmental benefits in very positive terms, and claim the technology is proven or increasingly popular.

Items independent of HP interests, like the Which page, list both pros and cons, but the latter largely concern limitations on the applicability of HPs. In particular, they often suggest that HPs are 'generally only suitable for', or 'recommended for' particular categories of dwelling such as new build detached houses.

Almost none of the items reviewed consider the process of installation other than in a technical sense, nor from the point of view of users, other than to point them to lists of accredited installers.

In particular, the items do not address, and the writers do not appear to have taken into account even implicitly, the key issues that we have identified as affecting consumer confidence and as deterring those considering GSHPs – besides, that is, the capital costs:

- the difficulty of obtaining impartial information and especially payback times and performance evaluations based on actual rather than hypothetical operation, and the possibility that claims made by suppliers and advocates are exaggerated;
- having to deal with multiple parties when coordinating an installation;
- getting a full and firm costing for the entire project and avoiding hidden or unpredicted extra costs.

The exception [1.9 & 1.10] is the EST booklet Heat Pumps, which has useful sections on 'Controlling costs', 'Maintenance', and 'What to look for in an installer'.

Aside from the material considered here, there are however many more mentions of GSHPs, alongside other options, in more general webpages or leaflets about energy saving in homes, renewables, microgeneration, etc. GSHPs are also mentioned and discussed in many other information sources which are accessible to users, the wider public and relevant occupations – particular web forums on energy, environment and sustainability issues. Here the information and views presented are not as easily controlled by GSHP interests. They may be however be just as important sites in which to intervene to present arguments for the technology, to counter opposition or misinformation, and to avoid creating an impression of disputes, inconsistencies and divergent ideas of best practice among experts – not least because the audiences include interested householders and others seeking more information. In particular, we have observed that the common dismissals of GSHPs – on the grounds that their energy, economic and carbon benefits are illusory or overstated – often feature in web forums.

## **4.2 Conclusion**

There is a considerable amount of information available in the UK aimed at potential users and others seeking basic introductory information, and with a few exceptions it is adequate and appropriate and points to sources of more detailed information. There is little active dissemination of the material, however, and most requires its audiences actively to look for it. Given that much of the residential market in the UK is composed of environmentally aware self-builders or renovators who are likely to look actively for information from multiple sources, this is not currently a problem, and the crucial need is to ensure these enquirers are given satisfactory answers, adequate pointers to other sources, and the necessary contacts, when they reach this introductory material.

We recommend that organisations producing webpages and leaflets on GSHPs examine the EST booklet, by far the most satisfactory as well as comprehensive item we have found, and try to provide condensed summaries of the passages it contains on the issues we have found to be absent in most others [Fehler! Verweisquelle konnte nicht gefunden werden.].

## 5 Guiding material Bulgaria (DLAEM)

As explained in the introduction the Bulgarian partner provided the report in Bulgarian language.

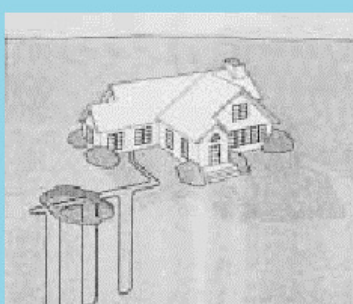
### Принцип на работа, видове, специфики

Термопомпените системи поддържат температурата в различни като квадратура приложения, в съответствие с конкретните изисквания за комфорт, в широк диапазон на изменение на външните атмосферни условия. Принципът на работа на геотермалните термопомпи се базира на постоянната в значителна степен температура на локални участъци от земната кора. През последните години отоплението с термопомпени системи става все по-актуално. На пазара в страната вече се предлага значително разнообразие от термопомпени системи - родно производство и внос. Би могло да се твърди, че термопомпените системи представляват технически и ценово ефективна алтернатива на традиционно използваните отоплителни и климатични технологии. Според историческите сведения най-старата земно свързана термопомпа в Европа е монтирана през 1937 г. и до днес отоплява кметството на град Цюрих. Сред страните с най-широко използване на термопомпи са Швеция, Швейцария, Австрия, Норвегия, Канада и др. През последните години терминът земно свързани все повече измества наименованието геотермални, за да се подчертае принципната разлика между термопомпите и системите, захранвани от горещи подземни и открити водоизточници.

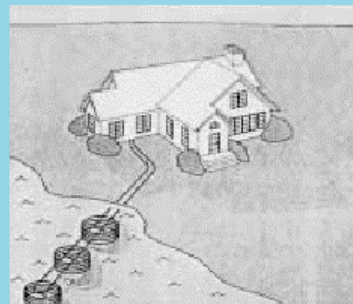
Термопомпите стандартно работят при температура на земните пластове и водата в диапазона от 8 до 15°C.



Фиг. 3.



Фиг. 4. Земносвързана затворено-контурна система вертикално изпълнение.



Фиг. 5. Затвореноконтурна система свързана към воден басейн.

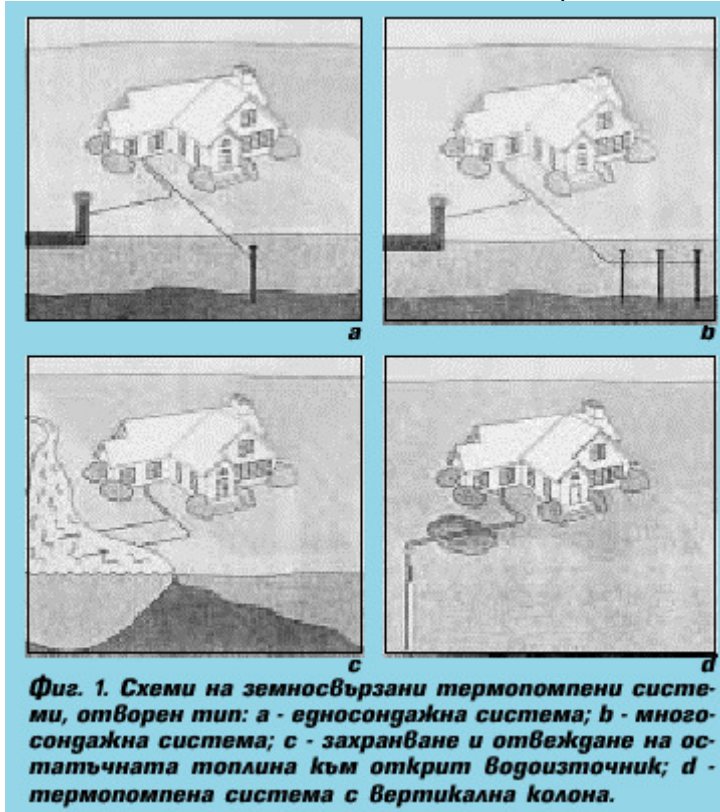
Земно свързаните термопомпи представляват автономни системи с електрическо захранване, които изпълняват комбинирано функциите - отопление, климатизация и производство на битова гореща вода. Принципно системите са изградени от пластмасови тръби с висока износостойчивост. В зависимост от конкретните условия на приложение, като работен флуид в системите циркулира вода или антифриз. За разлика от конвенционалните топло производствени мощности, геотермалните термопомпени системи абсорбират топлина от едно място и я пренасят към друго.

Режимът, в който работят помпите е реверсивен. Ефективната им работа, независеща от сезонните промени във външната температура се обяснява с

постоянната температура на земните пластове, респективно водата. През лятото термопомпите работят като климатици - извличат топлината от помещенията, предават я на работния флуид, циркулиращ в системата, който я пренася към значително по-студената земна кора.

Сред основните предимства на съоръженията е възможността за използване на остатъчната топлина за производството на битова гореща вода. През зимата топлината, която системите пренасят чрез циркулиращия флуид се предава на въздуха в помещенията. Сред отличителните специфики на геотермалните термопомпи е възможността да отопляват въздуха дори в мразовити, студени дни.

На практика, използвайки съществуващите принципи за охлаждане, термопомпите преместват топлина от по-ниско температурен източник, като въздух, вода или земята към по-високо температурна приемна среда. В зависимост от конкретното изпълнение на помпата като приемна среда се използва вода, въздух или антифриз. Ефективността на една термопомпа се определя като разлика между температурите на източника и средата. Изборът на термопомпена система зависи от спецификите на конкретното приложение.



### Видове термопомпени системи.

Геотермалните термопомпени системи са два основни вида - отворено изпълнение и т.нар. системи затворен контур. Отворените системи (фиг. 1) се отличават с поелементарна конструкция. Изискват сравнително по-ниска първоначална инвестиция. Захранват се с вода директно от различни открити и подземни водоизточници. В практиката от години се използват различни като изпълнение отворени термопомпени системи, захранвани с вода не само от извори и езера, но и от басейни, потоци и дори изоставени мини. Инсталирането на отворени термопомпени системи е свързано с изискването в непосредствена близост до захранвания обект да се намира водоизточник с достатъчен капацитет. Друго важно условие, което трябва да бъде изпълнено е съществуването на налични възможности за реализиране на отворен цикъл за отвеждане на отработената вода (загрята или охладена).

В затворено-контурните термopомпени системи (фиг. 2) през непрекъснато изолирани и зарити в земята тръби циркулира вторичен флуид - вода или водно базиран антифриз. Флуидът отвежда топлина от и към земята. Охлажда сградата, като флуида поема топлината от помещенията, пренася я през системата и я обменя със земята. Затворено-контурни системи, в които хладилния агент циркулира директно по медни тръби зарити под земята са известни под наименованието термopомпи с директно или пряко разширение (direct expansion heat pump). Общ вид на система от този тип е показан на фиг.3. Въпреки, че термopомпите с директно разширение са от най-старите използвани системи за комбинирано отопление и климатизация, през последните години употребата им е намаляла значително. Като основна причина за това се посочва високата прецизност, с която трябва да се направи изчислението и монтажа на подземния кръг, за да функционира ефективно термopомпената система. Системите с директно разширение имат по-висока теоретична ефективност от останалите видове термopомпи със затворен контур, поради изключването на циркулационна помпа от схемата.

В зависимост от конкретното изпълнение на тръбопроводната система, земно свързаните затворено-контурни термopомпи се класифицират като хоризонтални (фиг. 2) и вертикални (фиг. 4). Геотермалните термopомпени системи могат да бъдат свързани и към воден басейн (фиг. 5). Оптималната схема на системата се избира в зависимост от конкретните геофизични условия, в които ще работи термopомпата; площта на отопляваната, респективно климатизирана сграда; изискванията на възложителите и др. фактори. Прецизният анализ включва дори вида на почвата и скалите в района, където ще работи термopомпената система.



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