



Project

Promotion of efficient heat pumps for heating  
( ProHeatPump)

EIE/06/072 / S12.444283

**Deliverable N° 11**

**Simple cost calculator**

**swb**

Work Package 6  
Communication and dissemination

**Intelligent Energy**  **Europe**

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## Task Description:

Objective of this deliverable according to Annex 1 of the project application was the creation of an easy to use calculator on the project website to be provided for end users to stimulate their interest in heat pumps. The calculator shall especially be promoted to the target group e.g. via advertisements in the local/regional press. Responsible for this deliverable is the lead partner swb. In order to avoid double expenditure the project partners decided to use available tools which might eventually be adapted to the project purposes.

## Approach

The first idea was to adapt the following tool which is in use on the RWE WEB site:

The screenshot shows a web browser window with the title 'Eingaben zum Vergleich von Heizsystemen - Microsoft Internet Explorer'. The page content is as follows:

- Header:** 'Eingaben zum Vergleich von Heizsystemen' and the RWE logo.
- Main Instruction:** 'Bitte geben Sie an, wie der Energieverbrauch des Hauses abgeschätzt werden soll:' with two radio buttons: 'Dämmstand des Gebäudes' (selected) and 'Bisheriger Energieverbrauch'.
- General Information (Allgemeine Angaben):**
  - Dämmstand des Gebäudes: 1988 - 1995
  - Bisheriger Energieverbrauch: kWh
  - Hausart: Einfamilienhaus
  - Wohnfläche in m²: 150
  - Wohnheiten: 1
  - Bewohner pro Einheit: 3
  - Etagen: 1
  - Nutzfläche in m²: 180
- Specific Information (Spezifische Angaben):**
  - Jetziges Heizsystem:** Gas-Brennverheizung, Keller, Speicher ohne Zirkulation, Neueinbau, nach 1990, Vorlauftemperatur 50 (Mischsystem).
  - Neues Heizsystem:** Wärmepumpe Sole/Wasser, Technikraum, Wärmepumpe mit Speicher, Neueinbau, nach 1990, Vorlauftemperatur 50 (Mischsystem).
- Footer:** 'Für alle Systeme wird das gleiche Haus angenommen', 'Berechnen' button, and 'Erstellt von lexikon GmbH | Impressum'.

This idea was discussed in various chats and on the project meeting in September in Edinburgh. Due to the important differences between the participating region according to parameters like climatic situation, energy prices, prices for competing energies, subvention systems etc. it became evident, that one unique tool which had just to be translated into the different languages of the project partners would not be sufficient to give serious information to end users in different markets. In any case the tool should also combine the option to adapt all relevant parameters together with the translation.

## 1<sup>st</sup> solution

The Swedish partner Energikontor Sydost offered the option to use an EXCEL tool which is documented in this deliverable. This tool was prepared to be used as an integrated tool in each of the future national chapters of the project WEB site. The technical feasibility of this option has been checked by partner SP who will adapt the tool to the remade WEB site. The partners further on agreed that the tool can only give a brief aid on decision to the end user and would not allow a final analysis as the installer would need. For the latter target group it was decided to prepare a separate more sophisticated tool which shall be made available for download instead embedding it in the surface of the WEB site.

Fuel prices updated as of: Aug 07

**Comparison between different heat sources for heating**

Andra denna siffra och jämför!

Heat demand **20000** kWh/year Comparable to **2,5** m<sup>3</sup> oil or **30** m<sup>3</sup> wood

Source of the calculus are *Energimyndigheten (Swedish energy administration) and Växjö Kommun (Växjö Community)*

ENERGY	Oil	Direct electric	Pellet boiler	Pellet burner	GSHP	Wood	Electric boiler	District heat
Heat content	9.9 MWh/m <sup>3</sup>	1 MWh/ton	4.8 MWh/ton	4.8 MWh/ton		1 MWh	20.000 kWh	20.000 kWh
Net heat demand	20.000 kWh	20.000 kWh	20.000 kWh	20.000 kWh	20.000 kWh	20.000 kWh	20.000 kWh	20.000 kWh
Efficiency	80%	100%	85%	75%	250%	75%	98%	100%
Bruttoenergibehov	25.000 kWh	20.000 kWh	23.529 kWh	26.667 kWh	8.000 kWh	26.667 kWh	20.408 kWh	20.000 kWh
Quantity needed	2,5 m <sup>3</sup>	20.000 kWh/year	4,9 ton/year	5,6 ton/year		30 m <sup>3</sup>		

EKONOMI#	Oil	Direct electric	Pellet boiler	Pellet burner	GSHP	Wood	Electric boiler	District heat
Investment cost	60.000 kr	30.000 kr	80.000 kr	25.000 kr	150.000 kr	95.000 kr	35.000 kr	58.750 kr
Annuity factor	0,0963	0,0963	0,0963	0,0963	0,0963	0,0963	0,0963	0,0963
Capital cost	5.778 kr/år	2.889 kr/år	7.704 kr/år	2.408 kr/år	14.445 kr/år	9.149 kr/år	3.371 kr/år	5.658 kr/år
Fuel price	10,060 kr/m <sup>3</sup>	1,17 kr/kWh	2,481 kr/ton	2,481 kr/ton	1,32 kr/kWh	0,32 kr/kWh	1,17 kr/kWh	0,60 kr/kWh
Annual fuel cost	25.404 kr/år	23.440 kr/år	12.162 kr/år	13.783 kr/år	10.544 kr/år	8.400 kr/år	23.918 kr/år	12.000 kr/år
Other operating costs	900 kr/år		1.000 kr/år	1.500 kr/år	400 kr/år	2.300 kr/år	300 kr/år	2.490 kr/år
Sum operating costs	26.304 kr/år	23.440 kr/år	13.162 kr/år	15.283 kr/år	10.944 kr/år	10.700 kr/år	24.218 kr/år	14.490 kr/år
Total cost (Capital and operating)	32.002 kr	26.329 kr	20.066 kr	17.691 kr	25.309 kr	19.049 kr	27.589 kr	20.148 kr

Lokala prisvariationer kan förekomma. För exakta priser kontakta respektive lokal leverantör. Observera att kalkylen endast ger en fingervisning till hur prisbildningen ser ut. Hur de verkliga kostnaderna blir i DITT hus beror på hur vanor och beteende är, husets kondition osv. Till energianvändningen i exemplet tillkommer hushållselen (vanligen 5.000 kWh/år)

Elpriset är baserat på kostnaden per kWh inkl skatter, avgifter och fasta kostnader, vilka har baserats på ett vanligt hus med 16 A-säkring och en energianvändning på 25.000 kWh/år och det aktuella tillsvidarepriset. (Har du 20 A märksäkning skall du lägga på ca 3,4 öre till på elpriset. Detta tack vare att den fasta abonnemangskostnaden ökar med ca 600 kr/år)

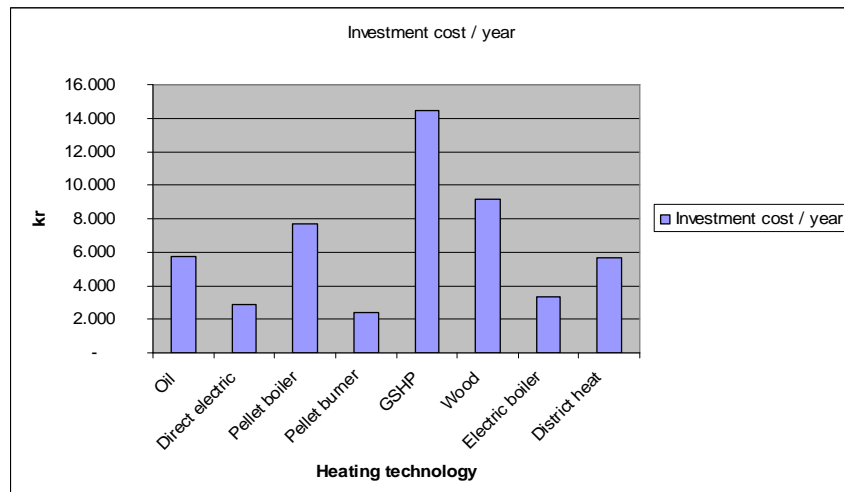
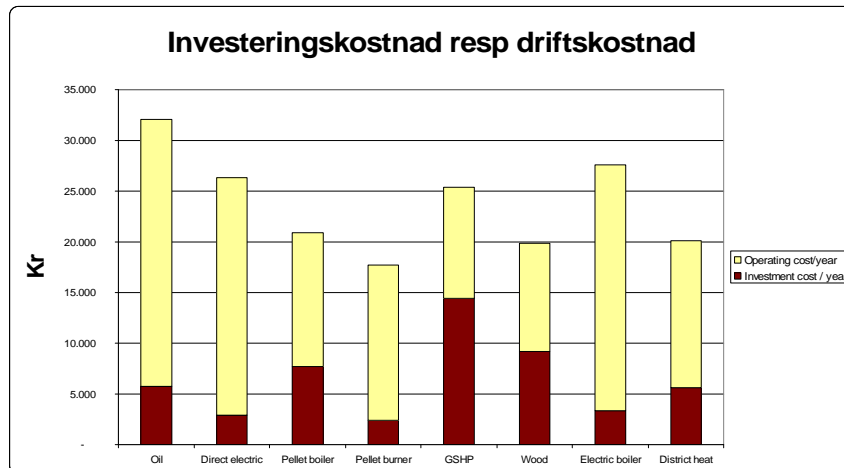
Vid bergvärme är priserna baserade på 20 A märksäkning, vilket är vanligast förekommande.

Tabellen visar årskostnader för investering och drift för ett hus med ett energibehov enligt ovan. Bränslekostnader kan variera lokalt. Kontakta din lokala leverantör. Kontrollera om din värmeanläggning medför ytterligare driftskostnaderna än de som är medräknade i kalkylen (t.ex. byte av keramikplattor i vedpanna vart fjärde år) Investeringkostnaderna varierar beroende på förutsättningar i ditt hus. För en exakt prisbild - kontakta en leverantör. Kapitalkostnaderna är baserade på 15 års avskrivning och 5% ränta. Avsikten med kalkylen är att ge dig en generell bild om skillnaderna i driftskostnaderna mellan olika värmesystem. För mer information - kontakta energirådgivningen i din kommun.

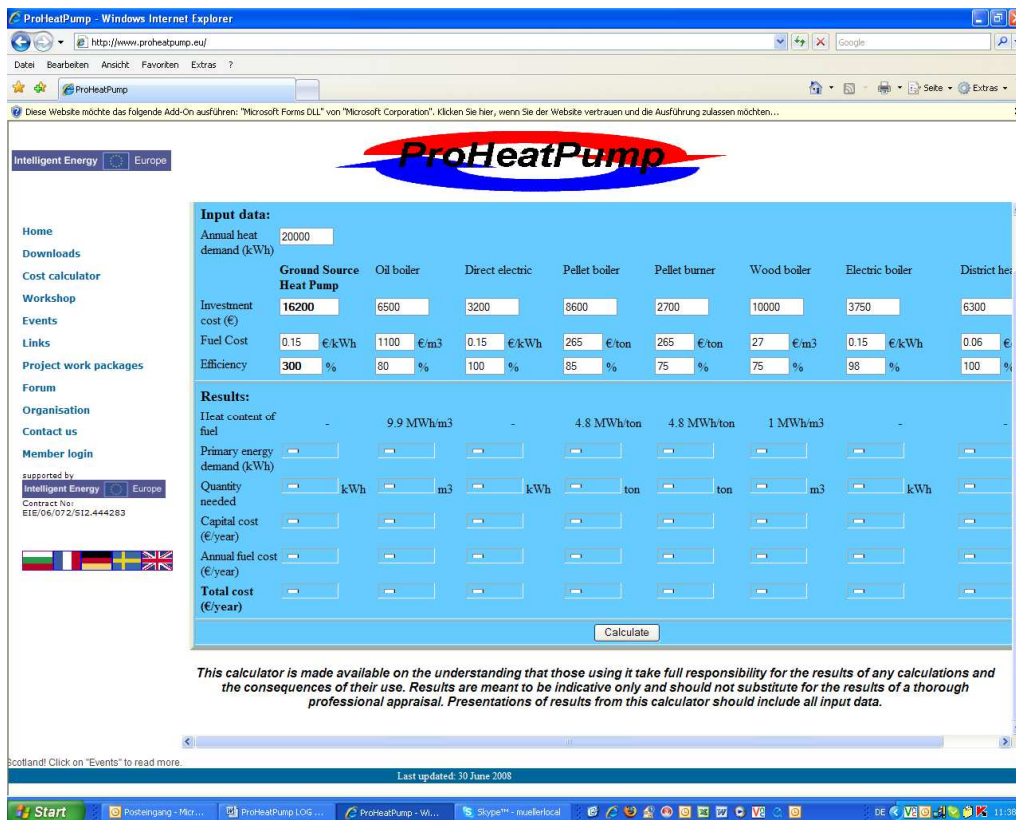
Observera att sotningskostnader är inbakade under övriga driftskostnader!

För Kalmar ser sotningskostnaderna ut på följande sätt:

Primary energy chimney-sweeping per year	Cost per year
Oil	306 kr
Pelletsp	342 kr
Pelletsb	685 kr
Ved konv	1.027 kr
Ved keram	685 kr



Based on this Excel tool the following cost calculator was programmed by the Swedish partner SP in Virtual Basic:



## Revision of the tool in May 2009

Since there was no budget allocated for the production of the Cost Calculator the product which was uploaded in autumn 2007 seemed to be satisfying. With the further development of Internet Browsers the project partners were faced with the problem of restrictions in the usability of the tool. It only worked accurately in some versions of Microsoft Internet Explorer. Other versions only gave partly support to the tool. With Firefox it was even not possible to use the calculator at all. This technical problem was recognized quite late in the project since project coordinator and webmaster did not have problems with using the calculator. A final quality check during the last project meeting in Varna failed, since it was not possible to activate the calculator on the conference computer.

Beyond this background the idea came up to rewrite the calculator in Java Software. Finally it was not clear, if this would help to create a sustainable result which would accurately run also after the end of the project. For this reason the lead partner, who had the contractual responsibility for the creation of the tool decided to reproduce the cost calculator in a state of the art solution for interactive WEB content.

Criteria for the remade Cost Calculator were:

- The tool should work with each state of the art WEB browser
- It should be faster and more comfortable for the user
- The programming should enable the use of the tool at least for the 2 years period after the project during which the WEB site must be on the air without technical problems, even without further maintenance

- The calculator should be embedded in the project WEB site in the context of a re-written user guideline.
- It should be possible to open the tool in each project language from each language version site.
- The skin design of the calculator should be adaptable to each partners local WEB site in the case that the partner wants to use the tool as a ProHeatPump result in his later day to day business to promote heat pumps.

These goals were achieved by using the following technologies:

- The country specific calculations are now based on a MySQL data base. This technology allows adapting the tool easily to country specific needs and calculations and allowing easier correction of mistakes. Also the adaptation to future further development of browser technologies is now easier.
- The reading of input data and the calculation of the outputs is arranged on the server side by PHP technology. This allows a much faster presentation of the data and increases the compatibility to different types of WEB browsers. The tool runs now without necessary plug ins for virtual basic or Active X.
- The additional use of AJAX for programming leads to a further improvement of the presentation quality and the speed to set up the page. The reason is, that AJAX allows reducing the operation on those values which have been changed and avoids the total reload of values which was necessary with the previous technology. Using AJAX starts automatically if the calculator is used by browsers which have activated JAVA.
- The calculator has become interactive also with the browser. It detects the options of the browser and uses automatically the best and fastest way for its operations.

The new cost calculator is available on the WEB site in all languages. The French version has been added in August 2009 since the French partner provided the necessary French version of the user guidelines to the WEB master after the end of the project.

The operation of the new tool is described in the following Annex of this document.

## ANNEX

### User guide for using the online heating cost calculator

This document describes the steps that should be followed to calculate the heating cost for heat pumps and other technologies using the ProHeatPump online heating cost calculator (Figure 1), [www.proheatpump.eu](http://www.proheatpump.eu). The necessary steps to calculate the annual heating cost for different heating options are described below.

#### Input data:

1. Choose the types of heating systems you would like to compare by clicking in the boxes for each technology.

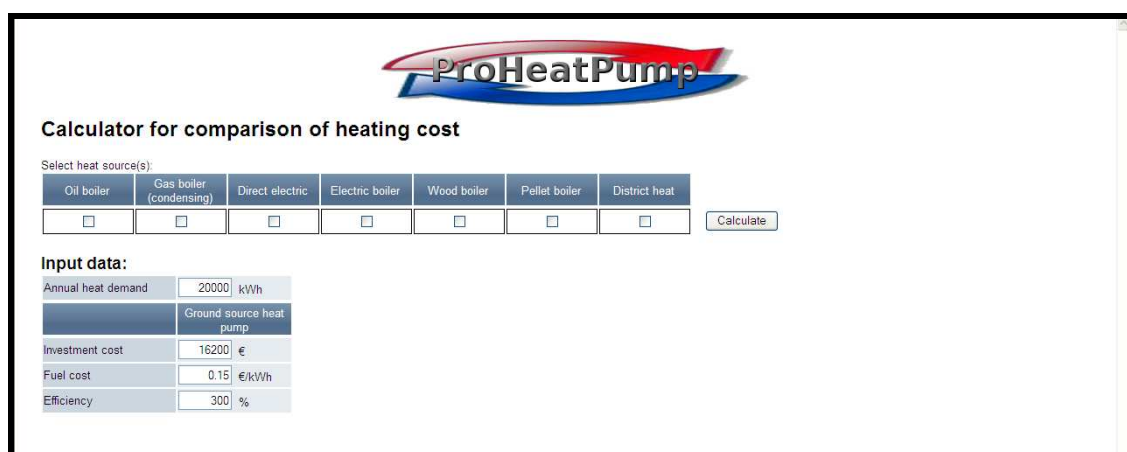
1. The first data needed is the annual heat demand of the house you want to evaluate the heating cost for. This value (in kWh per year) is prompted in the box for “Annual heat demand”.

2. Next, the investment cost (€) for each heating technology is prompted. Default values representing reasonable costs are set as initial values, but the user should use the values given by a local installer. If you are only interested in one or a few technologies, just fill in the data for those technologies and leave the others.

3. Fill in the cost for the fuel. In the case of heat pumps, direct electric radiators and electric boiler, the fuel cost is the cost for electricity. This cost is the total electric cost per kWh, including grid costs and fixed costs.

4. Last, the efficiency for the heating technology is prompted. For heat pumps, the efficiency is the same as the COP/SPF value. This is why the efficiency is expressed as more than 100% in this case. The default values are representative for the technologies, so if you don't have a number from your local installer, use the number set as default.

When these numbers have been entered, press the button “Calculate”.



The screenshot shows the ProHeatPump online heating cost calculator interface. At the top, there is a logo for ProHeatPump. Below the logo, the title "Calculator for comparison of heating cost" is displayed. Underneath, there is a section for "Select heat source(s)" with a table of options: Oil boiler, Gas boiler (condensing), Direct electric, Electric boiler, Wood boiler, Pellet boiler, and District heat. Each option has a checkbox. To the right of this table is a "Calculate" button. Below this is the "Input data:" section, which contains a table with the following entries: Annual heat demand (20000 kWh), Ground source heat pump (checkbox), Investment cost (16200 €), Fuel cost (0.15 €/kWh), and Efficiency (300 %).

Figure 1. The online heating cost calculator.

The calculator then calculates:

- The primary energy demand (the amount of fuel that has to be purchased to meet the heat demand after adjusting for the efficiency),
- The quantity of fuel that has to be purchased annually,

- The capital cost per year<sup>1</sup>,
- The annual fuel cost, and
- The total annual cost for providing the heat.

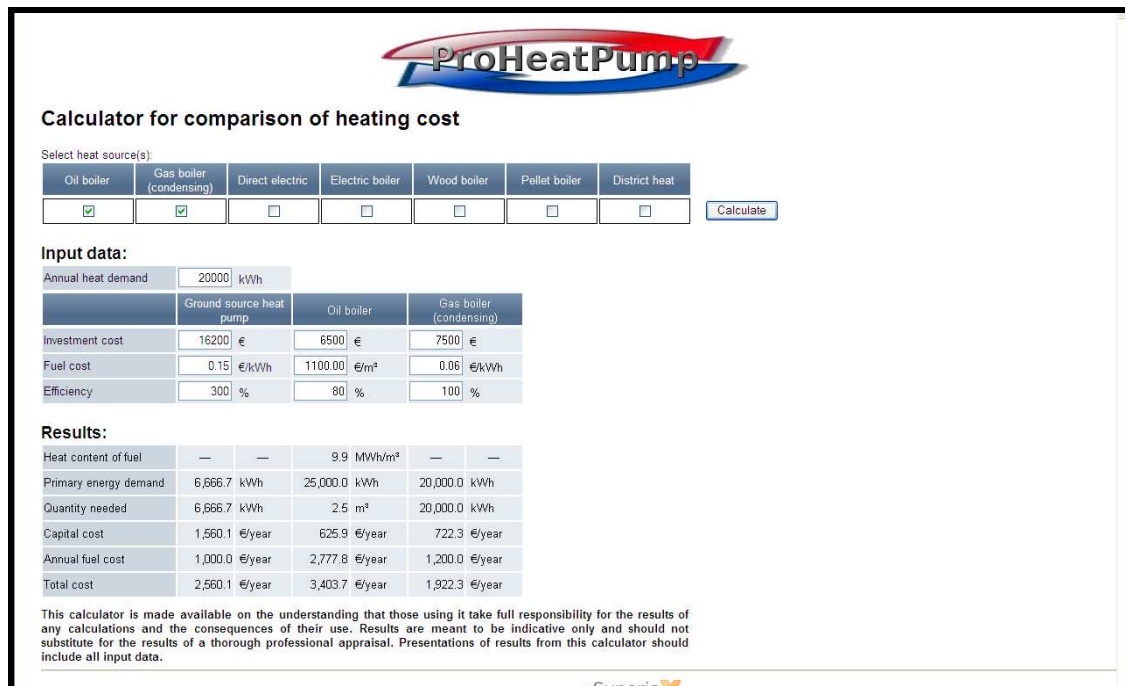


Figure 2. Results are displayed for each heating option that was initially chosen.

## Definitions of the heating options

**Ground Source Heat Pump:** A ground source heat pump producing space heating and domestic hot water is installed.

**Oil Boiler:** An oil boiler is installed in the house. Hydronic heating and domestic hot water production is supplied by the boiler.

**Gas boiler:** A condensing gas boiler is installed in the house. Hydronic heating and domestic hot water production is supplied by the boiler.

**Direct electric:** Heat is supplied to electric radiators and domestic hot water is produced by electric resistance heating.

**Electric boiler:** An electric boiler is installed in the house. Hydronic heating and domestic hot water production is supplied by the boiler.

**Wood boiler:** A wood boiler is installed in the house. Hydronic heating and domestic hot water production is supplied by the boiler.

**Pellet boiler:** A pellet boiler is installed in the house. Hydronic heating and domestic hot water production is supplied by the boiler.

**District heat:** A district heating central is installed in the house. Hydronic heating and domestic hot water production is supplied by district heat.

## Disclaimer

***This calculator is made available on the understanding that those using it take full responsibility for the results of any calculations and the consequences of their use. Results are meant to be indicative only and should not substitute for the results of a thorough professional appraisal. Presentations of results from this calculator should include all input data.***

<sup>1</sup> The capital cost per year is calculated using an annuity factor of 0.0963, representing a depreciation time of fifteen years and an interest rate of five percent. This annuity factor is the same for all heating options in the calculator.

ProHeatPump - Windows Internet Explorer

http://www.proheatpump.eu/

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Input data:

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3. Fill in the cost for the fuel. In the case of heat pumps, direct electric radiators and electric boiler, the fuel cost is the cost for electricity. This cost is the total electric cost per kWh, including grid costs and fixed costs.
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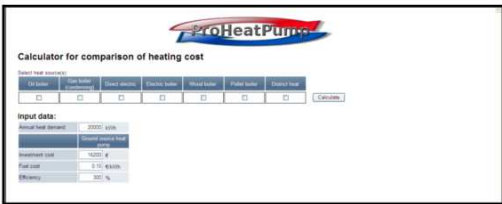


Figure 1. The online heating cost calculator.

Last updated: 6 July 2009

proheatpump calculator - Windows Internet Explorer

http://proheatpump.syneris.com/calculator.html?lang=GB

ProHeatPump

## Calculator for comparison of heating cost

Select heat source(s):

Oil boiler	Gas boiler (condensing)	Direct electric	Electric boiler	Wood boiler	Pellet boiler	District heat
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Calculate

Input data:

Annual heat demand	20000 kWh						
	Ground source heat pump	Oil boiler	Gas boiler (condensing)	Direct electric	Electric boiler	Wood boiler	Pellet boiler
Investment cost	16200 €	6500 €	7500 €	3200 €	3750 €	10000 €	8600 €
Fuel cost	0.15 €/kWh	1.10 €/l	0.06 €/kWh	0.15 €/kWh	0.15 €/kWh	27.00 €/m <sup>3</sup>	265.00 €/ton
Efficiency	300 %	80 %	100 %	100 %	98 %	75 %	85 %

Results:

Heat content of fuel	—	—	9.9 kWh/l	—	—	—	—	1.0 MWh/m <sup>3</sup>	4.8 MWh/ton
Primary energy demand	6,666.7 kWh	25,000.0 kWh	20,000.0 kWh	20,000.0 kWh	20,408.2 kWh	26,666.7 kWh	23,529.4 kWh		
Quantity needed	6,666.7 kWh	2,525.3 l	20,000.0 kWh	20,000.0 kWh	20,408.2 kWh	26.7 m <sup>3</sup>	4.9 ton		
Capital cost	1,560.1 €/year	625.9 €/year	722.3 €/year	308.2 €/year	361.1 €/year	963.0 €/year	828.2 €/year		
Annual fuel cost	1,000.0 €/year	2,777.8 €/year	1,200.0 €/year	3,000.0 €/year	3,061.2 €/year	720.0 €/year	1,299.0 €/year		
Total cost	2,560.1 €/year	3,403.7 €/year	1,922.3 €/year	3,308.2 €/year	3,422.3 €/year	1,683.0 €/year	2,127.2 €/year		

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