

# Energy+ Pumps

## Technology procurement for very energy efficient circulation pumps Final Report

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Wuppertal Institute for Climate, Environment and Energy

**On behalf of the Energy+ Pumps project team**

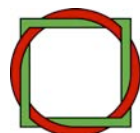
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## The Project in brief

About 2 to 3 % of the overall electricity consumption of the EU is caused by circulators in single or double family homes and flats. A new technology of pumps with electronically commutated (EC) motor pumps is available now; it is one possible way to achieve a reduction in circulator annual electricity use by 60 % or more.

The project's objective was a market transformation towards this new very energy-efficient pump technologies – Energy+ pumps – for circulators in heating systems, both stand alone and integrated in boilers. The aim of the project was, therefore, to bring more products to the market from all major manufacturers, to contribute to their market success, and to reduce their prices through mass production.

In order to achieve this objective, the project adapted and applied the technology procurement methodology. Large buyers were aggregated to activate pump and boiler manufacturers. Sales and training materials and a spreadsheet software for installation contractors were developed and applied. A competition both for energy-efficient products and marketing campaigns was organised and the information on the Energy+ pumps was disseminated widely through website, newsletter, media, and fairs.

## Consortium

The project was co-ordinated by the Wuppertal Institute. The 11 project partners were:

<b>Project Partner</b>	<b>Country</b>
Wuppertal Institute for Climate, Environment and Energy (WI)	DE
Österreichische Energieagentur – Austrian Energy Agency (A.E.A.)	AT
Politecnico di Milano, Dipartimento di Energetica, eERG	IT
Flemisch Institute for Technological Research (Vito)	BE
Agence de l'Environnement et de la Maitrise de l'Énergie (ADEME)	FR
Centre for Renewable Energy Sources (CRES)	GR
ESCAN, S.A.	ES
SEVEn, Stredisko pro efektivni vyuzivani energie, o.p.s.	CZ
Motiva Oy	FI
Deutsche Energie-Agentur GmbH (dena)	DE
ARENA, Arbeitsgemeinschaft Energie-Alternativen	CH

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# Final Report

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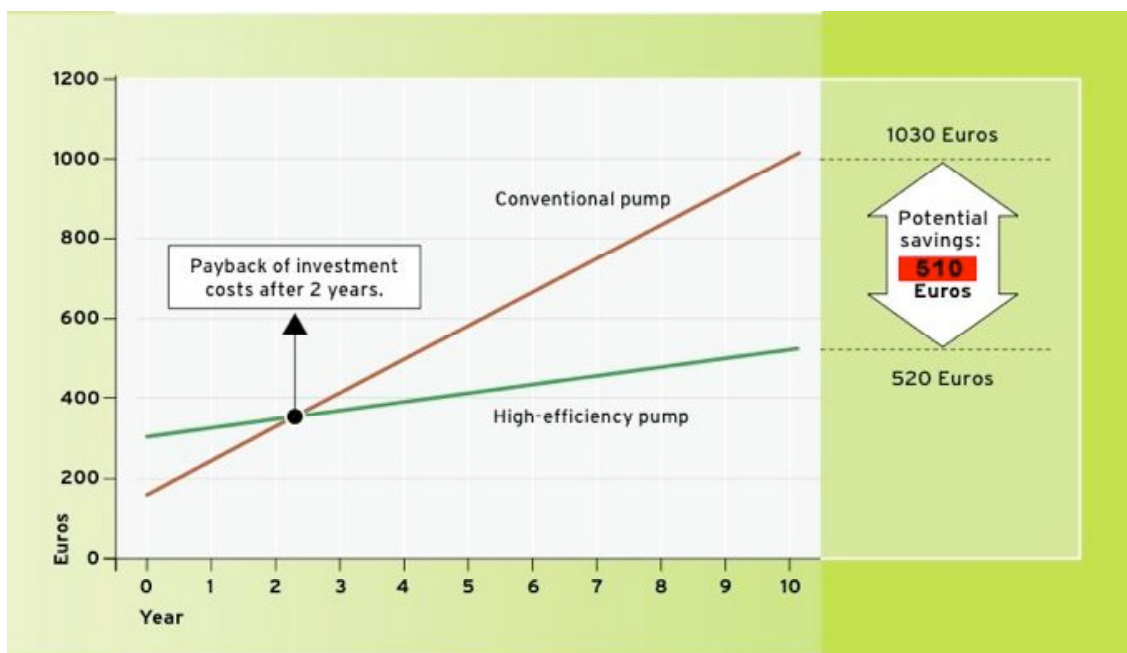
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## 1 Introduction

In the EU-27, the electricity consumption by circulators for heating purposes in households amounts to more than 50 TWh per year. This is caused by over 100 million circulators, most of them with a power input below 250 W. They are responsible for 5 to 10 % of a private household's electricity bill. The energy used by circulator pumps is equal to about 2 to 3 % of the overall electricity consumption and causes CO<sub>2</sub> emissions of more than 30 million tons per year. A new technology of pumps with electronically commutated (EC) motor pumps is available now. If these new very energy-efficient pump technologies became the new technology standard for circulators, a reduction in circulator annual electricity use by 60 % or more could be achieved, that is more than 30 billion kWh/year in the EU-27. Efforts to minimise this energy consumption would be worthwhile both for economic and for climate change mitigation reasons. European consumers would make large energy cost savings if these circulators became the European standard, as figure 1 presents for current circulator and electricity prices in Germany.

Figure 1: Economic gains possible with highly energy-efficient circulators



Therefore, the Energy+ Pumps project was initiated in 2006 to contribute to making highly energy-efficient circulation pumps the European standard.

For the approach to pursue this objective, the project chose the methodology of **co-operative procurement**. The basic idea behind this approach is to gather large buyers who state the intention to purchase a new, very energy-efficient technology in large numbers, in order to provide a 'demand pull' for manufacturers and for providers in general.



When the project was conceived, the new highly energy-efficient circulators were not yet available on the market for the small-scale circulators suitable for single family houses and dwelling. These, however, constitute the largest part of the market and of the electricity consumption for circulators, and here it is where conventional circulators are most inefficient. Circulators are a classical low-interest product, and usually either the installation contractor or the boiler manufacturer make the choice of the product. Most building owners are not even aware that the circulator may be a major energy consumer in the home, although it typically needs between 200 and 500 kWh of electricity per year – more than an energy-efficient refrigerator.

Therefore, the project was conceived for providing an incentive to manufacturers to bring the new technology to the market, by bringing together sufficient demand from large buyers. These buyers may then choose a winning product to satisfy all the demand. This variety of co-operative procurement has been developed and used for many products by the Swedish energy agency NUTEK (now converted to STEM) during the 1990ies. It is called **technology procurement**, and figures in the title of this project. In 1998, a European study group led by STEM confirmed that it can be applied in pan-European projects for products that have an EU-wide market (STEM 1998).

However, shortly before the project was actually launched, major circulator manufacturers put first small-scale circulators with the new technology on the market. Still, this technology was in a vicious cycle because of the low interest characteristic of circulators:

- The production volumes will be low, so the manufacturers will not invest in large-scale automated production lines but produce small series, largely by hand.
- As a consequence, the additional market price will be much higher than that of conventional circulators but may not even cover the higher production costs of the small series.
- Installation contractors lack tools to convince their customers that the higher price will soon pay off. Boiler manufacturers don't want to increase the price of their products by using the new circulators, since they don't trust installation contractors will be able to sell them.
- As a consequence, market demand will be low, and so will be production volumes.

Therefore, this technology was now a very good subject for the other type of co-operative procurement: **market procurement** aims at assisting the most energy-efficient products on the market to achieve market breakthrough.

With market procurement, large buyers are still important to encourage manufacturers to scale up production, because there is a sign of an initial larger market volume. However, open lists of existing and qualifying products, from which the buyers can choose as they want, will complement the award of the most energy-efficient models. Furthermore, supporters are engaged to participate for the large-scale dissemination of



information on the benefits of the new technology to final consumers and building owners. This methodology of market procurement has first been applied on a European scale in the two consecutive Energy+ projects on cold appliances running from 1999 to 2004 (ADEME et al. 2001; SenterNovem et al. 2005). With Energy+ Pumps, it was first applied for a product that is installed in buildings. On the one hand, this is a more complex market, with boiler manufacturers, planners, and installation contractors involved in lieu of just the appliance retailers as the market intermediaries. On the other hand, it is a market with more large final buyers in many countries; there are only a few countries, in which there are bulk buyers of cold appliances.

The project's **objective** was a market transformation towards new very energy-efficient pump technologies – Energy+ pumps – for circulators in heating systems. The short-term objective of the project was to bring more products to the market, to contribute to their market success, and to reduce their prices through mass production.

This **final report** presents the elements of the Energy+ Pumps project and its results achieved. The report starts with what the Energy+ Pumps project did to support the market for highly energy-efficient circulators (chapter 2). Chapter 3 presents how the markets have developed in the course of the project, and what Energy+ buyers contributed to it. What market actors think about the impact of the Energy+ Pumps project is collected in chapter 4. Finally, in chapter 5 we offer our conclusions on how to further promote highly energy-efficient circulators in the EU.





## 2 What Energy+ Pumps did to support the market for highly energy-efficient circulators

As mentioned in the Introduction, the Energy+ Pumps project used the instruments of market procurement to bring more highly energy-efficient circulators to the market and to contribute to their market success. Finally, this was expected to reduce their prices through mass production.

In order to achieve its short-term objective, the project has adapted and applied the technology procurement methodology:

- aggregate large buyers, to activate the pump and boiler manufacturers;
- link Energy+ pump buyers, manufacturers and supporters through published lists and direct personal contacts;
- develop sales and training materials, and a sizing spreadsheet software for installation contractors, in order to make it easy for them to sell the new energy-efficient pumps based on life-cycle cost arguments, and work with installer associations and pump manufacturers for the use of the materials;
- organise a competition both for energy-efficient products and marketing campaigns, and an independent test of a sample of products;
- disseminate widely the information on the Energy+ pumps through website, newsletter, media, and fairs.

The purpose of the different elements is to tackle the many barriers that exist for the actors in the circulator market. Table 1 presents an overview of the project approach to tackle the main barriers.

Table 1: How Energy+ Pumps aimed to achieve its goals

<b>Challenge</b>	<b>Project Approach</b>
<b>No market incentive for the new highly efficient technology</b>	⇒ <b>Procurement Declaration</b> of large institutional buyers ⇒ <b>Development and Lists of Energy+ products</b> ⇒ <b>Energy + Award</b> for the best energy-efficient circulator, the best energy-saving condensing boiler
<b>Lack of knowledge about the new pump technology outside manufacturers</b>	⇒ <b>Supporter Declaration</b> of energy agencies, consumer NGO, and other organisations ⇒ <b>Energy + Award</b> for the most innovative supporting campaign of Energy+ products ⇒ <b>Dissemination of information</b> by the project partners and the supporters
<b>Lack of preparation of the installation Installation contractors lack sales tools</b>	⇒ <b>Training</b> of installation contractors ⇒ <b>Dissemination of information</b> ⇒ Easy to use <b>sizing software tool</b>



In the following sections of this chapter, we will present the elements of this package of instruments in more detail.

## 2.1 The Energy+ Lists

By publishing lists both of products, potential buyers, and supporters, the project improved market transparency and linked the supply and demand side together:

- Potential buyers, whether they participate or not in the project, are able to see which models are available.
- Manufacturers can see that there are buyers interested in the product and can actively approach them.
- Supporters are informing the general public and particularly building owners of the advantages of the new technology. This will increase market demand.

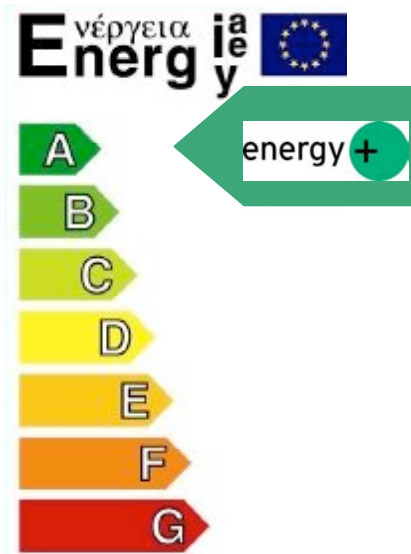
### 2.1.1 Energy+ Products

In the beginning of the project, the Energy+ Pumps team defined the range of products that are to be included in the project and developed specifications for qualifying products. The aim was to support both circulators as stand-alone products (e.g., for replacement of broken circulators), and condensing boilers that have Energy+ circulators built in or are sold as a package with them.

#### Circulators

To define the energy efficiency of stand-alone circulators, the project applied the load profile and classification of the Europump Labelling Scheme. The minimum energy efficiency required is equivalent to **Europump Label Class A** for heating circuit pumps. Although the Europump Label is a voluntary label created by an organisation of circulator manufacturers and has not been endorsed by the European Commission, the Energy+ Pumps team chose to use it as a basis for defining its requirements, because it is accepted by the most important market actors in the nine Member States the project operated in.

Figure 2: the Europump Label for circulators and the Energy+ requirement



The focus of the project was clearly on small heating circuit pumps as used in apartments, single family houses and small flats. However, medium-sized circulators for use in multi-family houses and smaller non-residential buildings were also included. The **upper size limit** for Energy+ circulators, therefore, is given by a maximum power consumption of **300 W**. Furthermore, to provide more clarity on the areas of use for the Energy+ products available, the Energy+ Lists were split into three categories by their flow rate at the operating point of maximum hydraulic power:

Range from - to (m <sup>3</sup> /h)	associated heating system type *	
0	1.85	flat, apartment, single family house
1.86	2.35	large single family house, up to 6 flats/ apartments
2.36	+more	more than 6 flats/ apartments or equivalent commercial building

\* very well insulated buildings need 50% less flow rate.

Circulator manufacturers responded very positively to the Energy+ calls for products. Energy+ Lists were published four times, in connection to major European or national trade fairs for the heating industry (e.g., ISH 2007 and Mostra Convegno 2008, cf. chapter 2.4.6). The fourth and last Energy+ Lists, published in November 2008 at the Motor Summit in Zurich, included 26 different circulator models from eight manufacturers (cf. figure 3).





























Figure 3: The fourth Energy+ Lists of qualifying heating system circulators, November 2008

# Energy+ Pumps

*Europe's most energy-efficient heating system circulators*

energy+

Category 1 with Flow Rate: 0-1.85 m <sup>3</sup> /h	Category 3 with Flow Rate: >2.35 m <sup>3</sup> /h
 <p>Brand: LAING Model: eccocirc E4 auto Max. Power input: 35 W Flow Rate: 1.40 m<sup>3</sup>/h EEI: &lt;0.40</p>	 <p>Brand: BIRAL Model: A 12 Max. Power input: 33 W Flow Rate: 3.6 m<sup>3</sup>/h EEI: A</p>
 <p>Brand: GRUNDFOS Model: ALPHA2 25-40 Max. Power input: 22 W Flow Rate: 1.58 m<sup>3</sup>/h EEI: &lt;0.20</p>	 <p>Brand: BIRAL Model: A 13 Max. Power input: 49 W Flow Rate: 3.6 m<sup>3</sup>/h EEI: A</p>
 <p>Brand: SMEDEGAARD Model: ISOBAR 2-50 Max. Power input: 32 W Flow Rate: 1.60 m<sup>3</sup>/h EEI: &lt;0.40</p>	 <p>Brand: BIRAL Model: A 14 Max. Power input: 69.5 W Flow Rate: 4.0 m<sup>3</sup>/h EEI: A</p>
 <p>Brand: BIRAL Model: AX 12 Max. Power input: 22 W Flow Rate: 1.70 m<sup>3</sup>/h EEI: &lt;0.20</p>	 <p>Brand: WILO Model: Stratos 25/1-6 Max. Power input: 84 W Flow Rate: 4.4 m<sup>3</sup>/h EEI: &lt;0.25</p>
 <p>Brand: LAING Model: eccocirc E6 auto Max. Power input: 63 W Flow Rate: 1.70 m<sup>3</sup>/h EEI: &lt;0.40</p>	 <p>Brand: KSB Model: Rio-Eco 25-60 Max. Power input: 84 W Flow Rate: 4.4 m<sup>3</sup>/h EEI: &lt;0.25</p>
 <p>Brand: WILO Model: Stratos ECO 25 1-3 Max. Power input: 32 W Flow Rate: 1.85 m<sup>3</sup>/h EEI: 0.20</p>	 <p>Brand: SALMSON Model: SIRILUX 25-40 Max. Power input: 84 W Flow Rate: 4.4 m<sup>3</sup>/h EEI: &lt;0.25</p>
 <p>Brand: KSB Model: Eitronic ECO 25-40 Max. Power input: 32 W Flow Rate: 1.85 m<sup>3</sup>/h EEI: 0.20</p>	 <p>Brand: GRUNDFOS Model: MAGNA 25-60 Max. Power input: 84 W Flow Rate: 4.6 m<sup>3</sup>/h EEI: &lt;0.25</p>
Category 2 with Flow Rate: 1.85 – 2.35 m <sup>3</sup> /h	 <p>Brand: BIRAL Model: A 15 Max. Power input: 108 W Flow Rate: 5.0 m<sup>3</sup>/h EEI: A</p>
 <p>Brand: WILO Model: Stratos ECO 25/1-5 Max. Power input: 36 W Flow Rate: 1.86 m<sup>3</sup>/h EEI: 0.27</p>	 <p>Brand: BIRAL Model: A 16 Max. Power input: 176.5 W Flow Rate: 6.0 m<sup>3</sup>/h EEI: A</p>
 <p>Brand: KSB Model: Eitronic ECO 30-60 Max. Power input: 56 W Flow Rate: 1.86 m<sup>3</sup>/h EEI: 0.27</p>	 <p>Brand: BIRAL Model: A 401 Max. Power input: 176 W Flow Rate: 6.0 m<sup>3</sup>/h EEI: A</p>
 <p>Brand: GRUNDFOS Model: ALPHA 2 25-60 Max. Power input: 43.5 W Flow Rate: 1.97 m<sup>3</sup>/h EEI: &lt;0.25</p>	 <p>Brand: KSB Model: Rio-Eco 25-80 Max. Power input: 130 W Flow Rate: 6.0 m<sup>3</sup>/h EEI: 0.27</p>
 <p>Brand: BIRAL Model: AX 13 Max. Power input: 44 W Flow Rate: 2.00 m<sup>3</sup>/h EEI: &lt;0.25</p>	 <p>Brand: GRUNDFOS Model: MAGNA 25-100 Max. Power input: 176 W Flow Rate: 6.28 m<sup>3</sup>/h EEI: &lt;0.30</p>
 <p>Brand: GRUNDFOS Model: ALPHA 2 25-50 Max. Power input: 30.6 W Flow Rate: 2.05 m<sup>3</sup>/h EEI: &lt;0.20</p>	 <p>Brand: WILO Model: Stratos 30/1-12 Max. Power input: 305 W Flow Rate: 7.2 m<sup>3</sup>/h EEI: A</p>
 <p>Brand: ASKOIL Model: TRONIC 25-60 / 130 Max. Power input: 61.5 W Flow Rate: 2.10 m<sup>3</sup>/h EEI: 0.384</p>	

Intelligent Energy Europe

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## Heating units

The project also worked to include gas and oil boilers with a high thermal energy efficiency in the project.

The minimum energy efficiency required, therefore, concerned requirements for the thermal energy efficiency as well as the circulator energy efficiency.

Gas and oil boilers have to be condensing boilers to be included in the Energy+ products lists.

The internal hydraulic resistance of a condensing boiler at nominal flow rate must be lower than 50 mbar to avoid a forced circulation inside the boiler.

Regarding the circulator energy efficiency, the manufacturer of the heating unit had to declare that the unit has a circulator built in or packaged that would qualify for Europump Label Class A if run and controlled like a stand-alone circulator.

There are now a number of gas condensing boilers with highly energy-efficient circulators that would classify for the Energy+ lists on the European market, and also many oil condensing boiler come packaged with Energy+ circulators. However, no boiler was nominated for the Energy+ Lists. One important reason for gas condensing boilers was that most of these boilers had an internal hydraulic resistance at nominal flow rate above 50 mbar. These boilers are designed to have minimal size, which increases the internal hydraulic resistance. They would have to be redesigned to fulfil the Energy+ requirements. Apparently, the project lifetime was too short for this. An exception is the winner of the Energy+ Award for boilers, the Solvis Gas Max (cf. chapter 2.2). This boiler directly heats the hot water tank, and the circulator is drawing water from the tank with minimal internal hydraulic resistance.

### 2.1.2 Large buyers

In the procurement methodology, the aggregation of demand plays an important role to accelerate increasing the production volumes. Therefore, the group actively approached municipal and other housing companies, public authorities such as municipalities, but also installation contractors as potential bulk buyers of Energy+ circulators. In this way, both final buyers and retailers of circulators were included.

At the end of the project, almost 50 buyers had declared their interest to purchase Energy+ circulators and become Energy+ participants. These include many installation contractors, particularly in Belgium, Greece, and Spain, and a number of heating system designers. They also include a district heating company (Prague, Czech



Republic), a number of housing and construction companies, an Italian ESCO, and the building company of the City of Madrid.

Altogether, these buyers purchased more than one thousand Energy+ circulators during the course of the project.

### 2.1.3 Supporters

For market procurement, it is important that all market players become aware of the new most energy-efficient products on the market and their advantages. This is why the project works with supporting organisations who have a much better and established relationship and distribution channels to their members or target groups. Supporters who joined the Energy+ Pumps projects include:

- Regional or local energy agencies in several countries, and the Regional Government of Madrid
- Consumer organisations, and associations of energy consumers or of owners of single-family houses
- A federation of real estate managers
- Associations of installation contractors or HVAC professionals, and chimney-sweepers providing energy advice in several countries
- Energy efficiency consultants and HVAC systems designers
- A national research and training centre of the HVAC installation company association
- An association of solar water heater manufacturers
- An association of pump, compressor, and valve manufacturers
- Organisations for promoting energy-efficient oil and gas heating
- A union of (electricity) grid owners in Belgium
- The Czech Chamber of Commerce
- WWF Italia

Altogether, 27 supporters signed an Energy+ Declaration of Support and contributed to disseminating the Energy+ information material or to training installation contractors. The grid owners in Belgium can also offer promotion and incentive programmes for Energy+ circulators to their customers in the framework of their obligations to save energy.



## 2.2 The Energy+ Award

In order to create a further incentive for bringing most energy-efficient circulators and boilers to the market and to provide a higher visibility to them, but also to stimulate supporters to become more active in promoting Energy+ circulators, the project team launched the Energy+ Award competition in May of 2007.

Energy+ Awards were given to the best energy efficient circulator in the three different flow rate ranges defined by Energy+ Pumps (cf. chapter 2.1), and to the most electricity saving condensing boiler. In the third category, an Energy+ Award was given to the most innovative and effective promotion campaign to support the market demand of these products. An international Jury of five experts selected the winners in January of 2008.

On 11<sup>th</sup> March of 2008, a very successful Award Ceremony took place in the morning of the first day of the international trade fair Mostra Convegno in Milan. Afterwards, the winners presented themselves at the Energy+ booth.

The models Grundfos Alpha2 25-40, Grundfos Alpha2 25-50 and WILO Stratos 25/1-6 won the Energy+ Awards in the circulators category, one in each range of flow rate.

*Figure 4: The Energy+ Award - winning circulators*



In the category condensing boilers, the Solvis Max Gas Pur 356-20 in combination with the heating circuit station HKS-G-6.3 received the Energy+ Award.



Figure 5: The Energy+ Award - winning condensing boiler with heating station



In addition to the high level of energy efficiency, the products elected by a jury of experts are user-friendly and easy to install. Due to the reduction of electricity costs, the investment pays back in a short time.

The Energy+ Award for the best supporter campaign was given to “HeizungsCheck”, a cooperative initiative by the regional government of Salzburg, the Salzburg AG and the plumber guild of Salzburg. The “HeizungsCheck” was awarded for its comprehensive, action orientated approach, which includes a promotion for individual advice in the modernization process of heating systems. It also performed a mass procurement of Energy+ circulators, that were obtained and sold to consumers at the same favourable price, close to the price of conventional electronically controlled circulators. Finally, it also worked intensively with a network of market actors to make them all aware of the advantages of Energy+ circulators and of the programme.

Figure 6: The Energy+ Award - winning campaign







Figure 7: Proud Energy+ Award Winners



After the Awards, the Energy+ Pumps team organised a test of six of the winning circulators by an **independent test** laboratory. The pumps tested were equally divided over the following flow ranges: 0-1.85 m<sup>3</sup>/h, 1.86-2.35 m<sup>3</sup>/h and above 2.36 m<sup>3</sup>/h.

The independent test results confirm that all tested pumps meet the Energy+ Pumps criterion for energy efficiency, i.e., the criterion of an Energy Efficiency Index (EEI) below 0,40 according to the Europump classification and labelling scheme. Moreover, test results are close to EEI values stated by manufacturers.

### 2.3 Training for installation contractors

As the feasibility analysis at the beginning of the project confirmed, installation contractors play an important role in the market for smaller heating systems and circulators, since they usually choose the product they offer to the customer. Easy-to-use information that assists installation contractors in selling Energy+ circulators, and a training course on the use of the material and the benefits of Energy+ circulators are thus an important element of the project.

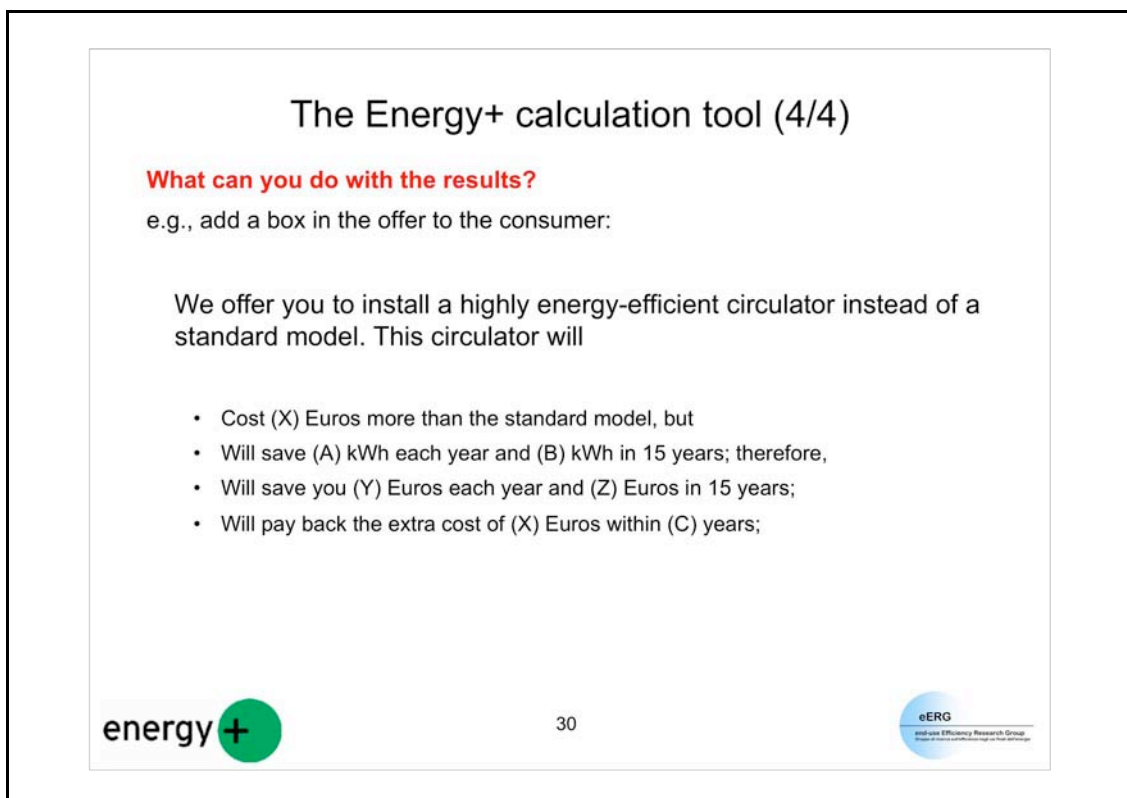
A software tool for sizing and choosing Energy+ circulators was, therefore, developed in the project. All partners translated the tool into their national languages.



Furthermore, the Energy+ Pumps project offers organisations, which are training installation contractors, a presentation for a training module on energy-efficient circulators and on how to use the Energy+ software tool. This is available in all the project partners' languages, too. There is also a manual for trainers in English.

For example, the module suggests text that installation contractors can use to convince the customer of the net benefits of Energy+ circulators, as displayed in the figure below.

Figure 8: A page from the Energy+ training module



Energy+ Pumps project partners teamed up with professional training organisations in their countries or organised own training courses. In at least two seminars per country during the project, several hundred installation contractors participated, and many more will benefit from the training module and the software provided by the project.

## 2.4 Publications and other dissemination activities

To support all participants with information and to inform all market actors and the general public, the project has extensively published on the advantages of Energy+ circulators and its lists.



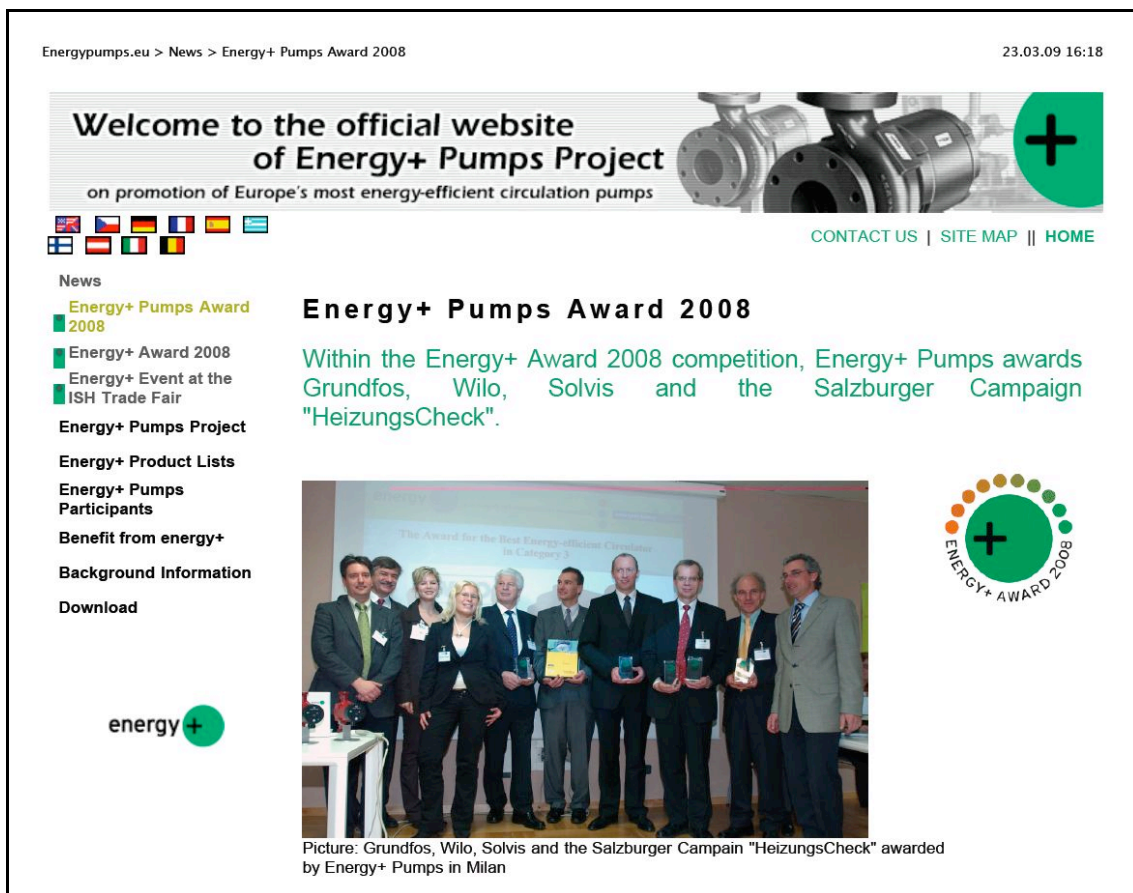
### 2.4.1 The Website [www.energypluspumps.eu](http://www.energypluspumps.eu)

As an information tool for all interested parties, the project website [www.energypluspumps.eu](http://www.energypluspumps.eu) was set up. Energy+ Pumps project partners translated it into all languages of their countries, in addition to an English version.

The project website has been regularly updated. General information about the project, the results of the Energy+ Award, updated Energy+ Lists, the newsletters, and all publications by the project are available there.

The evaluation only for the year 2008 shows 10.062 visits by 7.597 visitors from all over Europe. It can therefore be considered a major source of independent information for energy-efficient circulators in Europe. Furthermore, the lists of Energy+ circulators have been adopted by the EuroTopTen project, another Intelligent Energy project, as a source for EuroTopTen websites in Austria, Belgium, Finland, Poland, and Switzerland, and for the European website [www.topten.info](http://www.topten.info).

Figure 9: The website [www.energypluspumps.eu](http://www.energypluspumps.eu)



Picture: Grundfos, Wilo, Solvis and the Salzburger Campaign "HeizungsCheck" awarded by Energy+ Pumps in Milan



### 2.4.2 Newsletters

During the project duration, five newsletters were produced. The first one (April 2007) presented the first Energy+ Lists, while the second one was focusing on the launch of the Energy+ Awards (July 2007). The third one (December 2007) presented the second lists and invited for the Energy+ Awards Ceremony, while the fourth one (June 2008) was focusing on the results of the Awards Ceremony and of the Energy+ booth at the Mostra Convegno fair. A fifth newsletter (December 2008) gave a review and reported about success stories.

Partners translated the newsletters and sent them out by e-mail to Energy+ participants, market actors, and stakeholders. In total, the newsletters were directly sent by all partners to more than 600 contacts all over Europe, including, e.g., 26 regional delegations and 160 local information centres by ADEME in France. These contacts often forwarded them to other contacts, e.g., members of associations of installation contractors, so that the total number of potential addressees has been estimated to be in the order of 1,000 for the Czech Republic alone. In addition, the newsletters are available on the website.



Figure 10: the third Energy+ Pumps newsletter





### **2.4.3 Brochures**

For the presentation of the first Energy+ Lists and the project at the ISH fair in March 2007, the project published a brochure in English and German.

A second brochure was produced in English and Italian for the presentation of the Energy+ Awards at the Mostra Convegno in March 2008.

### **2.4.4 National posters**

For presentation at national events and fairs, each partner produced a poster. This had the same content and design for all languages, but with the calculation of economic benefits adapted to the national circumstances.



Figure 11: The English blueprint for the national Energy+ Posters

# Energy+ Pumps

*Europe's most energy-efficient heating system circulators*

## Energy+ Makes High Efficiency Circulators the Standard

**If you are...**

- ... a manufacturer of circulators or manufacturer of condensing boilers:**  
Reference your high-efficiency circulator pumps as Energy+ qualified products. Win our Energy+ Award.
- ... an owner of a large building stock:**  
Sign up as an Energy+ buyer to demonstrate your interest in saving money and protecting the environment.
- ... a private building or apartment owner:**  
Installing high efficiency circulator pumps in your heating system will strongly reduce your energy costs.
- ... a potential supporter:**  
Join the numerous institutions and organisations that support Energy+ and become an active promoter of responsible, energy-saving and environmentally-friendly solutions.
- ... an installation contractor:**  
Offer your customers the energy-saving technology of Energy+ pumps. Check the national events pages and come to our booths and workshops!

### What is Energy+

Energy+ pumps are the new generation of circulators for the residential sector. The Energy+ project aims at market transformation towards this very energy-efficient pump technology for circulators in heating systems. This huge energy saving potential offers economic and environmental benefits.

### Potentials

- About 3 % of the overall electricity in the EU is used for circulation pumps in single and double family houses and flats.
- Savings of 60 % and more in circulator's annual electricity use are possible, that is more than 30 kWh/year and equivalent to about 18 million tons of avoided carbon dioxide emissions.

### Energy+ saves your Money

About 10% of a single household's electricity consumption is used by circulators for heating systems.

- Investment costs for a new high-efficient circulator are about 300 Euro which is twice as high as for a conventional one.
- Payback is only two to three years because of the low energy consumption.
- During an average life-span of a circulator the net savings are about 750 Euro.

### Time line of life cycle costs of circulation pumps

Category	Value
Consumption by the current stock of circulators	~50 TWh/year
Potential consumption by high-efficiency circulators	~15 TWh/year
Potential savings	More than 30 TWh per year

### The Energy+ Award 2008

The Energy+ Award will be launched for:

- the best energy-efficient circulator,
- the best electricity-saving condensing boiler, and
- for the best supporting campaign.

### Timetable

- Registration for entries by December 2007
- Awards ceremony in March 2008 at the international trade fair *Münster Congress* in Münster.

### The Europump Label

Applying the energy label of Europump, the European Association of Pump Manufacturers, Energy+ pumps reach the A-label because of their high efficiency.

### How to achieve our goals

Challenge	Project Approach
Low market incentive for the new highly efficient technology	<ul style="list-style-type: none"> <li>• Procurement Declaration of large institutional buyers</li> <li>• Development and Lists of Energy+ products</li> <li>• Energy+ Award for the best energy-efficient circulator, the best electricity-saving condensing boiler</li> </ul>
Lack of knowledge about the new pump technology	<ul style="list-style-type: none"> <li>• Supporter Declaration of energy agencies, consumer NGO and other organisations</li> <li>• Energy+ Award for the most innovative supporting campaign of Energy+ products</li> <li>• Dissemination of information</li> </ul>
Lack of preparation of the installation contractors	<ul style="list-style-type: none"> <li>• Training of installation contractors</li> <li>• Dissemination of information</li> <li>• Easy to use sizing software tool</li> </ul>

# ENERGY+ AWARD 2008

energy+

# www.energypluspumps.eu

The Energy+ Pumps project is being conducted under the auspices of the Intelligent Energy Europe programme of the European Commission. Energy+ Pumps project partners: Germany - Ruppertal Institute for Climate, Environment and Energy (project coordinator), DGA, German Energy Agency, Austria - A.E.A., Austrian Energy Agency, Italy - EFC, Politecnico di Milano, Belgium - VITO, Flemish Institute for Technological Research, Greece - CRE, Centre for Renewable Energy, Spain - ESCAN S.A., Czech Republic - SEVA, Energy Efficiency Center, Finland - MOTVA, Energy Information Centre for Energy Efficiency and Renewable Energy Sources, France - ADEME, French Agency for the Environment and Energy Management, Switzerland - Arena. Financial contributions by: Deutsches Bundesministerium für Wirtschaft und Technologie (BMWi), Ministerium für Wirtschaft, Mittelstand und Energie des Landes Nordrhein-Westfalen (MWME), Österreichisches Bundesministerium für Land- und Forstwirtschaft, Umwelt- und Wasserwirtschaft (BMLFUW), Comunidad de Madrid and Ministry of Trade and Industry in Finland.

Intelligent Energy Europe



### 2.4.5 Articles in press, journals, and other media coverage

Of course, the project also directly addressed the media to launch articles about the project, sometimes in supporters' journals. In the course of the project, in each country at least three articles were published or launched by the team, in total around 70. Many more were published by others about the project. For instance, in Italy alone, about 70 articles could be found in the media, which report about the results of the Energy+ Award Ceremony.

### 2.4.6 Presentations at major trade fairs

The Energy+ Pumps project participated at the ISH trade fair in March 2007 in Frankfurt am Main; ISH is one of the two major trade fairs for heating technology in the EU, organised every other year in alternation with Mostra Convegno.

With a press conference on 6<sup>th</sup> March 2007, the Energy+ Pumps project was presented to the media and the award competition was announced. From 06<sup>th</sup> to 10<sup>th</sup> March 2007, the project was present with a booth at the fair. A sample of five Energy+ circulators – one from each manufacturer participating at that time – was shown at the booth, and the Energy+ brochures, the Energy+ Lists, and other materials were distributed.

*Figure 12: The Energy+ Team presenting the first Energy+ Lists at the ISH 2007*







In March 2008, the Energy+ Pumps project participated at the Mostra Convegno trade fair in Milan with the Award Ceremony and an own booth.

With the award ceremony on 11<sup>th</sup> March 2008, the Energy+ Pumps project presented the winners to the media. From 11<sup>th</sup> to 15<sup>th</sup> March 2008, the project was present with a booth at the fair. The Energy+ Award winners were shown at the booth, and the second Energy+ brochures, Energy+ Lists, and other materials were distributed.

*Figure 13: The Energy+ team with jury members and EU project officer Dr. Kerstin Lichtenvort at the Mostra Convegno 2008 booth*



Furthermore, partners presented the Energy+ project at around 20 national trade fairs.

#### **2.4.7 Other dissemination activities**

One activity that may potentially have a very large impact on the market shares of Energy+ circulators is that France and the Belgian region of Flanders have included them in the list of technologies allowed for meeting energy savings obligations of energy suppliers (in France, in the French system of energy savings certificates) and network companies (in Flanders). This happened during 2008 in both countries, but we do not know the actual impact in terms of schemes run by energy companies or energy savings certificates generated.



### 3 Market shares and prices of Energy+ products

The short-term objective of the Energy+ Pumps project was to bring more energy-efficient circulators and boilers to the market, to contribute to their market success, and to reduce their prices through mass production. Therefore, this chapter will look at the availability of Energy+ products, their market shares, and whether their prices have reduced compared to the year 2005, i.e., before the project started.

#### 3.1 Energy+ products available in the countries represented in the project

##### 3.1.1 Circulators

From the first Energy+ Lists in March 2007 to the fourth edition in November 2008, the number of Energy+ circulators rose from 19 to 26, so the market offer has increased. It is likely that Energy+ Pumps contributed to this increase in products on the market. However, it is impossible to say what exactly was the contribution of the project to this market development.

Out of the 26 Energy+ circulators, 15 are available in all European countries, which are those from Grundfos, KSB, Laing, and Wilo. The other 11, from Askoll, Biral, Salmson, and Smedegaard, are only available in selected countries.

This is confirmed by a market screening of the Energy+ partners, although in the smaller countries, sometimes only between 8 and 13 models were easily found on the market.

##### 3.1.2 Boilers

No boilers were offered by manufacturers for inclusion in the Energy+ Lists. However, one model won the Energy+ Award. Many major boiler manufacturers are now offering condensing boilers with highly energy-efficient circulators, however, they usually do not meet the Energy+ criterion of a low internal flow resistance. E.g., in Spain, seven models in total were found available on the market, which include circulators that would meet Energy+ requirements if sold stand-alone.

#### 3.2 Market shares and prices of Energy+ products

##### 3.2.1 Energy+ circulator market shares

Have the new highly energy-efficient circulators been successfully introduced in the market? The Energy+ Pumps project partners asked manufacturer representatives for the market shares they achieved or estimate for the market of circulators sold stand-



alone in 2008 in each of the nine countries. Table 2 presents the results. In the Czech Republic, no data were obtained from the manufacturers, so that the figures are informed estimates by the project partner.

*Table 2: Market share of Energy+ circulators among small stand-alone circulators in 2008*

Austria	Belgium	Czech Republic	France	Finland	Germany	Greece	Italy	Spain
20%	15 to 20%	10 to 15%	5%	25%	30%	2%	20%	8%

Altogether, weighted with the annual sales of stand-alone circulators per country, the Energy+ circulators have achieved **more than 15 % of the market** for small-scale circulators (below 1.85 m<sup>3</sup>/h of flow rate) sold stand-alone (i.e., for installation with floor-standing boilers or for replacement).

This is much higher than the Energy+ Pumps project hoped when writing the proposal: the initial target was a market share of 5 %.

However, the market share for circulators included in boilers, particularly wall-mounted boilers, is certainly much lower than 15 % in the Energy+ Pumps countries overall. We have no substantiated estimates, but the market share probably still remains below 10 % in all of the nine countries. For example, one major manufacturer reported a share of 3 % in his sales in Spain. Particularly in the Southern European countries such as France, Greece, Italy, and Spain, the total sales of circulators included in wall-mounted boilers is much more important than those of stand-alone circulators. These are often not condensing boilers but a rather cheap product, which is unlikely to host an expensive circulator, however energy-efficient it may be. Furthermore, Energy+ circulators can normally not even be used as replacement circulators due to special geometry or hydraulic design of the boiler.

Given these uncertainties, we may estimate that the **overall market share of small Energy+ circulators** in the nine Energy+ Pumps countries was **probably between 5 and 10 %**. This is more than the project's target, and means that an initial market acceptance of the products has been achieved. This even more the case for the **medium-sized** circulators, which have achieved market shares as high as 45 % in Austria and 60 % in Finland during 2008.

Again, to which extent the Energy+ Pumps project has contributed to this market success, is very difficult to estimate. The next chapter will provide some qualitative evidence from interviews made with market actors. It is clear that particularly the manufacturers are now keen to increase the market share of Energy+ circulators, which they still sell at quite a high price premium (cf. next section). E.g., Grundfos in Italy has announced a target of raising the market share to 50% by 2010.



### 3.2.2 Energy+ circulator market prices

The small Energy+ circulators (below 1.85 m<sup>3</sup>/h of flow rate) usually cost around 300 Euros. This is between 70 and 100 percent more than the price of a conventional, non-controlled model and between 50 and 60 percent more than for a conventional, electronically controlled model of the same hydraulic performance (flow rate and head).

For the medium-sized models, the price differential towards conventional, non-controlled models is in the same range, whereas it is often lower compared to a conventional, electronically controlled model (20 to 60 percent).

These prices and price premiums over conventional circulators have changed very little compared to the first survey the project did in 2006.

The Energy+ Pumps project's target was to reduce the price premium over conventional electronically controlled circulators for sizes below 100 Watts to less than 50 % or 60 Euros. Given the results reported here, this has not (yet) been achieved. In relative terms, the price premium is only slightly higher than 50 %. In absolute terms, however, the price premium remains around 100 Euros in most countries. We do not know whether the reason for this is that production volumes are not yet big enough to achieve economies of scale, or whether it is manufacturers' marketing strategies. However, the marketing strategies may now change. For example in a campaign in Italy from September to December 2008, Grundfos offered the small Energy+ circulators at around 180 Euros, i.e., with almost zero price premium over conventional electronically controlled circulators.

Regarding boilers, highly energy-efficient circulators are usually included in premium products that have a higher price anyway, which is only for a small part due to the circulator. However, this is of course also a barrier for wider market uptake of highly energy-efficient circulators.



## 4 What market actors think about the impact of the Energy+ Pumps project

To learn more about the impact the project has had on the market for heating system circulators in the participating countries, the project partners asked a non-representative selection of market partners what they did, what use they made out of the information provided by the project, and whether they think Energy+ Pumps has had an influence in the market.

This chapter briefly summarises the results of these interviews.

### 4.1 Participating buyers

All buyers who signed a declaration were asked to state how many Energy+ circulators they purchased. Not all of them responded; from those who did we estimate that the buyers directly purchased more than 1,000 Energy+ circulators.

Furthermore, the project made detailed interviews with potential buyers in each country. In countries, in which there are participating buyers, both participating and non-participating buyers were to be interviewed; in the other countries, non-participating buyers only.

Purchasing Energy+ circulators was easy for the participating buyers due to the information provided by the project. One buyer in the Czech Republic reported that sometimes, in urgent replacement cases, wholesalers did not have the big pumps on stock. Another remark was that installers who are not familiar with the new circulators prefer the conventional ones, since the new circulators require more work for setting the optimal way of operation.

For the participating buyers, the Energy+ Lists, newsletter, seminars, and website were very helpful to create awareness of the advantages of Energy+ circulators, for information and for selection of circulators. Those buyers interviewed, who were not participating buyers, generally did not know of the project at all, and often not of the advantages of energy-efficient circulators either.

In conclusion, the participating buyers do not feel able to judge to which extent Energy+ Pumps was influencing the market, but it was at least influencing themselves in a positive way. Obviously, since the non-participating buyers were not aware of the project, they also did not think it had an influence on the market.



## 4.2 Participating supporters

A sample of supporters was also interviewed in detail. Generally, the information provided by the Energy+ Pumps project - Energy+ Lists, newsletter, and website were very helpful for them in their activities directed either to the general public of energy consumers, or to installation contractors. They used the material for publications, websites, events, training courses, and some for own campaigns, as in Salzburg. The material thus helped them to create awareness of the advantages of Energy+ circulators among their target groups.

On the other hand, their opinion as to whether Energy+ Pumps was influencing the market was mixed. Most think that through the information provided and through linking market actors and supporters, the project has had an impact, but was not able to deeply change the market. Much more media presence than what can be done with such a small budget, even through supporters, financial incentives, and regulation were mentioned as necessary to achieve a real change in the market.

## 4.3 Installation contractors

Both contractors listed as participating buyers and those that are not but participated in training courses organised in connection with the project were interviewed.

Countries differ as to the knowledge and opinion of installation contractors about class A circulators. There are countries, in which installation contractors are both aware of and try to sell the energy-efficient circulators, e.g., Austria, Belgium, Finland, or Germany. Still, they see difficulties to sell them to customers who are not aware of their advantages because of the higher price of the circulators.

Then, there are countries, such as the Czech Republic, Italy, or Spain, where many installation contractors know about the energy-efficient circulators but don't actively sell them, since they feel they will not be able to convince customers, or the building designer has specified a conventional circulator.

And there are countries, where most installation contractors did yet not know of the energy-efficient circulators. For example, in France, out of 12 installation contractors who participated in a training course and answered a questionnaire, only four (33%) had known about A pumps before and only three (25 %) had used them. None of them knew about the project before. Greece may be another member of this group of countries.

Those who participated in the training courses found the material provided very helpful, some even asked for more detailed information about sizing of circulators or interpretation of pump load curves.



Their opinion about whether Energy+ Pumps was influencing the market is similar to that of the supporters.

#### 4.4 Manufacturers' representatives

Manufacturers of circulators are the actor group who value the Energy+ Pumps project most useful. This includes both the project as such and the material it created. Manufacturer representatives used the material most intensively, and also visited fairs and the Energy+ booths at ISH and Mostra Convegno much more often than the representatives of buyers, supporters, and installation contractors. They value particularly high that the project was run by an independent consortium, which ensures that the information provided is highly credible to end users and installation contractors.

Furthermore, the Energy+ Awards had a high value for the winning companies in their marketing and particularly communication efforts towards final customers but also installation contractors.

The manufacturers confirm that installation contractors are an important link in the market chain, but also that wholesale is a bottleneck: if wholesale does not store the energy-efficient circulators due to the vicious circle of low sales numbers / high prices, installation contractors will have difficulties to order and sell them. This is why the manufacturers think that making the final customers aware is very important, too, to create market demand pull on both installation contractors and then wholesale. Some manufacturers say that Energy+ Pumps has made them more aware of the needs and benefits of addressing final consumers, something that they did not do so much in the conventional circulator business. So this is why they value the communication by Energy+ Pumps and its supporters to final consumers, and the Energy+ Awards so positively.

As one reason for the still relatively high price premium, one manufacturer representative in one country quoted the still high costs of permanent magnets, which are mostly imported from China.

Furthermore, the training courses and material for installation contractors were also seen as very useful. However, major manufacturers hesitate to use the software tool provided by the project, since it includes circulator models from all manufacturers. They prefer to use their own software that only features their own models.

In conclusion, the manufacturers are the group of market actors who judge the (potential) influence of Energy+ Pumps on the market most positively. They think the project has been highly useful but was too short. Some state that financial incentives would be needed, as well as addressing end-users much more intensively to achieve a demand pull towards installation contractors and then wholesale.



## 5 Conclusions: how to further promote highly energy-efficient circulators in the EU

Looking at the evidence on the market development (chapter 3) and the statements of buyers, Energy+ supporters, installation contractors, and manufacturers (chapter 4), we can conclude: The Energy+ Pumps project has had some impact on the market for highly energy-efficient heating system circulators in the nine countries represented in the project. It has made potential buyers and installation contractors more aware of the advantages of Energy+ circulators, it has assisted at least those installation contractors who participated in the training courses organised with assistance of the project to correctly size and sell Energy+ circulators more easily, and it has made manufacturers more aware of the need to market the new generation of circulators more actively to final customers, and assisted them in doing so, particularly the Energy+ Award winners.

The market for circulators with a Europump label class A that are sold stand-alone (for replacement and/or in floor-standing boiler systems) has increased quite considerably during the three years the project has operated (2006 through 2008), reaching a share of more than 15 % in the nine countries during 2008. However, what exactly is the contribution of Energy+ Pumps to this development is impossible to say. And it became clear that boiler and circulator manufacturers still need to work closely together to increase the share of wall-mounted boilers that have the highly energy-efficient circulators included, both the share in the model range and sales.

The three main lessons learnt from the project are, therefore:

1. Market structures, the functioning of the market, and (dis)incentives of market actors to engage in the production, sale, or purchase of energy-efficient circulators are generally as assumed beforehand. In particular, the analysis confirmed that installation contractors are usually the actors who take the choice of the circulator or the boiler in the residential sector, not the building occupiers or owners (except maybe for large housing companies).
2. It turned out to be easier than expected to win the circulator manufacturers to participate in the project, but it also appears to require more work than expected to convince boiler manufacturers – even those who already have products on the market that include Energy+ circulators – and potential large buyers of circulators to participate.
3. A reason may be that the standard circulators available on the market fit well into existing heating systems, in which the circulator is external to the boiler, and yield high energy and cost savings if the heating system runs continuously during the heating season, with control via the external temperature. By contrast, if the heating system is under on-off control, energy and cost savings





will be smaller. And if the circulator is integrated in the boiler, a standard circulator may not fit, particularly not for retrofit in existing boilers. While that confirms the importance of working with boiler manufacturers to include Energy+ circulators for the new boiler market, it creates some uncertainty among installation contractors and potential buyers of replacement circulators. It needs well-laid arguments for communicating the benefits of highly energy-efficient circulators. And the large shares of heating systems with on-off controls particularly in Southern Europe confirm the absolute necessity of reducing the price premium, but also lead to the conclusion that there is a market for highly energy-efficient circulators without sophisticated variable speed controls and with a lower price than those currently on the market.

How could the market for Energy+ circulators be broadened in the future? The team has collected the following proposals:

- It is highly important to **address all actors** in the market chain, i.e., circulator and boiler manufacturers, heating system designers, wholesale, installation contractors, and building owners. If the chain of information breaks at one point, the energy-efficient solution might fail to be chosen.
- **Installation contractors are identified as key actors** in the market system. They need to continuously be schooled and trained with respect to these new products available on the market. Associations of contractors and organisations providing training to them are thus important partners for promoting energy-efficient circulators and boilers.
- **Information campaigns and initiatives with a broad target group**, like the incorporation of Energy+ pumps in the TopTen websites, are important to involve the final customer. In such a way the final customer is informed about the product and can trigger his or her installer by actively asking for these products. The installer on his or her turn will ask feedback to the wholesaler and manufacturer. A bottom-up cascade is triggered, re-enforcing the top-down approach by the manufacturers.
- **Combining** these campaigns and initiatives **with a financial incentive of 50 to 100 Euros** for the purchase of a circulator of Europump label class A or better could be decisive for real market transformation. The incentive could be offered by the government, or by energy companies. Energy+ partners in Belgium and France have contributed to making class A pumps eligible for the schemes run to fulfil the energy companies' energy savings obligations. Running such incentive programmes for one or two years may be sufficient to achieve much higher production volumes and bring down the price premium. Mass procurement of circulators, as done by the City of Salzburg, could be another way to reduce prices to participating building owners. Incentive programmes could also trigger more boiler manufacturers to include Energy+ circulators in their products, and circulator manufacturers to produce more replacement circulators for boilers.



- An **official EU energy label for circulators should be introduced**. However, it should be **improved** compared to the Europump label. There are now circulators on the market using only half as much electricity as is required for Europump class A, so the requirements for class A should be tightened.
- Member States could also **require class A** circulators in their national building codes. The Greek project partner has proposed this to the legislator.
- And finally, the **EuP requirements** for circulators should require circulators of (an improved) class A. Then they would really become the European standard.

To promote a significant market introduction of a new product, the **time span of an average two-year project is very modest**. Promoters and manufacturers signal that this needs a long term strategy. This seems particularly the case for the boilers, which often need redesign to host the energy-efficient circulators, and for the development of highly efficient replacement circulators for existing boilers. However, the manufacturers appreciate the support from European projects as Energy+ Pumps, since it acknowledges the relevance of the energy saving products towards the broad public, which facilitates the further introduction.

Nevertheless, the Energy+ Pumps project has had a number of success stories:

- The awareness for circulation pumps have risen strongly during the project duration. At the start of the project only two and in addition expensive efficient circulation pumps from one manufacturer were available on the European market. By any chance the two biggest European pump manufacturers launched new very efficient models just at the beginning of the project, other manufacturers followed so all big manufacturers were inline with the project goals and supported it. Hand in hand, this helped for the successful implementation of the project. The versatile project activities have made the new efficient technology become well known to many installers and other stakeholders and with the help of the Energy+ project the market share of very efficient circulation pumps for residential use could raise within 3 years from 0 % to about 5 – 10 % for all and to 17 % for stand-alone circulators. In some countries, market shares of about on third are already achieved. That shows that the market goes in this direction and is irreversible. The slogan of the Energy+ project **“Energy+ makes highly efficient circulators the standard” will become true in near future**.
- In France, to raise awareness among all sectors of civil society and encourage a sense of responsibility, French law has recently introduced a new tool: energy saving certificates. Among various products, circulators class A have been included in the French Energy Saving Certificates list since September 2008. Thanks to Energy pump project, ADEME managed to implement circulators as an energy saving certificate faster than it was expected. In Italy and in Belgium comparable measures could be implemented.
- By successful co-operation with another IEE-project Euro-Topten, the product lists have been presented on the national Topten product websites of Switzerland, Austria, Belgium, Netherlands, Finland and Poland, more could follow. This independent customer advice tool is very attracts more than one million visitors a year with growing tendency. As the Euro-Topten project will run for at least additional three years, regular updating of the circulators’ product



database is secured and one crucial aspect of the work done in the Energy+ project will be continued.



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