Benefits of Ecodesign for EU Households

2023 Update

Final Report

Authors

Matthew Smith (Trinomics)

Aurora Miari (Trinomics)

Ling Ying Lee (Trinomics)

Reviewed by: Jessica Yearwood (Trinomics)

Contact person

Matthew Smith

T: +31(0)61292 9246

E: matthew.smith@trinomics.eu

Date

Rotterdam, 17 March 2023

Acknowledgement

This project is funded by The European Consumer Organisation (BEUC).

Disclaimer

The views expressed herein can in no way be taken to reflect the official opinion of BEUC.

Rotterdam, 17 March 2023

Benefits of Ecodesign for EU Households

2023 Report

CONTENT

Executive Summary

Introduction

This study updates work carried out for BEUC in 2016[1] which quantified the financial benefit to households from Ecodesign and Energy Labelling at between €330 (Ecodesign only) and €515 (Ecodesign and Energy Labelling). An update of this work is timely and relevant due to a number of reasons but two primary reasons can be identified: (1) Updates to the Ecodesign and Energy Labelling Regulations for multiple products since 2016; (2) The energy price crisis that has emerged in Europe since summer 2021 and intensified following the Russian invasion of Ukraine in February 2022, and which has seen energy prices rocket and household energy bills soar, leading to a renewed interest in energy efficiency and savings. It is expected that both factors have increased the benefits of Ecodesign and Energy Labelling for the average EU household – this work quantifies the size of the benefits.

Approach

The approach of the work mirrors that from 2016, but uses the updated regulatory thresholds, updated prices, updated product characteristics and updates to a range of other variables[2]. It also updates the products used by the average EU household to include common products such as room air conditioners and printers. The products assessed are a dedicated space heating system, a dedicated water heating system, an electric room heater, a combined fridge-freezer, an electric oven, electric hobs, a washing machine, a vacuum cleaner, a TV, a monitor, lightbulbs (x45), a dishwasher, a complex set-top box, a desktop PC, a notebook PC, a coffee maker, a tablet PC, a router, a room air conditioning unit and a colour inkjet printer.

The overall approach involves estimating the energy use in kWh, multiplying this by an energy price assumption to calculate energy costs to estimate annual energy savings. An added step combines the energy cost with the purchase price and other running costs to estimate the total cost of ownership of a product. This is carried out for 3 versions of the same product, one representing a base case, or a counterfactual, which estimates the product characteristics if Ecodesign and Energy Labelling regulations did not exist. This is the product against which the two other products are compared, these are (1) an Ecodesign product, i.e. one that just meets the minimum energy performance standards set in the regulation; and (2) a Best Available Technology (BAT – which is Energy Label driven). The approach is further elaborated in section 1.2 of the report.

Key findings – Energy cost savings

The energy savings estimated from Ecodesign and BAT (Energy Labelling) are presented in Table 0-1. **These show that the energy cost savings from Ecodesign average around €650 per year in total across the lifetime of the products. This increases to €1 800 per year for BAT.** The majority of these savings come from increased efficiency of space heating products, and to a lesser extent lightbulbs. The savings from other products are lower.

[1] https://www.beuc.eu/sites/default/files/publications/beuc-x-2016-108-benefits_of_ecodesign_for_eu_households.pdf

[2] For these reasons, it should be noted the results in this study are not strictly comparable with the 2016 results as there are multiple changes to key assumptions, for example on product efficiency (due to regulation updates, BAT product improvement, assumed autonomous efficiency improvement in Base Case), energy prices, purchase prices, running costs, usage (load).

Further analysis in the report (see section 2.4) shows that during the energy price crisis peak energy prices further increased the annual savings. **Examples from Germany, Spain and Czechia estimate energy cost savings in 2022 under observed peak prices in each country of between €900-€1300 per year from Ecodesign, and between €2100-€2400 per year for BAT (Energy Labelling).**

Key findings – Total savings

However, the energy savings are only part of the story, more efficient products typically cost more to purchase, and additionally Ecodesign measures may affect other running costs for example by also regulating water consumption efficiency. Calculations were carried out which combined purchase costs, with energy costs and running costs over the full lifetime of the product to estimate the total cost of ownership (TCOE) of each product. Annualised values were calculated from this, based on the product lifetime.

The results showed that the total annual cost savings from Ecodesign average around €620 per year in total across the lifetime of this set of products. This increases to up to €950 per year for BAT. The Ecodesign total savings are similar to the energy cost savings total, this is because the impact of increased energy efficiency on energy costs is roughly proportional to the increase in purchase price of the more efficient products. This relation weakens a little for the BAT products where the total cost savings are lower than the energy cost savings, demonstrating a diminishing return on efficiency gains as it becomes more expensive to achieve gains in efficiency. However, it still pays off to invest in more efficient but expensive products. Similar to energy costs the majority of these savings come from increased efficiency of space heating products, and to a lesser extent lightbulbs. The savings from other products are significantly lower.

Conclusions

The financial benefits for the average European household from Ecodesign and Energy Labelling have increased in this period of high energy prices. Compared to earlier BEUC and EC analysis, which was based on pre-crisis lower prices, and earlier versions of the regulation, the benefits are estimated to have increased considerably.

It is estimated the average European household will save between €650 - €1 800 per year on their energy costs due to Ecodesign and Energy Labelling. The savings are highly concentrated on space heating systems (which contribute Ecodesign €315 / BAT €1 047 savings) and lamps (Ecodesign €211 / BAT €241). The other products also contribute but the amounts are smaller, totalling €121 Ecodesign and €486 BAT.

In 2022 at the peak prices experienced in the year these energy cost savings increased to an EU average of €890 - €2 450 per year. Examples from specific countries showed:

- Savings of €1 450 - €2 700 in Germany, higher savings due to higher energy prices
- Savings of €1 000 - €2 350 in Spain
- Savings of €1 250 - €2 550 in Czechia

Taking the increased purchase price of more efficient products into account, there are still significant cost savings over the full lifetime of the majority of products.

On a total cost of ownership basis Ecodesign and Energy Labelling are estimated to save the average European household €620 - €950 per year. Savings are particularly concentrated on space heating systems and lighting.

More efficient space heating systems provide strong evidence for financial payback over their lifetime. High efficiency gas boilers and high-efficiency heat pumps all more than payback their additional purchase costs compared to the minimum efficiency (Ecodesign) products. The payback period for the high-efficiency heat pump is around 10 years and it provides the highest total lifetime cost savings of the assessed heating systems. For low-average efficiency heat pumps the benefits are much lower with little or no benefit compared to the high-efficiency gas boiler. **Current Ecodesign proposals for minimum efficiencies for heat pumps could be tightened.**

The savings vary with energy prices and appliance usage, with benefits increasing with high prices and/or usage and vice-versa. The benefits of Ecodesign and Energy Labelling are higher for products where energy costs contribute a high share to total costs, and also for high use households. For heat pumps the relative prices of electricity and gas have a big influence, **reducing taxes on electricity and/or increasing taxes on gas can have a significant positive impact on the financial attractiveness of heat pumps.**

Subsidies towards the purchase cost for heat pumps improve the financial outcomes considerably and can be a powerful policy measure to increase heat pump adoption. These reduce the payback periods for heat pumps to around 4-5 years, compared to 10-17 year payback periods without subsidy. These estimates are based on existing schemes in Europe providing subsidies of 2 000 EUR – 4 000 EUR towards an installation.

Ecodesign and Energy Labelling have a number of non-financial benefits that facilitate Europeans' daily life, improve their well-being and increase their independence.

Strengthening Ecodesign and/or Energy Labelling regulations is likely to yield additional benefits for consumers. Computers (desktop and notebook PCs) could be a particular area of attention, as regulation coverage, and also understanding of energy use and potential benefits is weaker for these products.

1 Introduction and approach

1.1 Introduction

Ecodesign and Energy Labelling are key EU policies which address the energy use of appliances by eliminating the least efficient products through Ecodesign minimum energy performance standards and incentivising more energy efficient appliances through Energy Labelling. Efforts have been made to quantify the benefits of these regulations to households. This study updates work carried out for BEUC in 2016[3] which quantified the financial benefit to households from Ecodesign and Energy Labelling at between €330 (Ecodesign only) and €515 (Ecodesign and Energy Labelling) per year for an average set of products. Whilst work by the European Commission estimates average savings of up to €285 per year on household energy bills.[4] In 2021 alone, Ecodesign measures, were estimated to have saved EUR 120 billion in energy expenditure for EU consumers and resulted in a 10% reduction in annual energy consumption across the 31 product groups it covers.[5]

An update of the 2016 work for BEUC is both timely and relevant due to a number of reasons but two primary reasons can be identified: (1) Updates to the Ecodesign and Energy Labelling Regulations for multiple products since 2016; (2) The energy price crisis that has emerged in Europe since summer 2021 and intensified following the Russian invasion of Ukraine in February 2022, and which has seen energy prices rocket and household energy bills soar, leading to a renewed interest in energy efficiency. It is expected that both factors have increased the benefits of Ecodesign and Energy Labelling for the average EU household – this work quantifies the size of the benefits. It also helps to make the case for continued improvements in product energy efficiency.

The work is also highly relevant in the current policy context of the European Green Deal, which, for the achievement of its climate neutrality goals, aims for a *just transition*. Amongst the Green Deal measures particular attention is given to the durability of products, as well as overall energy efficiency.[6] It should be mentioned that while the current Ecodesign Directive (2009/125/EC) covers only energy-related products, there is a proposal for a new Ecodesign for Sustainable Products Regulation which was published on 30 March 2022[7]. This proposal aims to broaden the coverage to include non-energy-related products and to address a broader range of environmental and sustainability impacts as part of the transition to a greener and more circular economy.

Ecodesign has a less visible impact in the eyes of the household consumer, compared to the EU Energy Label. However, it results in making products that are more energy efficient and removing the least efficient ones from the market, which translates to energy savings, and also delivers other benefits such as reduced noise and water usage, improved health and comfort etc. Many consumers are unaware of the impact that Ecodesign measures have on them.

[3] https://www.beuc.eu/sites/default/files/publications/beuc-x-2016-108-benefits_of_ecodesign_for_eu_households.pdf
[4] https://commission.europa.eu/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/energy-label-and-ecodesign/about_en
[5] https://commission.europa.eu/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/sustainable-products/ecodesign-sustainable-products_en
[6] https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en
[7] https://environment.ec.europa.eu/publications/proposal-ecodesign-sustainable-products-regulation_en

The EU energy label, on the other hand, has been recognised as a successful key driver to help consumers distinguish the energy efficiency of products. According to the Eurobarometer, 93% of consumers recognise the energy label, and 79% considered it when purchasing these products. With the development of more efficient products through continued research and innovation, the energy labels will also have to be gradually readjusted – for example, a product with an A+++ energy efficiency class could now be rescaled to class B or lower, leaving room for more energy efficient products to be developed. In 2021, five product groups had their energy labels 're-scaled', namely:

- Fridges and freezers;
- Dishwashers;
- Washing machines and washer-dryers;
- Electronic displays, including televisions;
- Lighting.

Rescaling of other product groups carrying the energy label is expected to take place in the coming years.

1.2 Objectives and general methodology

This study aims to further shed light on the financial and other benefits arising from the Ecodesign and Energy Labelling regulations for an average EU household. It builds upon a previous study from 2016 for BEUC[8]. Similar to this previous study, this report focuses on quantifying the financial benefits in terms of savings on the energy bill.

One of the key sources for the work is the Ecodesign Impact Accounting Report for 2021, published by the European Commission[9]. This is used to derive multiple values in the calculations.

The analysis follows a step-wise approach.

1. Firstly, the list of products (regulated by Ecodesign and Energy Labelling), which is most likely to be found in an average European household is identified. This is done by looking at products with the stock numbers as reported in the latest Impact Accounting report on Ecodesign published in 2022, from these numbers the average ownership of an appliance is calculated.[10]
2. For those selected products, we review the regulations to establish the current (or very soon to be in force in 2023) requirements for these products.
3. The basis of the calculations are carried out using the following case scenarios:
    a. **Base Case (BC)** represents the estimated product characteristics in the absence of any regulation, i.e. the No Ecodesign or Energy Labelling case, this is the main counterfactual and comparison point for the calculated savings. It is defined on the basis of the Base Case product defined in the Ecodesign Impact Accounting report, see PRICE tables, which provides for a purchase price and efficiency metric for this product for a base year. If the base year is 2010 (this is the case for many products) then the efficiency is improved in proportion to the change in efficiency in the business as usual scenario for this same time period in the Impact Accounting Report

[8] https://www.beuc.eu/sites/default/files/publications/beuc-x-2016-108-benefits_of_ecodesign_for_eu_households.pdf
[9] By VHK et al, available at https://op.europa.eu/en/publication-detail/-/publication/392bc471-76ae-11ed-9887-01aa75ed71a1/language-en
[10] https://op.europa.eu/en/publication-detail/-/publication/392bc471-76ae-11ed-9887-01aa75ed71a1/language-en

(see table BAUEFN). This adjustment is made to reflect the estimated autonomous efficiency improvements that would have occurred in the absence of regulation.

b. **Ecodesign (ECO)** represents a product which operates at the Minimum Energy Performance Standard (MEPS) set by the Ecodesign regulation, i.e. the least efficient product that is still currently allowed under the rules. The information in the regulation allows for the key parameters of such a product to be defined, and these are also triangulated with sources for actual products such as the European Product Registry for Energy Labelling (EPREL) database and/or appliance retail websites.

c. **Energy Label / Best Available Technology (BAT)** represents the most efficient currently available product on the market. Often, this represents the highest Energy Label category. In some cases, particularly for recently updated labels, the current best performing product is not in the highest label category, with these remaining empty for the time being. The product characteristics for this BAT product are defined on the basis of the Regulation and also information from other sources such as EPREL, Topten[11] and retailers.

4. Amongst the key steps, assumptions and principles in the calculations are:

   a. **We compare products of the same basic characteristics**, e.g. displays with the same screen dimensions and pixels, dishwashers with the same number of place settings.

   b. **We compare different technologies in a handful of cases**, notably for the space and water heating technologies—the Base Case and Ecodesign products are fossil (gas) based appliances, whilst the BAT product is an (electric) heat pump.

   c. **The calculations are made on a total cost of ownership basis**, which add up over the full lifetime of the product the purchase price + energy costs + other running costs (maintenance, water, other supplies). These are divided by the lifetime, the value for which (see Table 2-1) is taken from the Ecodesign Impact Accounting report (see STOCK tables), to provide an annualised basis for comparison. Only in the case of lighting is a different lifetime per product used. In this case the purchase price for the base case product (short lifetime) is multiplied by a value so that the cost of purchases for the lifetime of the Ecodesign and BAT products is considered, i.e. the purchase costs of 8 incandescent light bulbs with 2 year lifetimes is compared to the purchase costs of 1 LED bulb with a 16 year lifetime.

   d. **Purchase prices for products are calculated on the basis of the Ecodesign Impact Accounting report**, indexed to current (2023) prices and adjusted using assumptions on the cost of an additional unit of efficiency, e.g. for an increase in efficiency of 1% it is typical to have an additional purchase cost of X euros. For products that do not compete on efficiency, e.g. computers, no existing assumption was available, in these cases the team used expert judgement to estimate a value consistent with knowledge and observed prices. Prices are also checked against actual retail prices published on retail websites.

   e. **Energy costs are calculated on the basis of an assumed annual usage,** or product load, e.g. a washing machine runs 174 cycles per year, and the energy use in kWh is calculated for each of the product types. The load assumption is then derived. The assumption is based on an average EU household value, which equates roughly to the usage of 2.2 people (the EU average household size) – the specific usage assumptions

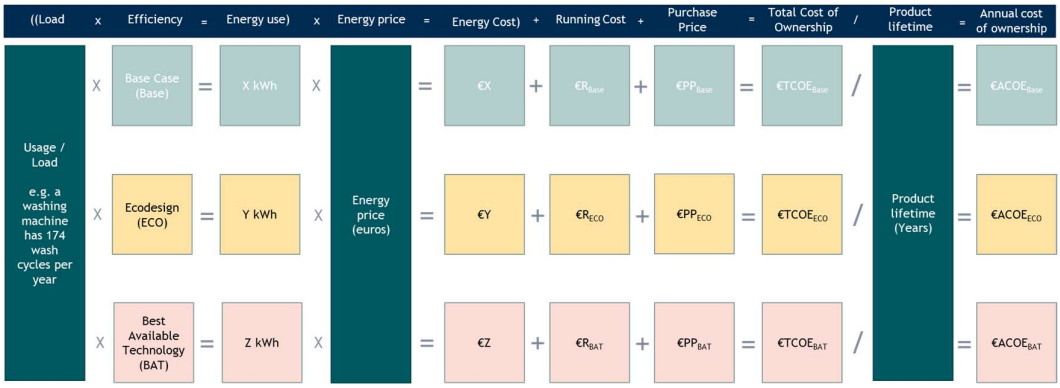
[11] https://www.topten.eu/

are presented in Table 2-1, and a sensitivity analysis of these values is presented in section 2.6. The energy use is then multiplied by the average prices for that fuel over the lifetime of the product. Energy price assumptions are derived from modelled projections of the future energy system, taking into account the current price crisis. Three price scenarios are used to show a range of possibilities given the uncertainties in future price developments. The assumptions are further detailed below.

f. **Other running costs are calculated on the basis of information in the Ecodesign Impact Accounting reports,** which provide estimates per product for energy and other running costs, from which product level estimates can be derived. Typically these do not vary between the Base Case, Ecodesign and BAT products, but in some cases, e.g. where water efficiency is also regulated by Ecodesign, then (small) adjustments are made to reflect the reduction in other running costs—this is most relevant for dishwashers and washing machines.

The following figure 1-1 provides a visual of the approach. This illustrates how a standard usage (load) is multiplied by product efficiency to calculate annual energy use. This is multiplied by energy prices to arrive at an energy cost, which when combined with running costs and the purchase price of the product provides a total cost of ownership (TCOE). This TCOE can be divided by the product lifetime to calculate an annual cost of ownership value which is the main indicator used in this study to summarise the financial savings achieved. Note: no discounting of future costs is applied, nor are costs inflated, the two effects assumed to cancel each other out.

Figure 1-1 Overview of the calculation approach used in the study



Energy price assumptions

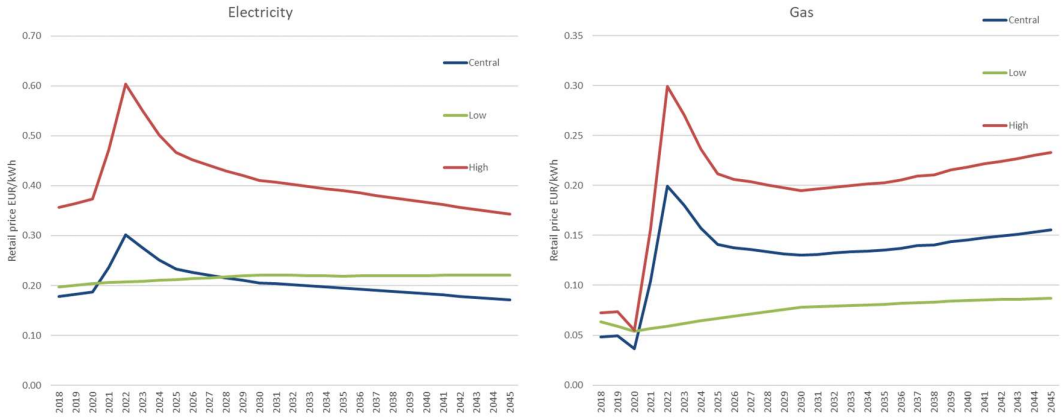
The energy price assumptions are crucial to calculating the financial savings that can be achieved by Ecodesign and more energy efficient products. However, the upheavals in energy markets since 2020 have made energy price forecasts for the next 10-20 years much more uncertain, with projections made prior to 2020 deviating significantly from the actual price movements of the last few years. This work has used a set of three EU27 price scenarios, these are based on leading EU projections of price developments and electricity market modelling by respected analysts, Cambridge Econometrics. The three scenarios are based on:

- **Low** – this price scenario is based on the Ecodesign Impact Accounting report, which bases future price assumptions on PRIMES v6 fossil fuel commodity prices, these were developed

prior to, and do not include the impact of, the energy price crisis. It is notable that long-term electricity prices in this scenario are a little higher than the central price scenario.

- **Central** – this price scenario is based on an average of 4 price scenarios, each of which is based on the price projections used for the REPOWER Impact Assessment, but which include differing assumptions on technology uptake towards net zero and carbon taxes (EU-ETS prices) for modelling the electricity prices.
- **High** – this price scenario represents a case where energy prices stay higher in the long term. With average electricity prices increased 100% compared to the central case, and gas prices increased 50%. These assumptions, whilst perhaps unrealistic in the medium- to long-term are used to demonstrate how prolonged higher prices could affect the financial savings from Ecodesign.

Figure 1-2 Energy price scenarios used as a basis for the work, electricity (left), gas (right), EUR/kWh



Price scenarios are applied to each product based on the lifetime of the product, e.g. for a product with an 8 year lifetime then an average of the prices for 8 years was used, starting with 2022 and the following 7 years. These price averages are presented below in Table 1-1, and show that the longer the lifetime of the product the lower the price assumption, this is due to the declining influence of high prices in the short term on the overall annual average.

Table 1-1 Price assumptions used in the analysis, annual average price over lifetime of product, EUR/kWh

Lifetime [years]	Central [EUR/kWh]		Low [EUR/kWh]		High [EUR/kWh]	
	Electricity	Gas	Electricity	Gas	Electricity	Gas
1	0.302	0.199	0.207	0.059	0.604	0.299
2	0.289	0.190	0.208	0.061	0.578	0.285
3	0.276	0.179	0.209	0.062	0.552	0.269
4	0.265	0.170	0.210	0.063	0.531	0.254
5	0.258	0.163	0.210	0.064	0.515	0.245
6	0.251	0.159	0.211	0.066	0.503	0.238
7	0.246	0.155	0.212	0.067	0.492	0.233
8	0.242	0.152	0.213	0.068	0.483	0.228
9	0.238	0.150	0.214	0.069	0.475	0.224
10	0.234	0.148	0.215	0.070	0.468	0.222
11	0.231	0.146	0.215	0.071	0.462	0.220
12	0.229	0.145	0.216	0.072	0.457	0.218
13	0.226	0.144	0.216	0.072	0.452	0.217
14	0.224	0.144	0.216	0.073	0.448	0.216
15	0.222	0.143	0.216	0.073	0.444	0.215

Lifetime [years]	Central [EUR/kWh]		Low [EUR/kWh]		High [EUR/kWh]	
	Electricity	Gas	Electricity	Gas	Electricity	Gas
16	0.220	0.143	0.216	0.074	0.440	0.215
17	0.218	0.143	0.217	0.075	0.436	0.214
18	0.216	0.143	0.217	0.075	0.432	0.215
19	0.214	0.143	0.217	0.076	0.429	0.215
20	0.213	0.143	0.217	0.076	0.426	0.215

Prices are retail prices for households including taxes and VAT.

In addition to the use of these price scenarios, actual price data for the last years was used to provide estimates of peak energy savings in three specific countries, see Section 2.4.

1.3 Report structure

This report is organised in the following manner:

- Chapter 2 presents the main results of the analysis of the financial savings derived from Ecodesign and Energy Labelling measures for an average European household.
- Chapter 3 concludes the results of the study and suggest key recommendations arising from this analysis.
- Annexes provide further detail on financial calculations at different price levels and usage (load) levels, and also product factsheets with more detailed information at product level

2 Results

2.1 Products (regulated by Ecodesign and Energy Labelling) owned by an average European household

The list of products that are regulated by the Ecodesign and Energy Labelling that are most likely to be found in an average European household includes the following:

- A dedicated space (central) heating system;
- A dedicated water heater;
- A portable electric room heater;
- Refrigerating appliances;
- An electric oven with electric hobs;
- A washing machine;
- A dishwasher;
- A vacuum cleaner;
- Two electronic displays (1 TV and 1 monitor)
- A complex set-top-box;
- A desktop and/or laptop computer;
- A home inkjet printer;
- A room air conditioning unit;
- Light sources - Approximately 45 lightbulbs per household
- A coffee machine, router and tablet (each of which are indirectly regulated for their standby power use)

Other standard appliances such as mobile phones, electric toothbrush, electric kettle, toaster, hair-dryer, and shaver/trimmer are regulated directly by neither Ecodesign nor Energy Labelling, (although their standby power consumption may be regulated under Ecodesign) and are thus not analysed here.

Table 2-1 below provides an overview of the products considered in this analysis, including stock data, assumed stock per household, lifetime, and load of each product.

Table 2-1 Overview of key details of products found in a typical EU Household in 2020

No.	Product name (in Ecodesign Impact Accounting report)	Simplified product name	Description	EU27 2020 stock ('000 units)	Average stock per household	Assumed average stock per household	Lifetime (No. of years)	Load	Remarks
1	CHB Central Heating boiler, space heating	**Dedicated space heating system**	Without regulation, i.e. Base Case, this represents a non-condensing gas boiler. With Ecodesign, it represents a condensing gas boiler and the best performing product (BAT: Energy Label) represents an electric heat pump system. Each has a heat output of approximately 9kW.	102,939[12]	0.52	1	18	8,298 kWh heat/annum	For heating systems the Base Case is a non-condensing gas boiler, the Ecodesign case is a condensing gas boiler, whilst the BAT case is a heat pump.
2	WH dedicated Water Heater	**Dedicated Water heating system**	Without regulation, i.e. Base Case, and with Ecodesign, this represents a dedicated instantaneous gas water heating system of approximately 24-30kW output. The BAT system is an electric heat pump water heater.	135,345[7]	0.69	1	15	Average daily hot water use for one year. Varies per technology and system.	Assumes an average daily hot water use for one year based on a standard tapping pattern.
3	LH Electric sum	**Electric room heater**	Electric local space heater of approximately 1kW power input.	256,111[13]	1.3	1	9	233 kWh heat/annum	Based on a 1kW system operating at 50% power for 475 hours per year.
4	RF Household Refrigerators & freezers	**Combined fridge-freezer**	Represents a combined fridge-freezer of around 300-400 litres capacity	258,072	1.31	1	16	563 kWh/annum	Based on constant usage
5	CA Electric ovens	**Electric oven**	A built-in oven with a volume of 65 litres.	194,026	0.99	1	19	110 cooking cycles per year	Electric ovens represent around 84% of the total ovens, the remainder are gas.
6	CA Electric Hobs	**Electric hob**	A 4-hob electric (induction) system.	153,464	0.78	1	15	438 cooking periods per year	Electric hobs represent around 66% of the total ovens, the remainder are gas. The load is equivalent to bringing 1229 litres of water/year to the boil for 20 minutes.
7	WM Washing Machines	**Washing machine**	Front loading machine, with rated capacity higher than 7kg.	167,857	0.85	1	15	174 cycles/annum	

[12] In addition to this number there are an estimated further 89 981 thousand combination (space+water heating) boilers of various types (primarily gas), and 9 068 thousand solid fuel boilers (mainly wood and coal, heating only)

[13] In addition to this number there are an estimated further 68 306 thousand solid fuel local space heaters, 1 985 thousand gas-fired local space heaters and 340 thousand liquid fuel local space heaters.

No.	Product name (in Ecodesign Impact Accounting report)	Simplified product name	Description	EU27 2020 stock ('000 units)	Average stock per household	Assumed average stock per household	Lifetime (No. of years)	Load	Remarks
8	VC Total Domestic mains+cordless +robots	**Vacuum cleaner**	General purpose vacuum cleaner. Without regulation, i.e. Base Case, this represents a vacuum with approximately 1,700W power input. With Ecodesign, the power input is less than 1,600W. For the best performing product (BAT: Energy Label) case the power input is 700W.	254,858	1.3	1	8	38 hours/annum	
9	DP TV	**TV set**	Refers to a 43-inch screen size, UHD electronic screen, with tuner.	418,021	2.13	1	7	10 hours standby-mode/day; 4 hours viewing time/day	
10	DP Monitor	**Monitor**	Refers to a 24-inch screen size, HD electronic screen.	84,734	0.43	1	7	4 hours standby-mode/day; 4 hours viewing time/day	
11	LS Lighting	**Lightbulbs**	Without regulation, i.e. Base Case, the bulb is an incandescent lamp, the Ecodesign and BAT lamps are LEDs. Each bulb is calculated to provide 584 lumens of output.	8,704,000	44.25	45	16	484 hours/annum	Equivalent to average 1.3 hours usage per lamp per day.
12	DW Household Dishwashers	**Dishwasher**	A standard household dishwasher	96,528	0.49	1	15	220 cycles/annum	
13	CSTB	**Complex set-top-box**	With Auto Power Down capability	173,137	0.88	1	5	4.5 hour daily usage in on-mode	Load also includes 4.5 hours in automatic power down, 15 hours in standby.
14	PC Personal Computers	**Desktop PC**	Hexa (6) core, 16GB RAM, G7 class graphics card (6 GB), 512GB internal storage	84,340	0.43	1	6	2 hours daily usage	Ecodesign does not regulate power consumption in active usage, only in sleep, idle and off modes. No robust data on energy use in active modes.
15	PC Personal Computers	**Notebook (laptop) PC**	Hexa (6) core, 8GB RAM, G7 class graphics card (4GB), 256GB internal storage	212,868	1.08	1	5	2 hours daily usage	
16	SB Coffee Makers	**Coffee maker**	Capsule (hard) espresso machine	136,674	0.69	1	6	1.7 hours day active/standby 22.3 hours day off mode	Regulated only networked standby energy use through horizontal Ecodesign measure.
17	PC Tablet/slate	**Tablet**	Tablet with Wi-Fi, with screen diagonal smaller than 9 inches.	119,044	0.61	1	4	2 hours daily usage 22 hours standby/idle/off	Regulated through networked standby energy use horizontal and Computers Ecodesign measures.

No.	Product name (in Ecodesign Impact Accounting report)	Simplified product name	Description	EU27 2020 stock ('000 units)	Average stock per household	Assumed average stock per household	Lifetime (No. of years)	Load	Remarks
18	SB Home network equipment	**Router**	Gateway device for wireless home Internet access.	124,456	0.63	1	5	7 hours On mode 8.5 hours standby 8.5 hours idle	Regulated only networked standby energy use through horizontal Ecodesign measure.
19	RAC Room Air Conditioner	**Air conditioner**	Electric mains-operated air conditioners with a rated capacity of ≤ 6 kW for cooling, and refrigerant with GWP >150.	46,089	0.23	1	12	1,221 kWh cooling/annum	Equivalent of 350 full load hours of usage per year. Cooling only.
20	EP & IJ imaging equipment	**Printer**	Inkjet colour printer	106,994	0.54	1	6	417 images /annum	Voluntary Agreements are limited to household and office equipment. Stock is for all printing and imaging equipment.

2.2 Financial savings achieved – annual energy bills

The following table (2-2) summarises the differences in energy use between products for the three cases we review. This shows that in all cases, except Desktop and Notebook PCs[14], the Ecodesign and BAT products result in very significant energy savings compared to a base case with no regulation. In the Ecodesign case energy savings of 3 735 kWh per year (1 401 kWh electricity, 2 723 kWh gas) are estimated, with this increasing for the BAT products to savings of 12 827 kWh per year (2 723 electricity saving, elimination of all 13 404 kWh of gas use, offset by an increase in electricity use for heating and hot water of 3 300 kWh). The biggest savings by far are achieved for space heating systems and lighting, with the next most significant savings also from water heating systems and fridge-freezers.

These savings translate into annual household energy cost savings of €648 per year in the Ecodesign case, and up to €1 774 per year in the BAT case. Mirroring the energy savings the largest part of these savings comes from space heating (49% of Ecodesign total, 59% of BAT total) and lightbulbs (33% of Ecodesign, 14% of BAT total). The other products contribute a smaller share of the total savings. The savings are also visualised in Figure 2-1 which highlights the impacts of individual products.

It should be noted that these are only energy savings and do not include changes in purchase prices or other running costs, these other aspects are addressed in the following section.

Table 2-2 Summary of energy savings from Ecodesign and their value, central price scenario

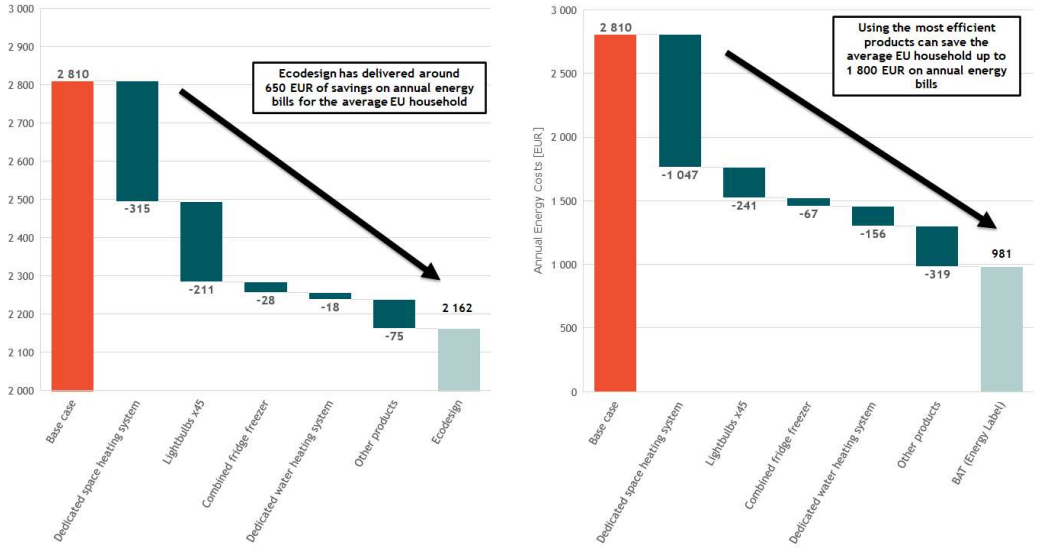
		Annual energy use (kWh)			Annual average energy costs [EUR/year]			Annual saving [EUR/year]	
No.	Product	BC	ECO	BAT	BC	ECO	BAT	ECO	BAT
1	Dedicated space heating system	11 854	9 649	3 000	1 695	1 380	649	-315	-1 047
45	Lightbulbs x45	1 156	196	61	254	43	14	-211	-241
1	Combined fridge freezer	417	291	111	92	64	24	-28	-67
1	Dedicated water heating system	1 550	1 422	300	222	204	67	-18	-156
16	Other products	2 313	1 998	992	546	471	227	-75	-263
		17 291	13 556	4 464	2 810	2 162	981	**-648**	**-1 774**[#]

* The base case and Ecodesign cases for these products are gas-fired systems, whilst the BAT system is an (electric) heat pump.

[#] The total for BAT (Energy Label) excludes 55 EUR of costs counted in the base case for which no BAT comparator applies. This explains the difference in values, where the Base Case comparison energy cost is 2 755 EUR/yr, not 2 810 EUR/yr.

[14] For PCs the estimation of energy use has high uncertainty due to a variety of factors including the fast movements in the sector, a lack of competition on energy efficiency in the sector and the limited scope of the Ecodesign measures (only affecting sleep, idle and off – but not active use modes).

Figure 2-1 Summary of energy savings from Ecodesign (left) and the most efficient products (BAT [Energy Label]) (right, central price scenario, EUR/year annual energy cost*



* The base case and Ecodesign cases for the space and water heating systems are gas-fired systems, whilst the BAT system is an (electric) heat pump. Other products includes 10 other products covered by Ecodesign and/or Energy Labelling.

2.3 Financial savings achieved – total cost of ownership

The previous section focused only on the energy cost savings due to Ecodesign, however improved energy efficiency typically comes at an additional cost, increasing the upfront purchase price of products. This can make it expensive for households to adopt the most efficient technologies. It is useful to take a lifetime perspective for the product, totalling all costs (purchase price, energy costs, running costs) incurred over the full lifetime to evaluate if the energy savings offset the additional upfront costs.

The following table (2-3) presents the results over the full lifetime of the product, calculating a total cost of ownership and savings (if any) per product group. It also annualises the values over the lifetime of the product to allow analysis of the combined effect.

As can be seen the product purchase price can vary considerably, typically, but not always, this increases with the efficiency of the product, e.g. a heat pump heating system is more expensive to purchase than a gas boiler. Other running costs are notable only for a handful of products including heating systems (mostly maintenance), washing machines (water, washing materials), vacuum cleaners (bags), dishwashers (water, washing materials), air conditioners (maintenance), printers (paper, ink). In the cases of washing machines and dishwashers small savings can also be observed in the Ecodesign cases due to the water efficiency requirements of the Ecodesign measures. Savings in other areas are also possible, for example maintenance costs may be reduced by requirements for reparability, durability and availability of spare parts, however, it was not possible to quantify the value of such impacts.

The table shows savings compared to the base case of €10 060 over the full lifetime of the products in the Ecodesign case, increasing to €19 775 in the BAT case. Illustrating that **overall, it pays off to**

purchase more efficient products and that the Ecodesign measures are providing large savings to households.

Looking at the annualised values the table shows that **compared to the base case the Ecodesign regulation has results in around €616 annual savings, whilst in the BAT case the savings increase to around €953 per year.** These values are similar to the energy savings values illustrating the trade of greater efficiency for higher purchase costs is quite balanced. Similar to the energy costs, the main savings are achieved by space heating (48% of Ecodesign total, 72% of BAT total) and lightbulbs (37% of Ecodesign, 26% of BAT total). The other products provide smaller total savings, but these do contribute to the total and the overall argument in favour of increased efficiency. Only in a very few cases it does not yet pay off to purchase the most efficient product. For example, the additional purchase price of a dedicated heat pump for water heating is not compensated by energy savings. A similar case exists for room air conditioning units.

Table 2-3 Detailed financial calculations, total cost of ownership (TCOE), annualised costs and savings - central energy price scenario assumptions

		Purchase Price [EUR]			Annual energy costs [EUR/yr]			Annual other running costs			Lifetime	Total cost of Ownership [EUR]			Total lifetime saving [EUR]		Annualised Cost of Ownership [EUR]			Annualised saving [EUR/yr]	
No.	**Product**	BC	ECO	BAT	BC	ECO	BAT	BC	ECO	BAT	Years	BC	ECO	BAT	ECO	BAT	BC	ECO	BAT	ECO	BAT
1	Dedicated space heating system	2 391	2 663	10 440	1 695	1 380	649	158	162	76	18	35 750	30 416	23 482	-5 334	-12 268	1 986	1 690	1 305	-296	-682
1	Lightbulbs x45	407	180	293	254	43	14	0	0	0	16	4 475	871	509	-3 604	-3 967	280	54	32	-225	-248
1	Combined fridge freezer	462	597	1 328	92	64	24	0	0	0	16	1 929	1 621	1 718	-307	-211	121	101	107	-19	-13
1	Dedicated water heating system	508	562	2 786	222	204	67	68	68	90	15	4 861	4 640	5 135	-221	275	324	309	342	-15	18
16	Other products	6 993	7 324	8 512	546	471	228	176	161	159	-65	15 112	14 518	13 571	-594	-232	1 669	1 608	1 362	-61	-29
		10 761	**11 326**	**23 358**	**2 810**	**2 162**	**981**	**402**	**391**	**325**		**62 127**	**52 067**	**44 414**	**-10 060**	**-16 403**	**4 380**	**3 763**	**3 148**	**-616**	**- 953**

* The base case and Ecodesign cases for these products are gas-fired systems, whilst the BAT system is an (electric) heat pump.

2.4 Energy cost savings achieved in 2022

The financial savings from Ecodesign and Energy Labelling are typically much higher in times of higher prices. With current EU average prices for Electricity of €0.302 EUR/kWh and Gas €0.199 EUR/kWh, compared to averages prior to the price crisis of around €0.20 - €0.25 EUR/kWh for electricity and €0.06 - €0.08 EUR/kWh for gas, the energy cost savings for the current year have increased considerably. As shown in Table 2-4 below, **in the current high energy price environment the benefits of Ecodesign and greater efficiency increase to €889 per year for Ecodesign and €2 435 per year for BAT**

Table 2-4 EU27 energy cost savings in 2023 at current high prices

		Annual energy use (kWh)			Annual average energy costs [EUR/year]			Annual saving [EUR/year]	
No.	**Product**	**BC**	**ECO**	**BAT**	**BC**	**ECO**	**BAT**	**ECO**	**BAT**
1	Dedicated space heating system	11 854	9 649	3 000	2 365	1 925	906	-440	-1 459
45	Lightbulbs x45	1 156	196	61	349	59	18	-290	-331
1	Combined fridge freezer	417	291	111	126	88	33	-38	-92
1	Dedicated water heating system	1 550	1 422	300	309	284	91	-26	-219
16	Other products	2 313	1 998	992	698	603	299	-95	-334
	Total	**17 291**	**13 556**	**4 464**	**3 847**	**2 958**	**1 348**	**-889**	**-2 435**

Country examples

Going beyond the EU27 average it is possible to use actual country level prices to give an indication of the extent of the range of energy savings during the last few years. The following section provides analyses for three EU Member States with different price characteristics in the last few years: Germany (high electricity prices, average gas prices pre-crisis, highest peak in prices during crisis), Spain (average electricity prices, above average gas prices pre-crisis, lowest peak in prices of the 3 MS), Czechia (average pre-crisis prices, high electricity and gas prices during crisis).

Germany

In Germany, pre-crisis (Jan-2020) prices of 0.332 EUR/kWh for electricity and 0.062 EUR/kWh for gas were the average. The electricity prices being amongst the highest in the EU. At the peak of the price crisis average prices for electricity reached 0.642 EUR/kWh (Nov-2022), almost doubling, whilst gas prices increased to 0.240 EUR/kWh (Dec-2022), almost quadrupling in the same period. These prices led to significant increases in annual energy costs of around 170-180% in the Base Case (BC) and Ecodesign (ECO) cases, and 94% in the BAT/Energy Label (BAT) case. **The increase in prices also significantly increased the benefits of Ecodesign and energy efficiency in Germany, increasing annualised savings at the peak price to €1 460 per year for Ecodesign and up to €2 713 per year for BAT.**

Table 2-5 Germany: annual energy cost savings at recent peak prices

		Pre-crisis (Jan-2020) annual average energy cost [EUR/yr]			Peak crisis annual average energy costs [EUR/year]			Change in annual energy costs [EUR/yr]			Peak Annual saving [EUR/year]	
No.	Product	BC	ECO	BAT	BC	ECO	BAT	BC	ECO	BAT	ECO	BAT
1	Dedicated space heating system	734	597	995	2 849	2 319	1 926	2 115	1 721	931	-530	-923
45	Lightbulbs x45	383	65	20	742	126	39	359	61	18	-617	-703
1	Combined fridge freezer	138	97	37	268	187	71	129	90	34	-81	-197
1	Dedicated water heating system	96	88	100	372	342	193	277	254	93	-31	-180
16	Other products	767	662	329	1 485	1 283	637	718	620	308	-202	-710
	Total	**2 118**	**1 509**	**1 480**	**5 716**	**4 255**	**2 865**	**3 597**	**2 746**	**1 385**	**-1 460**	**-2 713**

Spain

In Spain, pre-crisis (Jan-2020) prices of 0.219 EUR/kWh for electricity and 0.083 EUR/kWh for gas were the average. The gas prices being amongst the highest in the EU. At the peak of the price crisis average prices for electricity reached 0.384 EUR/kWh (Nov-2022), almost doubling, whilst gas prices increased to 0.198 EUR/kWh (Dec-2022), more than doubling in the same period. These prices led to significant increases in annual energy costs of around 110-115% in the Base Case (BC) and Ecodesign (ECO) cases, and 75% in the BAT/Energy Label (BAT) case. **The increase in prices also significantly increased the benefits of Ecodesign and energy efficiency in Spain, increasing annualised savings at the peak price to €999 per year for Ecodesign and up to €2 2343 per year for BAT.**

Table 2-6 Spain: annual energy cost savings at recent peak prices

		Pre-crisis (Jan-2020) annual average energy cost [EUR/yr]			Peak crisis annual average energy costs [EUR/year]			Change in annual energy costs [EUR/yr]			Peak Annual saving [EUR/year]	
No.	Product	BC	ECO	BAT	BC	ECO	BAT	BC	ECO	BAT	ECO	BAT
1	Dedicated space heating system	983	800	658	2 341	1 906	1 152	1 359	1 106	494	-436	-1 189
45	Lightbulbs x45	253	43	14	444	75	23	191	32	10	-369	-421
1	Combined fridge freezer	91	64	24	160	112	43	69	48	18	-48	-118
1	Dedicated water heating system	129	118	66	306	281	115	178	163	49	-25	-191
16	Other products	507	438	217	888	767	381	381	329	163	-121	-425
	Total	**1 963**	**1 462**	**979**	**4 140**	**3 141**	**1 714**	**2 177**	**1 678**	**736**	**-999**	**-2 343**

Czechia

In Czechia, pre-crisis (Jan-2020) prices of 0.220 EUR/kWh for electricity and 0.060 EUR/kWh for gas were the average. At the peak of the price crisis average prices for electricity reached 0.534 EUR/kWh (Nov-2022), more than doubling, whilst gas prices increased to 0.222 EUR/kWh (Dec-2022), more than trebling in the same period. These prices led to significant increases in annual energy costs of around 200-210% in the Base Case (BC) and Ecodesign (ECO) cases, and 141% in the BAT/Energy Label (BAT) case. **The increase in prices also significantly increased the benefits of Ecodesign and energy efficiency in Czechia, increasing annualised savings at the peak price to €1 266 per year for Ecodesign and up to €2 555 per year for BAT.**

Table 2-7 Czechia: annual energy cost savings at recent peak prices

		Pre-crisis (Jan-2020) annual average energy cost [EUR/yr]			Peak crisis annual average energy costs [EUR/year]			Change in annual energy costs [EUR/yr]			Peak Annual saving [EUR/year]	
No.	Product	BC	ECO	BAT	BC	ECO	BAT	BC	ECO	BAT	ECO	BAT
1	Dedicated space heating system	712	580	665	2 633	2 143	1 601	1 920	1 563	937	-490	-1 031
45	Lightbulbs x45	256	43	14	617	104	32	361	61	19	-513	-585
1	Combined fridge freezer	92	65	25	223	155	59	130	91	35	-67	-163
1	Dedicated water heating system	93	85	67	344	316	160	251	230	94	-28	-184
16	Other products	512	443	220	1 235	1 067	530	722	624	310	-168	-591
	Total	**1 666**	**1 216**	**989**	**5 052**	**3 785**	**2 383**	**3 385**	**2 570**	**1 394**	**-1 266**	**-2 555**

2.5 Focus on heating - gas boilers vs. heat-pumps

As can be seen clearly from the previous sections the largest part of any energy and financial savings resulting from Ecodesign and Energy Labelling come from the space heating systems used, with heat pumps having a significant efficiency advantage over fossil gas boilers. However, heat pump systems also have significantly higher purchase costs. The range of available heating systems is also high, with a variety of high efficiency (and more expensive) gas boilers, hybrid heat-pumps, and lower efficiency (but cheaper) heat pumps than the BAT case presented earlier. Our analysis, is based on the most commonly used type, air-source(water) heat pumps – and additionally we focus on those only providing the space heating function. The water heating function is addressed by a dedicated water heater (not assessed in this section) as per the earlier analysis. In this section we expand the comparison of heating systems to include more representative gas and heat pump products to help deepen the insights into the savings induced by Ecodesign and Energy Labelling in reality, not just those that can be observed at the minimum and maximum boundaries represented in the earlier analysis.

The Ecodesign Impact Accounting study estimates sales of central heating combi boilers of between 5-6 million units each year. With around 50% of the units falling in the M load category, i.e., a medium size residential system. Latest data from the European Heat Pump Association[15] estimates around 3 million heat pumps were sold in 2022 across 16 European countries (including the UK and Switzerland). This represents a 38% increase on 2021 sales, continuing rapid growth of the sector and demonstrating the high relevance and adoption rate of heat pumps.

However, data on the efficiency of the units sold is scarce, amongst the best proxy available for this study is the EPREL database[16]. This provides an indication of the distribution of registered products in each product group – however this only represents a registered product with no indication on associated sales, therefore it is only a proxy for the actual distribution. Of 25 011 registered space/combination heaters on the market there are 1 661 registered heat pumps as dedicated space heaters in the 8-10 kW heat output (55°C) category representing an average EU residential heat demand. For boilers, 1 836 products are registered (with an 8-30kW output range selected). The distribution per type is shown below in Figure 2-2.

[15] https://www.ehpa.org/press_releases/heat-pump-record-3-million-units-sold-in-2022-contributing-to-repowereu-targets/
[16] Accessible here https://eprel.ec.europa.eu/screen/home

Figure 2-2: Registered product Energy Label class distribution within EPREL for dedicated space heating systems, heat pumps (left & centre), gas boilers (right)

Seasonal space heating energy efficiency class (55°)
1 661 models

Class	Entries	%
A+++	49	3,0
A++	1 309	78,8
A+	303	18,2
A	0	0,0
B	0	0,0
C	0	0,0
D	0	0,0

Seasonal space heating energy efficiency class (35°)
1 661 models

Class	Entries	%
A+++	1 076	64,8
A++	480	28,9
A+	95	5,7
A	10	0,6
B	0	0,0
C	0	0,0
D	0	0,0

Seasonal space heating energy efficiency class (55°)
1 836 models

Class	Entries	%
A+++	1	0,1
A++	14	0,8
A+	2	0,1
A	1 457	79,4
B	171	9,3
C	11	0,6
D	180	9,8

The distribution shows that the great majority of heat pumps sit in the A++ (55° - Medium Temperature, MT) / A+++ (35° - Low Temperature, LT) categories, but there is also a sizeable minority (15%-35% of all registered products) that sit in lower efficiency categories. Importantly, the data shows that in reality most registered heat pumps of this size already have LT efficiencies >175% (A+++). Based on registrations, an A++ (MT)/A+++(LT) heat pump is likely most representative of savings achieved by most households. For reference, an A++ (MT) heat pump achieves a seasonal space heating efficiency of 125% ≤ η_s< 150%. The product data also shows that only 0.6% of registered heat pump products are A class, i.e. with an 35°(Low temperature or LT) efficiency of 115% ≤ η_s< 123%, this is actually below the level of the current Ecodesign regulation which sets a 110% (MT) / 125% (LT) minimum efficiency.

For boilers, the distribution shows a handful of products (co-generation) with efficiency in the A+/A++/A+++ categories, but by far the largest share of gas boilers sit in the A label category. This represents a boiler with a seasonal space heating efficiency of 90% ≤ η_s < 98%. However, the Ecodesign regulation only stipulates a seasonal space heating efficiency of >86%, therefore the product used in earlier analysis falls in label class B (82% ≤ η_s < 90%).

The efficiencies at 35° (LT) and 55° (MT) highlight an important complexity in comparing the efficiencies of fossil boilers and heat pumps. Typically a fossil heating system will work at 55° (MT), as these temperatures are required for supplying radiators. Heat pumps can also operate at MT therefore these also receive a 55° efficiency value. However, for heat pumps the more common use case is 35°, or low temperature (LT) operation, as this temperature is sufficient for underfloor heating which is most commonly used in new buildings and new heat pump installations. The comparisons in this study assume MT operation of the fossil systems, and LT operation of the heat pump systems.

Recently published work in the UK[17] suggests, based on analysis of real world operation, that there is a wide distribution in heat pump performance, however the majority of air-source heat pumps achieved a Seasonal Performance Factor of between 2.5-3.2 (250%-320%), with the highest performing products achieving around 4.0 (or 400%) efficiency. This is higher than the values registered by products in the

[17] Energy Systems Catapult: Electrification of Heat Demonstration Project (March 2023) Interim Heat Pump Performance Data Analysis Report, available at https://es.catapult.org.uk/news/heat-pumps-shown-to-be-three-times-more-efficient-than-gas-boilers/?reportDownload=https://es.catapult.org.uk/wp-content/uploads/2023/03/EoH-Interim-Heat-Pump-Performance-Data-Analysis-Report.pdf

EPREL database and likely represents divergences between the calculation approach of test values for Energy Labelling versus the observed real world performance. However, these observed values help place the efficiency ratings into context.

In our expanded analysis in this section we focus (see Table 2-8) on the following products/cases in more detail.

Table 2-8 Heating system characteristics

Product description	Efficiency [Seasonal Space Heating Efficiency]	Effective Energy Label Class	Estimated energy requirement to provide 8 298 kWh heat load [kWh]
Ecodesign: The Ecodesign regulation effectively moves the minimum performance standard to require a condensing gas boiler	86% (MT)	B	9 649
High Efficiency Gas boiler	94% (MT)	A	8 846
Ecodesign heat pump	110% (MT) / 125% (LT)	A+ / A+	6 638*
Revised Ecodesign proposal heat pump	130% (MT) / 155% (LT)	A++/A++	5 354*
Low/average efficiency heat pump	171% (LT)	A++	4 862*
BAT/Energy Label: The most efficient heating systems average based on EPREL.	277% (LT)	A+++	2 213*
Real world high performing based on UK study	400% (LT)	A+++	2 075*

* Calculation based on LT efficiency

Repeating the earlier analysis of costs and savings for these additional cases we calculate the results in Table 2-9. **This shows a the value of increased efficiency for both fossil boilers and heat pumps. A more efficient gas boiler quickly pays off, however the efficiency of these boilers has reached its upper threshold.**

For heat pumps, the installation costs, which constitute around 60% of the purchase price, lead to much higher initial costs, this plays an important role in the overall cost calculation. On energy costs, **all heat pumps except the very least efficient, i.e. the Ecodesign threshold heat pump, provide savings on annual energy costs compared to the gas boilers. The highest efficiency heat pumps are able to achieve annual energy bill savings of 700-950 EUR per year** compared to an Ecodesign level gas boiler.

The analysis shows over the full lifetime of the heating system that the highest efficiency heat pumps and the high efficiency gas boiler provide the best financial outcomes. The high efficiency heat pumps providing the highest savings, but also require the highest initial outlay. However, the higher outlay can be repaid within around 10-11 years, compared to an estimated heat pump lifetime of 18 years. Reducing the payback period further would make investing in these high efficiency heat pumps more attractive to consumers.

For low efficiency heat pumps, e.g. those at the current Ecodesign efficiency threshold (LT, 125%), the financial case is poor compared to an Ecodesign gas boiler, as the efficiency of an Ecodesign level heat pump is not high enough to reduce energy consumption by enough to overcome the fact that electricity prices are higher than gas prices per kWh, this means that annual energy costs are actually higher for the heat pump, and there is no savings to pay-off the higher purchase cost. The currently proposed higher Ecodesign efficiency thresholds for heat pumps (LT, 155%) do provide annual energy savings of around 220 EUR per year, however over the lifetime of the product (18 years), there is only a small saving on all costs, and the payback period is almost 23 years, i.e. longer than the average product lifetime. It would be hard to recommend such an investment to consumers. Fortunately, as highlighted earlier in Figure 2-2 few registered heat pump products have such low efficiencies, and the UK real-world study also didn't observe any heat pumps working at efficiencies lower than around 160%. The low-average efficiency heat pump (171% efficiency) in the table presents a case which over the lifetime of the product performs a little better than the high-efficiency gas boiler, however it takes almost the full lifetime of energy savings (16.4 years) from such a product to repay the additional purchase costs. As noted above the high-efficiency/BAT heat pumps with efficiencies of 277% and 400% each achieve significant savings on annual energy costs and lifetime, and pay back the extra purchase costs within 10-11 years.

Table 2-9 Analysis of costs of heating systems, central price scenario

Product description	Purchase price [EUR]	Annual energy cost [EUR/yr]	Annual other costs [EUR/yr]	Total cost (18 years) [EUR]	Lifetime saving compared to ECO [EUR]	Annualised cost [EUR/yr]	Annualised saving compared to ECO [EUR/yr]	Payback period compared to ECO[18] [years]
Ecodesign: Condensing gas boiler	2 663	1 380	162	30 416	-	1 690	-	-
High Efficiency gas boiler	2 839	1 265	162	28 527	1 889	1 585	105	1.6

[18] Additional purchase cost (compared to ECO) divided by average annual energy cost saving

Ecodesign heat pump	7 009	1 435	76	34 210	3 794	1 901	-211	N/A
Revised Ecodesign proposal heat pump	7 688	1 157	76	29 889	527	1660	29	22.6
Low-average efficiency heat pump	8 042	1 051	76	28 331	2 085	1 574	116	16.4
BAT/Energy Label: High efficiency electric heat pump.	10 440	649	76	23 482	6 934	1 305	385	10.6
Real world high -performing	13 232	449	76	22 673	7 743	1 259	430	11.3

Some general lessons can be taken from this analysis:

- **It is typically advantageous to purchase the most efficient heat pump possible**, subject to the affordability of the higher purchase price. Additionally, the strength of the case for higher efficiency heat pumps increases both with higher gas prices and higher energy consumption, and vice-versa.
- For policymakers two important policy changes would help to support further heat pump adoption, namely:
    - (1) **subsidies to consumers to reduce the initial cost of a heat pump**, making it more affordable and/or enabling consumers to purchase more expensive/efficient devices, reducing the payback period and improving the lifetime cost saving.
    - (2) **reviewing tax treatment of electricity and gas - increasing taxes on gas and/or reducing on electricity**. The differential in these prices is one of the key determinants, after purchase price, in the cost savings that can be achieved. Often gas is subject to lower tax rates than electricity, which reduces the benefit of heat pumps. From a climate and energy efficiency perspective there is a strong rationale to increase taxes on gas, which would make heat pumps much more financially attractive.

On the subsidies point, examples can be drawn from existing subsidy policies, which tend to provide 2 000 – 4 000 EUR in subsidies for an air-water heat pump installation. For example in France a few different schemes are available and can sometimes be combined. Taking one example, *Prime "Coup de pouce économies énergie": chauffage et ou isolation*[19], this provides a central government grant of up to 4 000 EUR for an air-water heat pump. In the case of the low-average efficiency heat pump (171%) above, the annualised cost over the lifetime moves close to the BAT (277%) heat pump at 1 351 EUR/year (+223 EUR/year) and the payback period comes down to 4.2 years. A similar picture emerges for the BAT heat pump, with the payback period coming down to 5.2 years. In Spain the *Realización de*

[19] https://www.service-public.fr/particuliers/vosdroits/F34421

instalaciones de energías renovables térmicas en el sector Residencial programme provides for a 500 EUR/kW subsidy, up to a 3 000 EUR maximum per household, which would have a similar, but slightly lower, positive impact to the French example. In Czechia the New Green Savings Programme (*Nová zelená úsporám*)[20] provides for 50% of the eligible costs, up to a maximum of 80 000 CZK (aprx. 3 400 EUR). At these levels the subsidies can make a big difference to the financial calculations and attractiveness of heat pumps.

Specifically for the Ecodesign revision process, the results shown above, suggest a tipping point in efficiency of heat pumps being advantageous compared to the highest efficiency gas boilers at an efficiency of around 168%. This, combined with the existing EPREL data showing most heat pumps already perform at >175% efficiency, suggests that the current Ecodesign proposals for 155% efficiency are too low, and this level should be increased. A level of 170% appears achievable and provides a reasonable basic financial case for consumers to choose heat pumps, and which can be further improved by the policy measures outlined above.

However, it should be noted that there are a number of uncertainties associated with these calculations, and perhaps the primary uncertainty is in the purchase price of a heat pump – particularly as these also include installation costs. We have used a figure based on an average installation, which includes some additional costs for changes to existing infrastructure (pipes, water tanks, etc). However, the total costs can vary considerably per installation as every installation is different, being dependent on the characteristics of the building, the changes required to existing building fabric and infrastructure, the specific product, the climate and multiple other variables. In any case, maximising the benefits of any heating system, especially heat pumps, should also include attention to building insulation. The lifetime saving metric provides an indication of the sensitivity of the outcome to the purchase price, i.e. if the purchase price increases by more than the lifetime saving, then there would no longer be a saving. The size of the calculated savings for the most efficient heat pumps give some confidence that even in the case of a more complex and expensive installation that significant savings would still be achieved. In a more straightforward installation, e.g. replacing an existing heat pump system where other infrastructure is already in place, would likely have much lower installation costs.

Energy price assumptions also play an important role in the totals. In a case of high prices (for both electricity and gas) the relative outcomes do not substantially change, the high-efficiency heat pump providing the best outcomes, the high-efficiency gas boiler the second best outcomes and the low-average heat pump providing no advantage over the Ecodesign gas boiler case. However, in the low price scenario the high efficiency heat pump advantage is reduced, and the high efficiency gas boiler provides the best financial outcomes. The differential in electricity and gas price assumptions also plays an important role, e.g. if gas prices were to increase proportionally more than electricity then this would improve the performance of heat pumps in comparison to gas boilers, and vice-versa. As noted above, to drive a move towards more heat pumps it would be beneficial for taxes on gas to increase, relative to electricity.

2.6 Sensitivity to different levels of consumption

The analysis is based on an average European household and assumed levels of usage of the products. Smaller or larger households than average will have different levels of usage. Cultural factors,

[20] https://www.sfzp.cz/en/administered-programmes/new-green-savings-programme/

consumer behaviour and climate also can play an important role in determining usage. To test the robustness of the results – i.e., does Ecodesign and Energy Labelling remain beneficial for lighter and/or heavier use we have carried out a sensitivity analysis of different levels of usage (load) for each product, increasing these by +/- 50% in each case. For some products such as fridge-freezers which run 24/7, 365 days per year, and others where only standby mode is regulated (Desktop PC, laptop, coffee machine, router, tablet) no sensitivity analysis is carried out.

As can be expected, if the usage (load) increases or decreases by 50% the energy use and annual energy cost also increases or decreases by the same amount, therefore the benefits also scale in these proportions. In a low usage case the energy savings from Ecodesign fall to 305 EUR/year compared to the base case, and for the BAT (Energy Label) case to 817 EUR/year[21].

On the total cost of ownership basis the change in usage scales in a different way as the purchase price and running cost assumptions remain the same[22]. In the base case, a 50% increase/decrease in usage translates into +/- 36% change in annualised total cost of ownership. For the Ecodesign case the same change is +/- 33% and for the BAT case +/- 19%. The main relation that can be observed is that the size of the change is proportionate to the role that energy costs play in the total cost of ownership. This means that products with high purchase prices and/or running costs as a proportion of their total cost (e.g. heat pumps, washing machines, TVs) see relatively smaller impacts on their total cost of ownership from changes in usage than products where energy plays a relatively much more important role in the total cost of ownership (e.g. gas boilers, electric room heaters, lightbulbs).

It can be interesting to focus specifically on the case of heating systems and the impact of higher usage (loads) which would reflect a colder climate or larger house or warmer indoor temperatures or a combination of these. When increasing the load in this case we see the annual energy cost savings for space heating increasing by 50%, to 473 EUR/year (+158 EUR/year) for the Ecodesign case, and to 1 570 EUR/year (+523 EUR/year) for the BAT case. On the total cost of ownership basis, the annualised savings increase by 41% for Ecodesign, from 296 EUR/year to 454 EUR/year (+158 EUR), and by 25% for BAT (heat pump) from 385 EUR/year to 751 EUR/year (+366 EUR/year). This highlights that for products for which energy costs are a major component in their total cost that the benefits of Ecodesign and Energy Labelling increase with usage.

[21] The totals are a little less than 50% of the earlier savings figures because of the exclusion of products for which no load adjustment is modelled.
[22] In reality these assumptions may also scale with usage, e.g. if a the size/capacity device changed, or more/less maintenance was changed. For simplicity and because energy is the largest determinant of cost these factors are not changed.

3 Conclusions

The financial benefits for the average European household from Ecodesign and Energy Labelling have increased in this period of high energy prices. Compared to earlier BEUC and EC analysis, which was based on pre-crisis lower prices, and earlier versions of the regulation, the benefits are estimated to have increased considerably.

It is estimated the average European household will save between €650 - €1 800 per year on their energy costs due to Ecodesign and Energy Labelling. The savings are highly concentrated on space heating systems and lamps.

In 2022 at the peak prices experienced in the year these energy cost savings increased to an EU average of €890 - €2 450 per year. Examples from specific countries showed:

- Savings of €1 450 - €2 700 in Germany, higher savings due to higher energy prices
- Savings of €1 000 - €2 350 in Spain
- Savings of €1 250 - €2 550 in Czechia

Taking the increased purchase price of more efficient products into account, there are still significant cost savings over the full lifetime of the majority of products.

On a total cost of ownership basis Ecodesign and Energy Labelling are estimated to save the average European household €620 - €950 per year. Savings are particularly concentrated on space heating systems and lighting.

More efficient space heating systems provide strong evidence for financial payback over their lifetime. High efficiency gas boilers and high-efficiency heat pumps all more than payback their additional purchase costs compared to the minimum efficiency (Ecodesign) products. The payback period for the high-efficiency heat pump is around 10 years and it provides the highest total lifetime cost savings of the assessed heating systems. For low-average efficiency heat pumps the benefits are much lower with little or no benefit compared to the high-efficiency gas boiler**. Current Ecodesign proposals for minimum efficiencies for heat pumps could be tightened.**

The savings vary with energy prices and appliance usage, with benefits increasing with high prices and/or usage and vice-versa. The benefits of Ecodesign and Energy Labelling are higher for products where energy costs contribute a high share to total costs, and also for high use households. For heat pumps the relative prices of electricity and gas have a big influence, **reducing taxes on electricity and/or increasing taxes on gas can have a significant positive impact on the financial attractiveness of heat pumps.**

Subsidies towards the purchase cost for heat pumps improve the financial outcomes considerably and can be a powerful policy measure to increase heat pump adoption. These reduce the payback periods for heat pumps to around 4-5 years, compared to 10-17 year payback periods without subsidy. These estimates are based on existing schemes in Europe providing subsidies of 2 000 EUR – 4 000 EUR towards an installation.

Ecodesign and Energy Labelling have a number of non-financial benefits that facilitate Europeans' daily life, improve their well-being and increase their independence.

Strengthening Ecodesign and/or Energy Labelling regulations is likely to yield additional benefits for consumers. Computers (desktop and notebook PCs) could be a particular area of attention, as regulation coverage, and also understanding of energy use and potential benefits is weaker for these products.

Annex A: Detailed financial saving calculations

In this annex we provide a more complete overview of the steps in the financial saving calculation and for all price scenarios.

Table 0-1 Summary of energy savings from Ecodesign and their value, central price scenario

		Annual energy use (kWh)			Annual average energy costs [EUR/year]			Annual saving [EUR/year]	
No.	Product	Base Case	Ecodesign	BAT	Base Case	Ecodesign	BAT	Ecodesign	BAT
1	Dedicated space heating system*	11 854	9 649	3 000	1 695	1 380	649	-315	-1 047
1	Dedicated hot water heating system*	1 550	1 422	300	222	204	67	-18	-156
1	Electric room heater	316	263	251	75	63	60	-13	-16
1	Combined fridge freezer	417	291	111	92	64	24	-28	-67
1	Electric oven	98	87	55	21	19	12	-2	-9
1	Electric hobs	249	240	209	55	53	46	-2	-9
1	Washing machine	193	157	77	43	35	17	-8	-26
1	Vacuum cleaner	85	62	26	21	15	6	-6	-14
1	TV set	126	88	67	31	22	17	-9	-15
1	Monitor	87	32	18	21	8	4	-14	-17
45	Lightbulbs	1 156	196	61	254	43	14	-211	-241
1	Dishwasher	255	242	123	57	54	27	-3	-29
1	Complex set-top-box	77	72		20	19	-	-1	
1	Desktop PC	272	272	14	68	68	3	-	-65
1	Notebook (laptop) PC	122	122	2	31	31	1	-	-31
1	Coffee maker	37	30		10	8	-	-2	
1	Tablet PC	19	12		5	3	-	-2	
1	Router	63	37		16	9	-	-7	
1	Air conditioning unit	296	266	151	68	61	35	-7	-33
1	Printers	18	18		5	5	-	-	
	Total	17 291	13 556	4 464	2 810	2 162	981	-648	-1 774

* The base case and Ecodesign cases for these products are gas-fired systems, whilst the BAT system is an (electric) heat pump.

Table 0-2 Summary of energy savings from Ecodesign and their value, low price scenario

		Annual energy use (kWh)			Annual average energy costs [EUR/year]			Annual saving [EUR/year]	
No.	Product	Base Case	Ecodesign	BAT	Base Case	Ecodesign	BAT	Ecodesign	BAT
1	Dedicated space heating system*	11 854	9 649	3 000	890	724	650	-166	-240
1	Dedicated hot water heating system*	1 550	1 422	300	114	104	65	-9	-49
1	Electric room heater	316	263	251	68	56	54	-11	-14
1	Combined fridge freezer	417	291	111	90	63	24	-27	-66
1	Electric oven	98	87	55	21	19	12	-2	-9
1	Electric hobs	249	240	209	54	52	45	-2	-9
1	Washing machine	193	157	77	42	34	17	-8	-25
1	Vacuum cleaner	85	62	26	18	13	5	-5	-13
1	TV set	126	88	67	27	19	14	-8	-13
1	Monitor	87	32	18	18	7	4	-12	-15
45	Lightbulbs	1 156	196	61	250	42	13	-208	-237
1	Dishwasher	255	242	123	55	52	27	-3	-29
1	Complex set-top-box	77	72		16	15	-	-1	
1	Desktop PC	272	272	14	57	57	3	-	-55
1	Notebook (laptop) PC	122	122	2	26	26	0	-	-25
1	Coffee maker	37	30		8	6	-	-2	
1	Tablet PC	19	12		4	3	-	-1	
1	Router	63	37		13	8	-	-6	
1	Air conditioning unit	296	266	151	64	57	33	-6	-31
1	Printers	18	18		4	4	-	-	
	Total	17 291	13 556	4 464	1 839	1 362	966	-477	-828

* The base case and Ecodesign cases for these products are gas-fired systems, whilst the BAT system is an (electric) heat pump.

Table 0-3 Summary of energy savings from Ecodesign and their value, high price scenario

		Annual energy use (kWh)			Annual average energy costs [EUR/year]			Annual saving [EUR/year]	
No.	Product	Base Case	Ecodesign	BAT	Base Case	Ecodesign	BAT	Ecodesign	BAT
1	Dedicated space heating system*	11 854	9 649	3 000	2 543	2 070	1 297	-473	-1 246
1	Dedicated hot water heating system*	1 550	1 422	300	333	306	133	-28	-200
1	Electric room heater	316	263	251	150	125	119	-25	-31
1	Combined fridge freezer	417	291	111	183	128	49	-55	-135
1	Electric oven	98	87	55	42	37	24	-5	-18
1	Electric hobs	249	240	209	111	106	93	-4	-18
1	Washing machine	193	157	77	85	69	34	-16	-51
1	Vacuum cleaner	85	62	26	41	30	12	-11	-29
1	TV set	126	88	67	62	43	33	-19	-29
1	Monitor	87	32	18	43	16	9	-27	-34
45	Lightbulbs	1 156	196	61	509	86	27	-423	-482
1	Dishwasher	255	242	123	113	107	55	-6	-59
1	Complex set-top-box	77	72		40	37	-	-3	
1	Desktop PC	272	272	14	137	137	7	-	-130
1	Notebook (laptop) PC	122	122	2	63	63	1	-	-62
1	Coffee maker	37	30		19	15	-	-4	
1	Tablet PC	19	12		10	7	-	-3	
1	Router	63	37		32	19	-	-14	
1	Air conditioning unit	296	266	151	135	122	69	-14	-66
1	Printers	18	18		9	9	-	-	
	Total	17 291	13 556	4 464	4 661	3 532	1 961	-1 129	-2 589

* The base case and Ecodesign cases for these products are gas-fired systems, whilst the BAT system is an (electric) heat pump.

Figure 0-1 Detailed financial calculations – central energy price scenario assumptions, negative savings values are savings compared to BC

		Purchase Price [EUR]			Annual energy costs [EUR/yr]			Annual other running costs			Lifeti me	Total cost of Ownership [EUR]			Total lifetime saving [EUR]		Annualised Cost of Ownership [EUR]			Annualised saving [EUR/yr]	
No.	Product	BC	ECO	BAT	BC	ECO	BAT	BC	ECO	BAT	Years	BC	ECO	BAT	ECO	BAT	BC	ECO	BAT	ECO	BAT
1	Dedicated space heating system	2 391	2 663	10 440	1 695	1 380	649	158	162	76	18	35 750	30 416	23 482	-5 334	-12 268	1 986	1 690	1 305	-296	-682
1	Dedicated hot water heating system	508	562	2 786	222	204	67	68	68	90	15	4 861	4 640	5 135	-221	275	324	309	342	-15	18
1	Electric room heater	33	35	35	75	63	60	-	-	-	9	709	598	572	-111	-137	79	66	64	-12	-15
1	Combined fridge freezer	462	597	1 328	92	64	24	-	-	-	16	1 929	1 621	1 718	-307	-211	121	101	107	-19	-13
1	Electric oven	599	668	770	21	19	12	-	-	-	19	999	1 022	995	23	-3	53	54	52	1	-0
1	Electric hobs	159	182	298	55	53	46	-	-	-	15	988	979	993	-9	6	66	65	66	-1	0
1	Washing machine	484	540	793	43	35	17	104	93	93	15	2 682	2 462	2 449	-220	-233	179	164	163	-15	-16
1	Vacuum cleaner	111	98	212	21	15	6	3	3	3	8	298	240	284	-57	-14	37	30	35	-7	-2
1	TV set	520	542	571	31	22	17	-	-	-	7	738	694	687	-45	-52	105	99	98	-6	-7
1	Monitor	197	206	220	21	8	4	-	-	-	7	346	260	251	-86	-96	49	37	36	-12	-14
45	Lightbulbs	407	180	293	254	43	14	-	-	-	16	4 475	871	509	-3 604	-3 967	280	54	32	-225	-248
1	Dishwasher	611	653	1 035	57	54	27	47	42	42	15	2 160	2 089	2 075	-72	-85	144	139	138	-5	-6
1	Complex set-top-box	162	166	-	20	19	-	-	-	-	5	261	259	-	-3	-	52	52	-	-1	-
1	Desktop PC	947	947	1 327	68	68	3	-	-	-	6	1 357	1 357	1 348	-	-10	226	226	225	-	-2
1	Notebook (laptop) PC	1 199	1 199	1 348	31	31	1	-	-	-	5	1 355	1 355	1 350	-	-5	271	271	270	-	-1
1	Coffee maker	155	159	-	10	8	-	-	-	-	5	203	197	-	-5	-	41	39	-	-1	-
1	Tablet PC	451	457	-	5	3	-	-	-	-	4	471	470	-	-1	-	118	118	-	-0	-
1	Router	99	122	-	16	9	-	-	-	-	5	180	169	-	-12	-	36	34	-	-2	-
1	Air conditioning and ventilation units	1 110	1 193	1 904	68	61	35	21	21	21	12	2 170	2 172	2 567	3	398	181	181	214	0	33
1	Printers	158	158	-	5	5	-	1	1	-	6	194	194	-	-	-	32	32	-	-	-
	Total	10 761	11 326	23 358	2 810	2 162	981	402	391	325		62 127	52 067	44 414	-10 060	-16 403	4 380	3 763	3 148	-616	-953

Figure 0-2 Detailed financial calculations – low energy price scenario assumptions, negative savings values are savings compared to BC

		Purchase Price [EUR]			Annual energy costs [EUR/yr]			Annual other running costs			Lifeti me	Total cost of Ownership [EUR]			Total lifetime saving [EUR]		Annualised Cost of Ownership [EUR]			Annualised saving [EUR/yr]	
No.	**Product**	BC	ECO	BAT	BC	ECO	BAT	BC	ECO	BAT	Years	BC	ECO	BAT	ECO	BAT	BC	ECO	BAT	ECO	BAT
1	Dedicated space heating system	2 391	2 663	10 440	890	724	650	158	162	76	18	21 255	18 618	23 515	-2 637	2 260	1 181	1 034	1 306	-146	126
1	Dedicated hot water heating system	508	562	2 786	114	104	65	68	68	90	15	3 235	3 148	5 110	-87	1 875	216	210	341	-6	125
1	Electric room heater	33	35	35	68	56	54	-	-	-	9	641	542	518	-99	-123	71	60	58	-11	-14
1	Combined fridge freezer	462	597	1 328	90	63	24	-	-	-	16	1 906	1 605	1 712	-300	-194	119	100	107	-19	-12
1	Electric oven	599	668	770	21	19	12	-	-	-	19	1 003	1 026	998	23	-5	53	54	53	1	-0
1	Electric hobs	159	182	298	54	52	45	-	-	-	15	967	959	976	-8	9	64	64	65	-1	1
1	Washing machine	484	540	793	42	34	17	104	93	93	15	2 666	2 449	2 443	-217	-223	178	163	163	-14	-15
1	Vacuum cleaner	111	98	212	18	13	5	3	3	3	8	278	226	278	-52	-0	35	28	35	-7	-0
1	TV set	520	542	571	27	19	14	-	-	-	7	708	673	671	-35	-38	101	96	96	-5	-5
1	Monitor	197	206	220	18	7	4	-	-	-	7	326	253	246	-73	-79	47	36	35	-10	-11
45	Lightbulbs	407	180	293	250	42	13	-	-	-	16	4 411	857	501	-3 554	-3 909	276	54	31	-222	-244
1	Dishwasher	611	653	1 035	55	52	27	47	42	42	15	2 139	2 069	2 065	-70	-74	143	138	138	-5	-5
1	Complex set-top-box	162	166	-	16	15	-	-	-	-	5	243	242	-	-2	-	49	48	-	-0	-
1	Desktop PC	947	947	1 327	57	57	3	-	-	-	6	1 292	1 292	1 345	-	53	215	215	224	-	9
1	Notebook (laptop) PC	1 199	1 199	1 348	26	26	0	-	-	-	5	1 327	1 327	1 350	-	23	265	265	270	-	5
1	Coffee maker	155	159	-	8	6	-	-	-	-	5	194	190	-	-4	-	39	38	-	-1	-
1	Tablet PC	451	457	-	4	3	-	-	-	-	4	467	467	-	0	-	117	117	-	0	-
1	Router	99	122	-	13	8	-	-	-	-	5	166	160	-	-5	-	33	32	-	-1	-
1	Air conditioning and ventilation units	1 110	1 193	1 904	64	57	33	21	21	21	12	2 123	2 130	2 544	7	420	177	178	212	1	35
1	Printers	158	158	-	4	4	-	1	1	-	6	189	189	-	-	-	32	32	-	-	-
	Total	10 761	11 326	23 358	1 839	1 362	966	402	391	325		45 536	38 423	44 270	-7 113	-7	3 409	2 963	3 133	-446	-7

Figure 0-3 Detailed financial calculations - high energy price scenario assumptions, negative savings values are savings compared to BC

		Purchase Price [EUR]			Annual energy costs [EUR/yr]			Annual other running costs			Lifeti me	Total cost of Ownership [EUR]			Total lifetime saving [EUR]		Annualised Cost of Ownership [EUR]			Annualised saving [EUR/yr]	
No.	**Product**	BC	ECO	BAT	BC	ECO	BAT	BC	ECO	BAT	Years	BC	ECO	BAT	ECO	BAT	BC	ECO	BAT	ECO	BAT
1	Dedicated space heating system	2 391	2 663	10 440	2 543	2 070	1 297	158	162	76	18	51 007	42 835	35 156	-8 172	-15 851	2 834	2 380	1 953	-454	-881
1	Dedicated hot water heating system	508	562	2 786	333	306	133	68	68	90	15	6 527	6 168	6 134	-359	-393	435	411	409	-24	-26
1	Electric room heater	33	35	35	150	125	119	-	-	-	9	1 385	1 161	1 108	-224	-276	154	129	123	-25	-31
1	Combined fridge freezer	462	597	1 328	183	128	49	-	-	-	16	3 396	2 646	2 107	-750	-1 288	212	165	132	-47	-81
1	Electric oven	599	668	770	42	37	24	-	-	-	19	1 399	1 376	1 221	-23	-178	74	72	64	-1	-9
1	Electric hobs	159	182	298	111	106	93	-	-	-	15	1 817	1 777	1 689	-41	-129	121	118	113	-3	-9
1	Washing machine	484	540	793	85	69	34	104	93	93	15	3 323	2 984	2 704	-339	-619	222	199	180	-23	-41
1	Vacuum cleaner	111	98	212	41	30	12	3	3	3	8	462	360	333	-102	-129	58	45	42	-13	-16
1	TV set	520	542	571	62	43	33	-	-	-	7	956	845	803	-111	-153	137	121	115	-16	-22
1	Monitor	197	206	220	43	16	9	-	-	-	7	496	315	281	-181	-215	71	45	40	-26	-31
45	Lightbulbs	407	180	293	509	86	27	-	-	-	16	8 543	1 555	717	-6 988	-7 826	534	97	45	-437	-489
1	Dishwasher	611	653	1 035	113	107	55	47	42	42	15	3 009	2 893	2 484	-115	-524	201	193	166	-8	-35
1	Complex set-top-box	162	166	-	40	37	-	-	-	-	5	361	351	-	-10	-	72	70	-	-2	-
1	Desktop PC	947	947	1 327	137	137	7	-	-	-	6	1 768	1 768	1 368	-	-399	295	295	228	-	-67
1	Notebook (laptop) PC	1 199	1 199	1 348	63	63	1	-	-	-	5	1 512	1 512	1 353	-	-159	302	302	271	-	-32
1	Coffee maker	155	159	-	19	15	-	-	-	-	5	250	236	-	-15	-	50	47	-	-3	-
1	Tablet PC	451	457	-	10	7	-	-	-	-	4	492	483	-	-8	-	123	121	-	-2	-
1	Router	99	122	-	32	19	-	-	-	-	5	261	216	-	-46	-	52	43	-	-9	-
1	Air conditioning and ventilation units	1 110	1 193	1 904	135	122	69	21	21	21	12	2 981	2 903	2 982	-79	1	248	242	249	-7	0
1	Printers	158	158	-	9	9	-	1	1	-	6	221	221	-	-	-	37	37	-	-	-
	Total	10 761	11 326	23 358	4 661	3 532	1 961	402	391	325		90 166	72 604	60 441	-17 561	-28 139	6 231	5 133	4 128	-1 098	-1 768

Annex B: Product factsheets

Provided as separate annex.