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Lot 25
Non-Tertiary Coffee Machines

Task 8: Scenario, Policy, Impact and Sensitivity Analysis – Final version

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8. TASK 8 – SCENARIO, POLICY, IMPACT AND SENSITIVITY ANALYSIS

8.1. INTRODUCTION

This task summarises and totals the outcomes of all previous tasks. It looks at suitable policy means to achieve the potential e.g. implementing Least Life Cycle Cost (LLCC) as a minimum and Best Available Technology (BAT) as a promotional target, using legislative or voluntary agreements, labelling and promotion. It draws up scenarios for the period 2010-2025 quantifying the improvements that can be achieved with respect to a Business-as-Usual (BAU) scenario, compares the outcomes with EU environmental targets, and estimates the societal costs and benefits.

It makes an estimate of the impact on consumers (purchasing power, societal costs) and industry (employment, profitability, competitiveness, investment, etc.) as described in Annex 2 of the Directive. Finally, in a sensitivity analysis of the main parameters it studies the robustness of the outcome.

In addition, an analysis of which significant impacts may have to be measured under possible implementing measures and what measurement methods would need to be developed or adapted is provided.

Note that the policy recommendations provided are the opinions of the consultants and do not reflect the views of the European Commission.

8.2. POLICY ANALYSIS

Scope: The policy analysis should identify policy option(s) considering the outcomes of all previous tasks. Notably the option(s) should:

- Be based on the exact definition of the product, according to Task 1 and modified/confirmed by the other tasks;
- Provide ecodesign requirements, such as minimum (or maximum) requirements;
- Be complemented, where appropriate, with (dynamic) labelling and benchmark categories linked to possible incentives, relating to public procurement or direct and indirect fiscal instruments;
- Where appropriate, apply existing standards or propose needs/generic requirements for harmonised standards to be developed;
- Provide measurement requirements, including test standards and/or methods;

- Consider possible self-regulation, such as voluntary agreement or sectoral benchmark initiatives;
- Provide requirements on installation of the product or on user information.

This task also provides a simple tool (e.g. in Excel), allowing estimates of the impacts of different scenarios.

8.2.1. Proposed exact product definitions and scope for policy measures

"Best" definitions proposed in existing standards or used in some voluntary or mandatory programmes will be included for all product categories within the scope of ENER Lot 25.

- Drip filter coffee machine: Coffee maker with separate containers for water and for the coffee brewed and with a filter arranged above the coffee container. The heated water passes once through a filter containing ground coffee into a container. (This type of machine corresponds to Base-Case 1 in this study).
- Low pressure portioned coffee machine: Coffee maker with water heated and forced through ground coffee contained in a capsule or pad by a mechanical pump, for which the pressure is below 9 bars. (This type of machine corresponds to Base-Case 2 in this study).
- High pressure portioned espresso machine: Coffee maker with water heated and forced through ground coffee contained in a capsule or pad by a mechanical pump, for which the pressure is above 9 bars. (This type of machine corresponds to Base-Case 3 in this study).
- Semi-automatic espresso machine: Coffee maker with water heated and forced through ground coffee and filter by steam pressure, manual piston drive or mechanical pump. Mechanical pump pressure is 9 bars or more. (This type of machine corresponds to Base-Case 4 in this study).
- Fully automatic espresso machine: Coffee maker with water heated and forced through ground coffee or coffee beans (with the use of a grinder) and filter by steam pressure, manual piston drive or mechanical pump. Mechanical pump pressure is 9 bar or more. (This type of machine corresponds to Base-Case 5 in this study).

Further, it is worth recalling the definitions of various modes according to the Standby Regulation (1275/2008):

- Ready-to-use mode: this corresponds to "active mode" in the Standby Regulation, meaning a condition in which the equipment is connected to the mains power source and at least one of the main function(s) providing the intended service of the equipment has been activated.

- Standby mode: means a condition where the equipment is connected to the mains power source, depends on energy input from the mains power source to work as intended and provides only the following functions, which may persist for an indefinite time: reactivation function, or reactivation function and only an indication of enabled reactivation function, and/or information or status display.
- Off mode: means a condition in which the equipment is connected to the mains power source and is not providing any function; the following shall also be considered as off mode: (a) conditions providing only an indication of off-mode condition; (b) conditions providing only functionalities intended to ensure electromagnetic compatibility pursuant to Directive 2004/108/EC of the European Parliament and of the Council.
- Auto-power down: this is a kind of “power management” as described in the Standby Regulation, meaning when equipment is not providing the main function, or when other energy-using product(s) are not dependent on its functions, equipment shall, unless inappropriate for the intended use, offer a power management function, or a similar function, that switches equipment after the shortest possible period of time appropriate for the intended use of the equipment, automatically into: standby mode or off mode or another condition which does not exceed the applicable power consumption requirements for off mode and/or standby mode when the equipment is connected to the mains power source. The power management function shall be activated before delivery.

In addition, as already mention in the study, any requirements should not alter the functionality of the machine and also the taste of the coffee cup, even if it is subjective. Therefore, “rules” have been elaborated by Illy to have a perfect espresso as presented in Figure 8-1. Even if these rules are not scientifically based, they can be taken into consideration when setting any Ecodesign Regulation for espresso coffee machines.

- DOSE: 7 grams +/- 0,5
- WATER TEMPERATURE: 90 degrees centigrade +/- 2 (between 190 and 197 degrees Fahrenheit)
- PUMP PRESSURE: 9 atmospheres
- EXTRACTION TIME: 5" pre-infusion + 25" extraction
- VOLUME IN CUP: 25 +/- 5 ml (1 ounce)
- Light-brown to cocoa-colored crema, sometimes with dark brown streaks
- Long-lasting foam 3-4 mm high
- Dense body, aromatic, full, sweet and perfumed
- Balanced acidity and bitterness
- Pleasant lingering aftertaste

Figure 8-1: Criteria for a perfect espresso (according to Illy)

8.2.2. GENERIC ECODESIGN REQUIREMENTS

Generic ecodesign requirements for coffee machines would enable the customer to know more about the products on the market, in order to allow easier comparison and also to improve the consumer behaviour during the use phase. As in the case of the recent Regulation for household dishwashers (N°1016/2010), instruction booklets could provide information on:

- A standard programme (drink preparation and power management system), which would be the most energy- and water-efficient programme for a typical user. This programme could be set as the default programme.
- Power consumption of the operating modes (standby, ready-to-use, off, etc.)
- Indicative information on the main characteristics of the different programmes available (energy and water efficiency, temperature, time, etc.)

- Tips to reduce the electricity consumption of the coffee machine, including switching off it after each use, decalcifying practices every 3 to 6 months depending on the frequency of use and the type of water.

This information would not be sufficient to achieve large savings on its own. Making (if possible, independent) information about energy consumption available on the internet and in sales brochures could be a next step.

8.2.3. Specific ecodesign requirements

According to the technical analysis of the current products (Task 4) and of the Best Available products (Task 6), there is room for improvement. Therefore, various policy tools, presented in the sections below, could be implemented to benefit from this improvement potential.

8.2.3.1 Minimum Energy Performance Standards (MEPS)

MEPS are a relevant option to push the market towards more efficient appliances and to remove the least efficient appliances. Indicative levels are suggested in this section, based on those developed on a mandatory or voluntary basis in various countries inside or outside the European Union, and on the energy performance of existing products (based on the outcomes of Task 5) and BAT models (based on outcomes of Tasks 6 and 7).

For establishing MEPS, a harmonised test standard is required against which different coffee machine could be compared. Because of the current lack of harmonised data on product performance (even if a draft standard is currently elaborated by CENELEC TC59X/WG15), these levels should be considered with caution and discussed again once harmonised tests and measurements have been defined. As EU averages were used to carry out the environmental and economic analysis, the results might not be representative for all situations. Finally, if finalising the test standard takes long time, during which the market and technologies will continue to evolve, and thus the targets suggested here would need a revision.

MEPS could be set in 2014. This schedule should give enough time to the Commission to follow the Ecodesign legislative process and to manufacturers to take into account the requirements in their new products.

The table below summarises the performance levels that could be suggested as MEPS for non-tertiary coffee machines, in terms of maximum energy consumption per coffee period. The values correspond to the LLCC options identified in Task 7, which are based on average EU parameters.

Table 8-1: MEPS by product category (kWh per coffee period)

	Base-Case with Standby Regulation in place[1]	MEPS (2014)
Drip filter coffee machine	0.232	0.164
Low pressure portioned machine	0.093	0.077
High pressure portioned machine	0.073	0.063
Semi-automatic espresso machine	0.083	0.055
Fully automatic espresso machine	0.062	0.050

These MEPS are based on the analysis performed in Task 7 and the identification of the improvement options (or their combinations) leading to the LLCC (Least Life Cycle Cost) options. However, manufacturers are free to use any technology to achieve these MEPS:

- For drip filter coffee machines: Scenario A (30-minutes auto-power down and "zero" standby) is the LLCC.
- For portioned, semi-automatic and fully automatic machines: Scenario A (5-minutes auto-power down and "zero" standby) is the LLCC.

MEPS could also be presented in terms of annual electricity consumption. The table below summarises the performance levels that could be suggested as MEPS for non-tertiary coffee machines, in terms of maximum energy consumption per year. Again, the values correspond to the LLCC options in Task 7, which are based on average EU parameters. This time, energy consumption in standby mode and off mode outside the coffee period is also taken into account. For drip filter machines, two coffee periods of 100 minutes are assumed, leaving 12.7 hours in standby and 8 hours in off per day. For pressure machines, three coffee periods of 100 minutes each are assumed, leaving 11 hours in standby and 8 hours in off per day.

[1] As presented in Task 7, the electricity consumption during a coffee period for the Base-case is equal to that of the Base-Case+Option 0 (corresponding to the 2013 requirements of the Standby Regulation) as the auto-power down delay is assumed to be set at 2 hours. However, the annual electricity consumptions of the Base-Case and the Base-Case+Option 0 are different.

Table 8-2: MEPS by product category (kWh per year)

	Base-Case with Standby Regulation in place	Tier 1 (2014)
Drip filter coffee machine	172	120
Low pressure portioned machine	114	85
High pressure portioned machine	89	69
Semi-automatic espresso machine	112	61
Fully automatic espresso machine	78	55

However, the MEPS proposed above may be considered with caution and may not be the best policy instrument, at this stage, to promote more efficient non-tertiary coffee machines. Indeed, there are some uncertainties about the electricity consumption values of the Base-Cases and their improvement options as the CENELEC standard used for defining consumption per coffee period is still in a draft stage, and the values were in some cases based on calculations and not on measurements. Furthermore, these MEPS are based on the LLCC option which includes an auto-power delay set at 5 minutes for pressure coffee machines (i.e. Base-Cases 2 to 5), which does not seem appropriate for consumers and for some machines could imply more electricity consumption for rinsing. Finally, almost all energy savings of the LLCC option come from the use of an auto-power down function.

Therefore, it is proposed at this stage to recommend maximum auto-power down delays for each type of coffee machine. MEPS may be implemented in a few years once the CENELEC standard has been adopted and measurements have been made on a large quantity of models.

8.2.3.2 MAXIMUM AUTO-POWER DOWN DELAY

It would also be relevant to specify auto-power down conditions (putting the machine in standby or off mode) delays. According to the Standby Regulation (1275/2008) an auto-power down function is mandatory from January 2013 onwards when the machine is not providing its “main function”. However, there is no definition of “main function” and manufacturers can interpret it in various ways. In this preparatory study, the consultants considered the “main function” to be making coffee, and thus the ready-to-use function is not the “main function”. Therefore, under such a definition, the implementation of a power management system is mandatory from January 2013. Also, it is stated in the Regulation that the delay should be “as short as possible”, which could lead to different interpretations.

For drip filter coffee machines, in 2013 or 2014 this delay could be 30 minutes for machines with glass jugs and using a warming plate. For machines with thermos jugs (for which heating plates should not be used), an auto-power down delay would not be relevant. However, some consumers might feel that a thermos jug deprives them of some functionality, such as the ability to see remaining coffee in a glass jug. In 2017 or 2018, it could be proposed to ban warming plates in order to promote the use of insulated jugs.

For portioned coffee machines (using pads or capsules, i.e. Base-Cases 2 and 3), a maximum delay could be set between 15 and 30 minutes (in 2013-2014).

For semi-automatic and fully automatic espresso machines (i.e. Base-Cases 4 and 5), maximum auto-power down delay could be set at 30 minutes (in 2013-2014) in order to avoid unintended consequences of increased energy use for rinsing, or loss of functionality. In any case, using the new CENELEC coffee period, short delays could be encouraged via an energy label.

For combined machines (i.e. composed of an espresso machine and a traditional filter coffee machine) the delay will be the maximum of the delays proposed for the two technologies including in the combined machine.

As this aspect is directly related to consumer habits, it may be useful to communicate this information to consumers, e.g. through a display panel/knob where the consumer could further reduce the power down time, or a beep which could announce that the coffee machine will auto power down if no intervention is made by the user.

After a few years of market experience, it should be discussed as to whether the delays could be reduced, taking into account the technological trends and the consumers' habits.

The consumers could also be given the possibility to adjust their machine to save energy. For example, a hard-off switch could be required and placed in a clear and visible zone of the machine for the user that would disconnect a machine from the mains, so that power input is zero.

Whatever approach is adopted by the European Union, an important stake will be the market surveillance. The approach to checking compliance with the performance requirements is based on self-declaration (no independent testing is required). Manufacturers can ask competitors to provide them with a machine to be tested in their own facilities. If the results are not compliant with the product declaration (the test should be repeated a given number of times), actions can be taken. Suppliers could also be required to establish sufficient technical documentation to assess the accuracy of the provided information (e.g. general description of the product, internal or independent test reports).

The information required should be measured according to harmonised standards. However, these standards are still to be finalised at the time of writing. Once the harmonised standard has been defined, a detailed market review of the various categories should be done to assess whether the MEPS proposed are still relevant or should be amended.

8.2.3.3 POLICY RECOMMENDATIONS FOR LABELLING

A mandatory labelling approach could be complimentary to the requirements presented in the previous section. Currently, there is no mandatory energy label for coffee machines. However, an energy label could reduce the energy consumption through market transformation.

An energy labelling scheme would complement minimum requirements by providing useful information to consumers to allow them to buy more efficient appliances. It would be appropriate for the non-tertiary coffee machines considered in this study because customers tend not to have a detailed level of information at the time of purchase, while vendors have little incentive to produce high efficiency machines.

Apart from heating water, energy consumption is intricately linked with the type of drink being prepared and any other functions such as cleaning. Any labelling scheme should provide clear and transparent information as to how quality is affected as energy consumption changes.

A labelling programme needs to be based on harmonised standards and definitions and so these would need to be developed first before it could be put in place. For setting thresholds for energy classes, the calculations will need to be made again using a database with information on energy consumption and operating modes for the relevant product categories. Industry may be able to provide such a database for machines manufactured by them. The classes would then need to be revised every few years as machines become more efficient.

It would not be possible to devise one energy label with the same classification scheme for both drip filter and pressure machines since they cannot be compared and since the measurement method will be different. Thus, two classification schemes could be envisaged: one for the drip filter product category and one for pressure machines.

However, drip filter machines themselves come in two distinct varieties – thermos jug and glass jug with heating plate. It would be difficult for a machine with a heating plate and glass jug to be more energy efficient than one with a thermos jug, irrespective of possible technical improvements. Indeed, as presented in Task 7, the use of a thermos jug allows more than 40% energy savings, which would not be achievable with other improvement option. Moreover, there seems to be little differentiation among drip filter machines with thermos jugs, which would effectively all be A-class. Therefore, the difference in electricity consumption between two classes would be too small to take into account the uncertainty in the measurement and to allow consumers to make a fair and relevant comparison of various models. The same is true of drip filter machines with a glass jug albeit to a much lesser extent since improvement is possible via insulation of the heating unit (underneath), sheltering of the jug from air circulation, temperature control by a separate device etc.

For pressure machines (Base-Cases 2 to 5) on the other hand, there is clearly room for improvement and there is also a voluntary Swiss energy label already in existence for espresso machines (see section 1.3.3). Manufacturers consider that only a small percentage of their espresso machines currently achieve the A class under the Swiss energy label. In addition, some of those that do achieve the A class under the FEA/CECED methodology, would no longer be A-class under the new CENELEC methodology.

The main characteristics for setting an energy label for pressure coffee machines are the following:

- Combined machines[2]: only one label for the pressure part.
- Annual energy consumption figures to allow the consumer to evaluate the operating cost: one value, in the same unit as on energy bills: kWh
- Energy class attributed according to an Energy Efficiency Index (EEI)
- The average number of coffee periods per year is for pressure coffee machines according to the current draft CENELEC methodology.
- Information on consumables.

The following information should be included on the label:[3]

1. Supplier's name and name of model.
2. The energy efficiency class of the machine, determined in accordance with future harmonised standards and attributed according to the annual electricity consumption. The indicator letter should be placed at the same level as the relevant arrow.
3. Annual energy consumption (in kWh/y).

Table 8-5 shows suggested different thresholds for an energy label for pressure coffee machines. However, it is difficult to assess the extent by which the variation of efficiency classes is a result of the difference between the test methods as the same models were not analysed in the three proposals. Between three and six years after its introduction, machines in the F and G classes could be banned from the market via introduction of MEPS (in two steps), while A+ and A++ classes could be created. Note that this distribution is based on sparse data and should be considered with caution. Indeed, setting such levels requires that a EN standard is in place and that some round robin tests are conducted to be sure that all energy classes will represent a non negligible share of the market. In addition, it would be useful to measure the electricity consumption of several models using the three measurement methods (FEA/CECED, Euro-Topten/S.A.F.E and draft CENELEC standard) and see the effect of such methods on the energy class.

[2] As mentioned in the introduction of Task 5, even if a Base-Case has not been defined for combined coffee machines, ecodesign requirements can cover this product type.

[3] Note that noise was not considered relevant to include on a label for non-tertiary coffee machines.

Table 8-3: Suggested energy efficiency thresholds for pressure coffee machines (but using different measurement methods)

Energy Efficiency Class	Swiss voluntary energy label by FEA/CECED[4] (kWh/y)	Proposed energy label by Euro-Topten / S.A.F.E.[5] (kWh/y)	New CECED proposal[6] (kWh/y)
A	>58-72	>50-75	>68-81
B	>72-90	>75-90	>81-97
C	>90-112	>90-105	>97-117
D	>112-140	>105-125	>117-140
E	>140-175	>125-150	>140-168
F	>175-219	>150-175	>168-202
G	>219	-	>202

Table 8-4 indicates the energy class of the pressure Base-Cases analysed in this study as well as their LLCC (Least Life Cycle Cost) and BAT (Best Available Technology) options as identified in Task 7, with the new classification proposed by CECED based on the annual electricity consumption.

Such classification shows that the Base-Cases, considering the Standby Regulation in place, i.e. Tier 2 (2013) requirements, would already have a "good" energy class, between A and C. In addition, LLCC and BAT options would all be A-class or above (in case A+ and A++ classes are created later) except for the LLCC option for low pressure portioned machines, which would have a B-class.

However, such analysis is based on a limited number of models, and as suggested earlier, would require that several round robin tests are carried out and that a database is created to ensure that the classes are well defined.

[4] Based on the FEA/CECED measurement method, and excluding low pressure portioned coffee machines.

[5] Based on the Euro-Topten/S.A.F.E measurement method, and excluding semi-automatic coffee machines.

[6] Indicative values, based on the draft standard CENELEC.

Table 8-4: Energy class for pressure coffee machines with the new CECED proposal

	Base-Case with Standby Regulation in place	LLCC option	BAT option
Low pressure portioned machine	C	B	A
High pressure portioned machine	B	A	A*
Semi-automatic espresso machine	C	A	A*
Fully automatic espresso machine	A	A*	A*

*: or A+/A++ if these classes are created.

8.2.4. PROPOSED POLICY ACTIONS RELATED TO CONSUMABLES

The production and end-of-life of coffee consumables such as filters, capsules and decalcifier have significant costs and environmental impacts associated with them. The stock of portioned machines, in particular hard caps machines, is growing very fast – by as much as 12% per year. In addition, there is some evidence that in some countries they may be used in small offices, where use patterns are more intense than in households.

According to Öko-Institut and others, the production and disposal of capsules causes significant greenhouse-gas emissions that offset somewhat the relatively positive life cycle assessment of the capsule machines themselves. In one study, Öko-Institut found that capsules contributed 20% of overall emissions at the production phase and 8-13% at the disposal phase. Therefore, policy action related to the manufacturing and disposal of consumables such as capsules needs to be considered.

The environmental impacts of consumables were not addressed directly in this study as it focuses on the machines themselves and the MEEEuP EcoReport tool does not allow their impacts to be integrated into the analysis. Furthermore, coffee pads and capsules are considered out of the scope of the WEEE Directive as they are consumables and are out of the scope of the Packaging Directive too. Therefore, there is a real need to address the consumables issue.

The most appropriate level of governance for policy action may in fact be the national or even local level, where some recycling initiatives and capsule collection point schemes already exist (see section 3.2.3). If some consumables have lower levels of environmental impact and establish themselves in the market, they should also be considered for promotional measures such as the European Ecolabel. In all cases, better information on these initiatives should be provided to consumers.

Further, as the number of manufacturers of coffee machines using such capsules is limited for the time being (Nespresso, Tassimo and Dolce Gusto are currently the main actors). The Commission could engage a discussion with the manufacturers of coffee machines with capsules and capsule manufacturers to assess the feasibility of setting a voluntary agreement with an extended producer responsibility approach having objectives on the collection and recycling of such capsules, or at least on the development of collection points.

8.2.1. Proposed policy actions related to products outside the scope of Lot 25

As mentioned in Task 1, hot vending machines are out of the scope of this study. However, the launch of a new preparatory study on hot vending machines (for coffee and other hot drinks) might be useful, as their aggregate environmental impacts are thought to be significant.

The Danish Energy Saving Trust has published some purchasing guidelines for vending machines on its website.[7] Furthermore, the European Vending machine Association (EVA) has developed a test method (Energy Managing Protocol) for hot vending machines. The method tries to estimate the energy consumption in a situation corresponding to real use. It includes measurement of energy consumption in the heating phase (heating to brew temperature), standby (idle) and vending situation (brewing).[8]

8.2.2. Other policy options

8.2.2.1 Benchmarking

Benchmarks could also be considered, although the role of benchmarking under the Ecodesign Directive is less clear than the other measures described here. Benchmarks are non-binding for manufacturers but would allow the evaluation of the environmental performance achieved by a new product against the best-performing products available on the EU market at a certain time.

Benchmarks could be specified by the European Commission in an Ecodesign Regulation based on the information provided in this study and any harmonised standards that are developed. It might be possible to implement a well-chosen and widely disseminated set of benchmark products even more quickly than energy labels.

For example, the draft CENELEC standard mentions benchmark values for pressure coffee machines (240 ml coffee period: 71.4 Wh) and filter coffee machines (850 ml coffee period: 125 Wh).

[7] See www.savingtrust.dk/public-and-commerce/products/professional-white-goods/coffee-makers-and-food-and-drink-vending-machines.

[8] See www.vending-europe.eu/standards/EVA-EMP.html for more information.

8.2.2.2 Proposed policy actions related to Best Not yet Available Technology (BNAT)

As mentioned earlier, information on BNATs was very difficult to obtain from manufacturers and there is a lack of independent research. However, it does not seem appropriate to recommend any specific policy support for R&D in this area as it would be difficult to show the additionality of such funding compared to what companies are already doing in this competitive market.

8.2.2.3 Green Public Procurement

This policy option is not considered relevant to non-tertiary coffee machines as they are mainly intended for domestic use.

8.3. SCENARIO ANALYSIS

An Excel tool was created to allow the impacts of different scenarios to be modelled (2010-2020 and 2010-2025). The tool was designed quite simply and relies on the following assumptions:

- The model is built on a discrete annual basis to match the available data.
- Annual sales growth rates over the period 2010-2025 are estimated at -6.9% for BC 1, 3.0% for BC 2, 9.1% for BC 3, -1.7% for BC 4 and 2.9% for BC 5. Base-year data (2007) were taken from the market data presented in Task 2.
- Primary energy consumption was judged to be the most relevant and representative indicator to be modelled using the tool and also to allow comparing savings with other Ecodesign Lots. The tool calculates the expenditure in euros and primary energy in GJ related to non-tertiary coffee machines, under different policy scenarios. The primary energy results are not limited to the use phase, but take into account the energy required over the whole lifetime (including the manufacturing, distribution and end-of-life phases).
- Energy consumption is allocated uniformly over the lifetime of the product although in theory this is only true for the use phase. Given the low shares of other life cycle phases in energy consumption (see Task 5), this assumption is considered reasonable in order to carry out the analysis; a more “realistic” modelling would not make a significant difference to the overall results.
- Expenditure measures the yearly value of the entire market. It consists of the money spent to buy the product (purchase price), taken into account at the time of purchase, and the operating costs (energy, water, coffee,

maintenance and repair), which are spread over the lifetime of the machine.

In the following subsections, four scenarios are described: Freeze, which assumes that products on the market do not include any new improvement options in future and that even the Standby Regulation is not implemented; BAU Standby, which assumes the full implementation of the Standby Regulation from 2013; Least Life-Cycle Cost (LLCC) scenario, which assumes that the LLCC options for all product categories are implemented from 2014; Best Available Technology (BAT) scenario, which assumes that the BAT options are implemented from 2018 (ideally, that would be the medium-term target).

The BAT and LLCC scenarios are compared to the BAU Standby scenario in order to estimate the overall potential of the improvement options. Most of the description in the sections below refers to 2025 for comparison. The following market data were used as inputs to the modelling tool.

Table 8-5 Market inputs of the policy analysis model

Category	Stock (millions)		Average annual stock change (%)	Lifetime (years)
	2010	2025		
BC1 – Drip filter coffee machine	58.8	29.4	-4.5%	6
BC2 – Pad filter coffee machine	22.7	35.3	3.0%	7
BC3 – Hard cap espresso machine	12.6	62.1	11.2%	7
BC4 – Semi-automatic espresso machine	9.0	6.3	-2.4%	7
BC5 – Fully automatic espresso machine	7.6	11.6	2.9%	10

8.3.1. BAU STANDBY SCENARIO

In the BAU Standby scenario, the Base-Cases remain the only products sold on the market over the outlook period: the only improvement that takes place is the full implementation of the Standby Regulation (Option 0) from 2013, meaning that an auto-power down of two hours is assumed and that the power consumption in standby mode is set at 0.5 W. No other improvement option or any other type of improvement is introduced to the market. In this scenario, it is consequently assumed that there is no incremental process of product improvement. This scenario is used as a baseline in order to compare the results with those of the BAT and LLCC scenarios.

Figure 8-2 and Figure 8-3 show the breakdown by Base-Case of energy consumption and expenditure over the period 2010-2025. BC 1 and BC 3 have the highest shares of energy consumption and BC 3 has more than double the expenditure of the BC1, the next highest Base-Case.

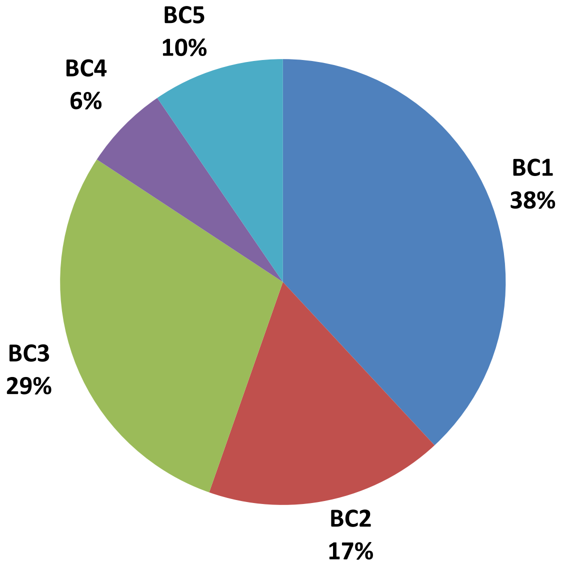

Figure 8-2: Total BAU Standby scenario energy consumption by Base-Case, 2010-2025 (PJ)

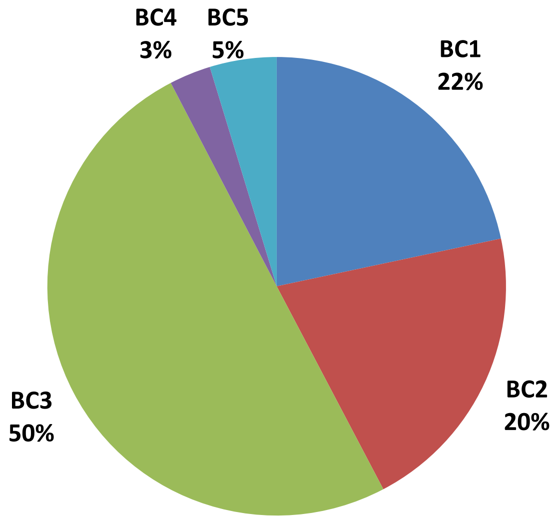

Figure 8-3: Total BAU Standby scenario expenditure by Base-Case, 2010-2025 (€bn)

In 2025, non-tertiary coffee machines would require 296 PJ of primary energy (i.e. 28.2 TWh of final electricity consumption), and total consumption over the period 2010-2025 would be 4 295 PJ (i.e. 409.0 TWh of final electricity consumption). Non-tertiary coffee machines will result in emissions of 190 $MtCO_2eq$ over the scenario period. Regarding expenditure, 113 €bn is projected to be spent on non-tertiary coffee machines in 2025, and the market is projected to represent a cumulative 1 352 €bn over the period 2010-2025.

8.3.2. LLCC SCENARIO

The LLCC scenario considers that the LLCC improvement option as described in Task 7 is implemented for each Base Case. From 2014, all products sold include these LLCC options and no more Base Cases are sold (the market shift takes place from one year to the next). Table 8-6 summarises the LLCC options for each Base Case identified in Task 7.

Table 8-6: LLCC improvement options by Base Case

Base Case	LLCC improvement option	Description
BC 1	Scenario A	Auto-power down after 30 minutes and “zero” standby
BC 2-5	Scenario A	Auto-power down after 5 minutes and “zero” standby

Figure 8-4 and Figure 8-5show the breakdown by Base Case of energy consumption and expenditure over the period 2010-2025. BC 1 and BC 3 have the highest energy consumption and BC 3 has more than double the expenditure of BC 1 and BC 2, the next highest Base Cases.

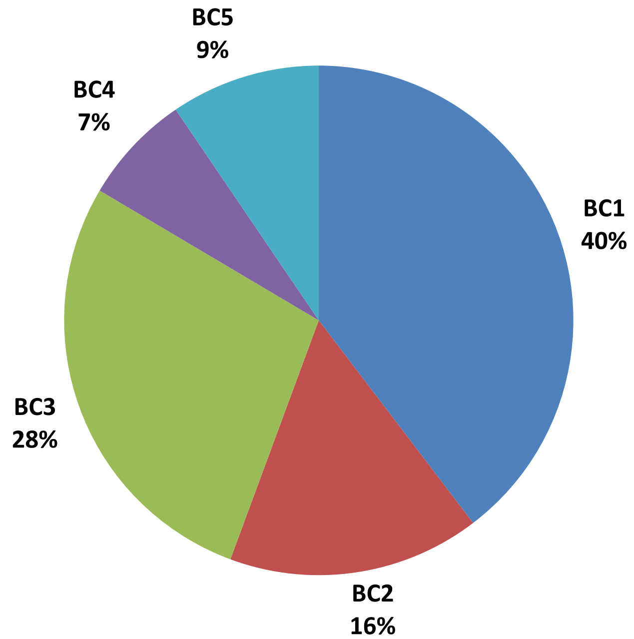

Figure 8-4: Total LLCC scenario energy consumption by Base Case, 2010-2025 (PJ)

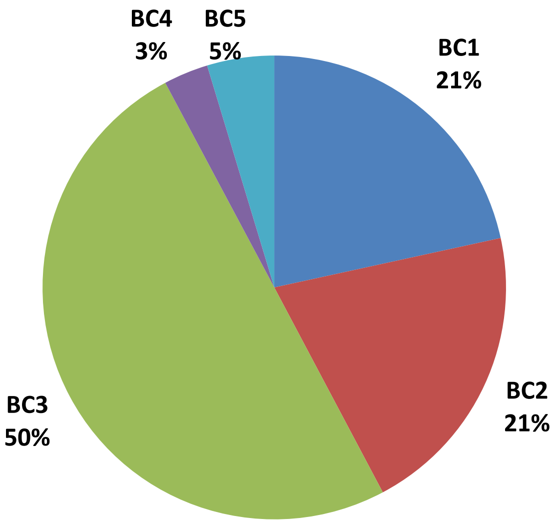

Figure 8-5: Total LLCC scenario expenditure by Base Case, 2010-2025 (€bn)

In 2025, the non-tertiary coffee machines market would require 233 PJ of primary energy, i.e 22.2 TWh of final electricity consumption (-21.3% compared to BAU Standby), and would represent 113 €bn (-0.04% compared to BAU Standby). Over 2010-2025, total primary energy consumption would be 3 776 PJ, i.e. 359.6 TWh of final electricity consumption (-12.1% compared to BAU Standby), total CO_2 emissions would account for 167 Mt (-23 Mt compared to BAU Standby), and total expenditure would be 1 354 €bn over the period (+0.1% compared to BAU Standby).

8.3.3. BAT SCENARIO

The BAT scenario considers that the LLCC improvement option is implemented for each Base-Case from 2014 and the BAT option as described in Task 7 is implemented from 2018 for each Base Case. From 2018, all products sold include these options, which are considered a long-term target. Table 8-7 is a reminder of the BAT options identified in Task 7.

Table 8-7: BAT improvement options by Base Case

Base Case	BAT improvement option	Description
BC 1	Option 4	Thermos jug
BC 2	Option 3	Flow-through heater
BC 3	Option 3	Flow-through heater
BC 4	Scenario B	Auto-power down with 5 minutes delay and “zero” standby and additional insulation
BC 5	Option 3	Flow-through heater

Figure 8-6 and Figure 8-7show the breakdown by Base Case of energy consumption and expenditure over the period 2010-2025. BC 1 and BC 3 have the highest energy consumption, as in the other scenarios. BC 3 still has the greatest share of expenditure but the gap between it and BC 1 is much smaller.

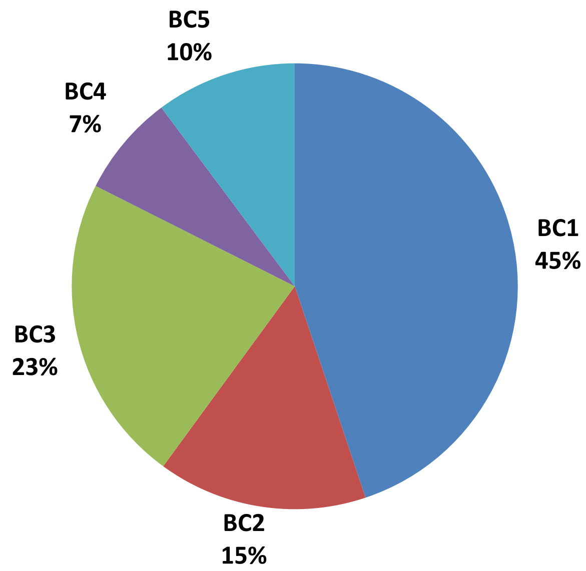

Figure 8-6: Total BAT scenario energy consumption by Base Case, 2010-2025 (PJ)

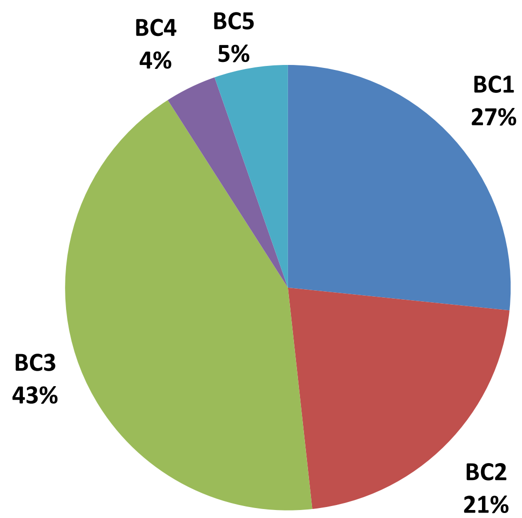

Figure 8-7: Total BAT scenario expenditure by Base Case, 2010-2025 (€bn)

In 2025, the non-tertiary coffee machines market would require 199 PJ of primary energy, i.e. 19.0 TWh of final electricity consumption (-32.7% compared to BAU Standby), and would represent 119 €bn (+4.7% compared to BAU Standby). Over the period 2010-2025, total primary energy consumption would be 3 583 PJ, i.e. 341.2 TWh of final electricity consumption (-16.6% compared to BAU Standby), total CO_2 emissions would account for 158 Mt (-31 Mt compared to BAU Standby), and total expenditure would be 1 381 €bn over the period (+2.1% compared to BAU Standby).

8.3.4. COMPARISON OF THE SCENARIOS

This comparison is made in terms of electricity consumption and consumer expenditure. Figure 8-8 to Figure 8-13show projected total primary energy consumption and expenditure between 2010 and 2025 by Base-Case and according to the BAT, LLCC and BAT scenarios previously described. As expected, the BAT scenario enables the largest primary energy savings (both annually and over the period 2010-2025) while the LLCC scenario results in the smallest annual expenditure.

However, looking at the overall results in Figure 8-14, the LLCC and BAT scenarios almost overlap, both in terms of energy consumption and expenditure, except for Base-Cases 3 and 4. It can also be seen that the improvement options have an insignificant overall impact on expenditure since higher product prices are offset by lower operating costs. For Base-Case 4, the BAT scenario annual expenditures become higher than the BAU Standby annual expenditure after 2020.

Table 8-8 shows that there are large cumulative savings (6.5 TWh) from the Standby Regulation alone for non-tertiary coffee machines. However, there is a much greater savings potential (21-26 TWh) from moving to the LLCC or BAT scenarios.

Table 8-8: Savings by scenario, cumulative 2010-2020

	PJ	TWh
BAU Standby compared to Freeze	67.8	6.5
LLCC compared to BAU Standby	219.5	21
BAT compared to BAU Standby	272.2	26

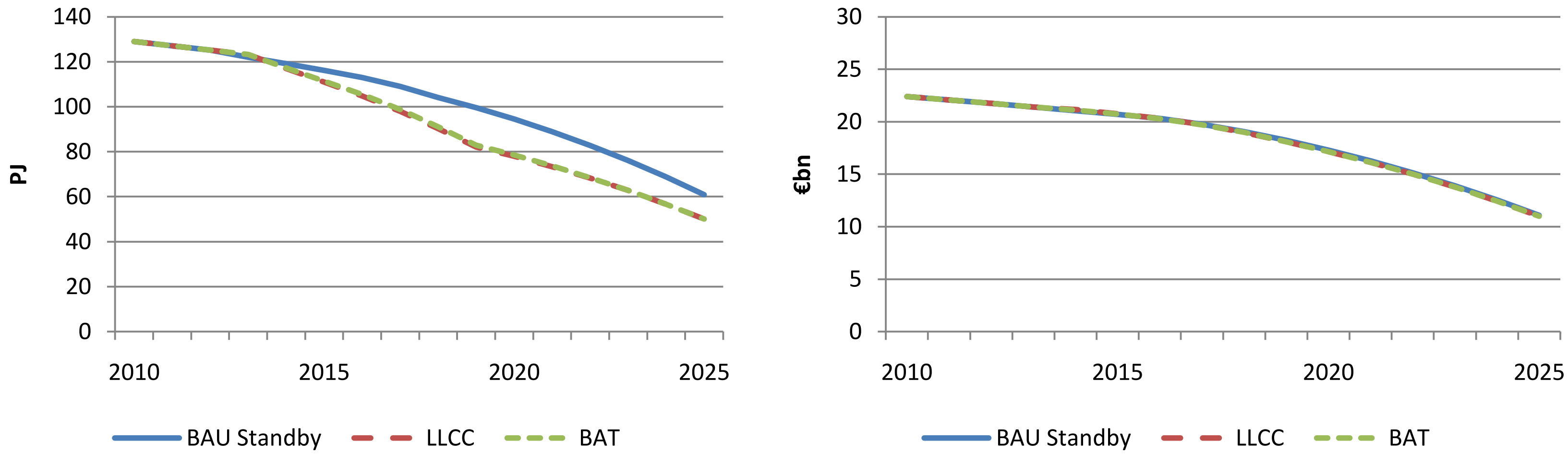

Figure 8-8: Primary energy consumption and expenditure by scenario, Base-Case 1

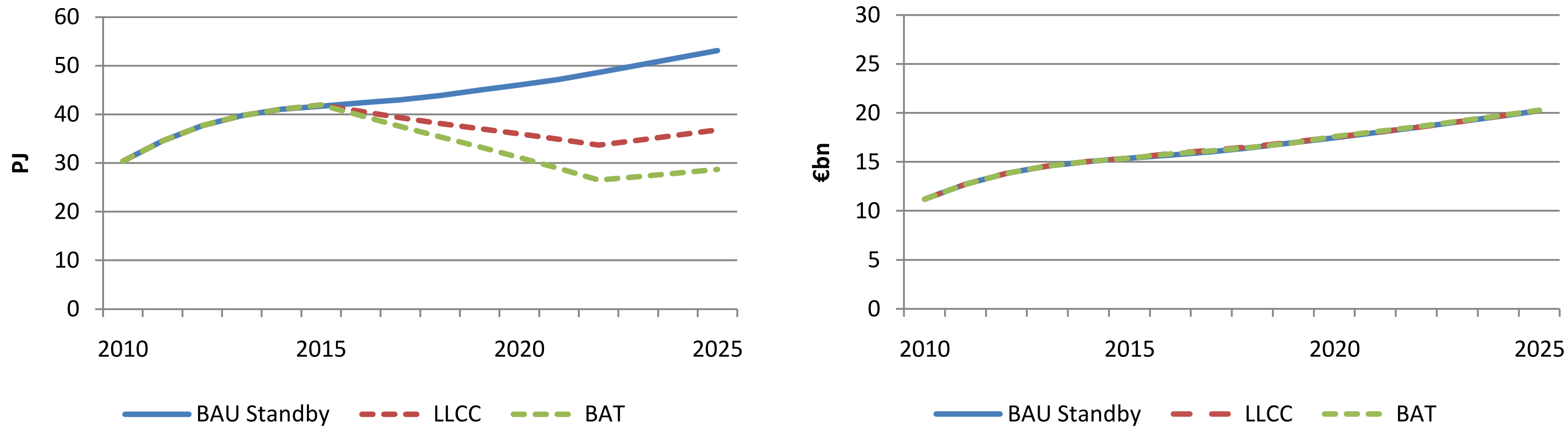

Figure 8-9: Primary energy consumption and expenditure by scenario, Base-Case 2

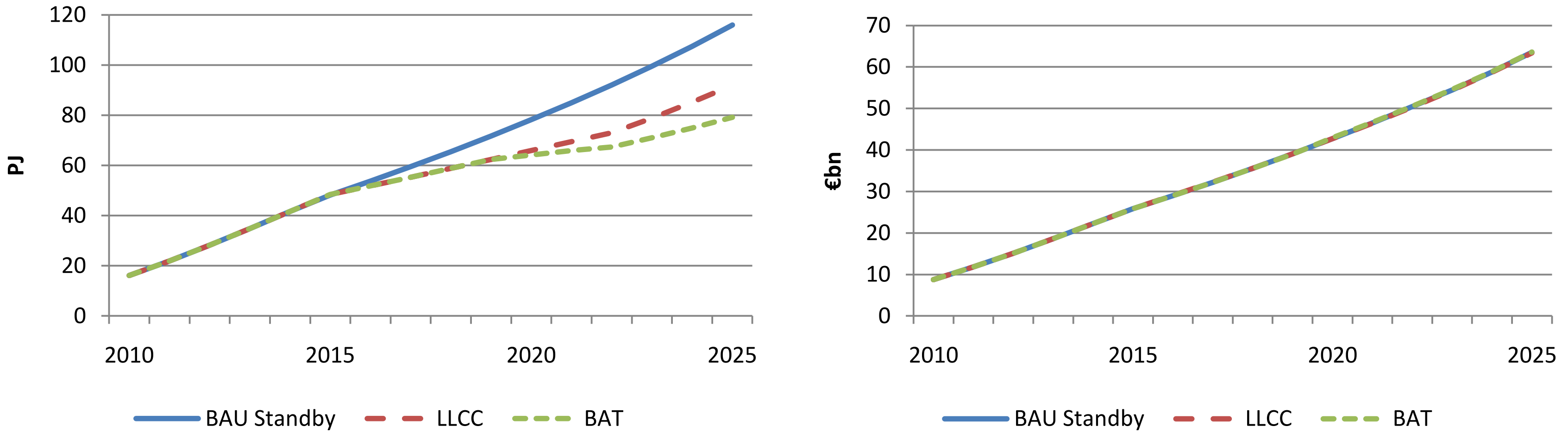

Figure 8-10: Primary energy consumption and expenditure by scenario, Base-Case 3

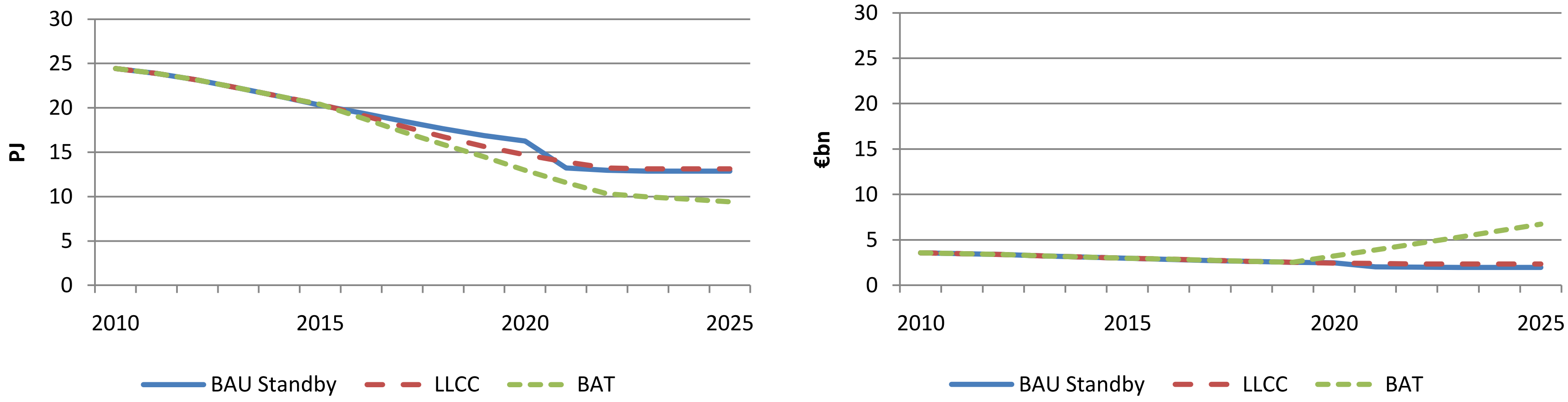

Figure 8-11: Primary energy consumption and expenditure by scenario, Base-Case 4

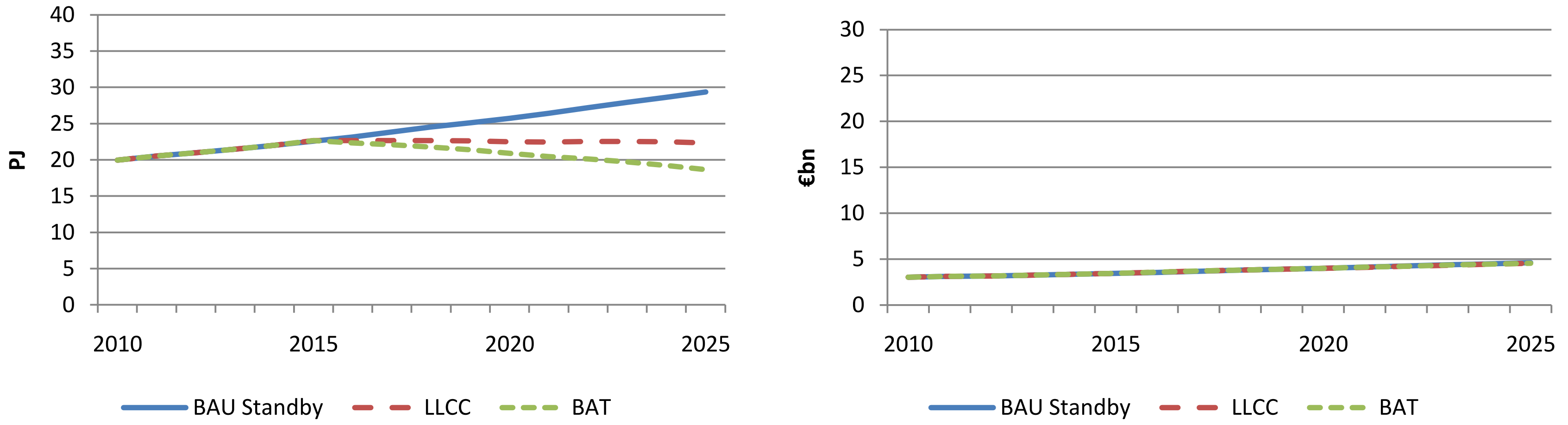

Figure 8-12: Primary energy consumption and expenditure by scenario, Base-Case 5

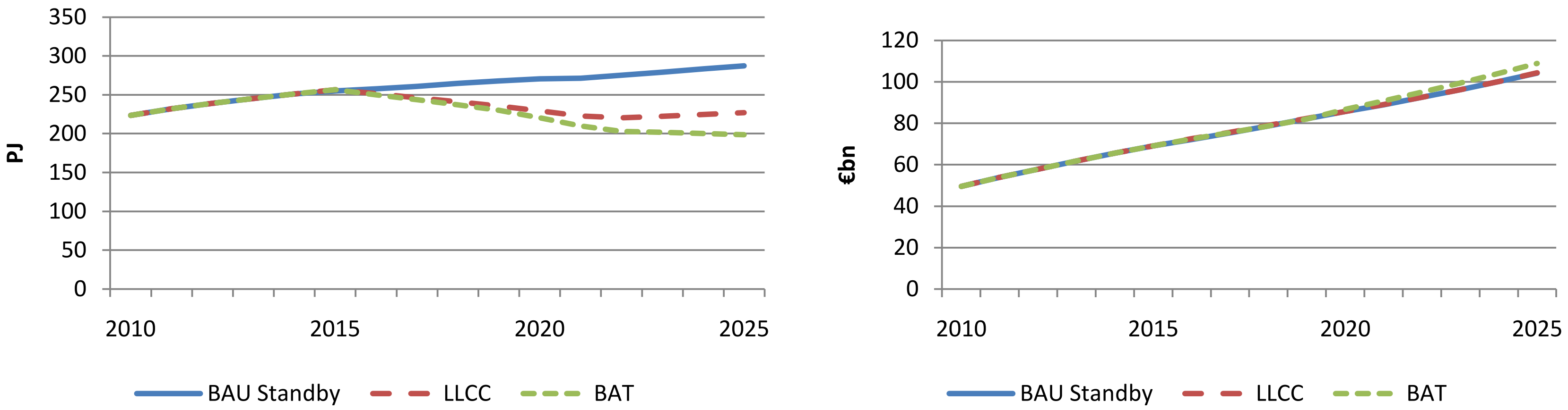

Figure 8-13: Primary energy consumption and expenditure by scenario, Total

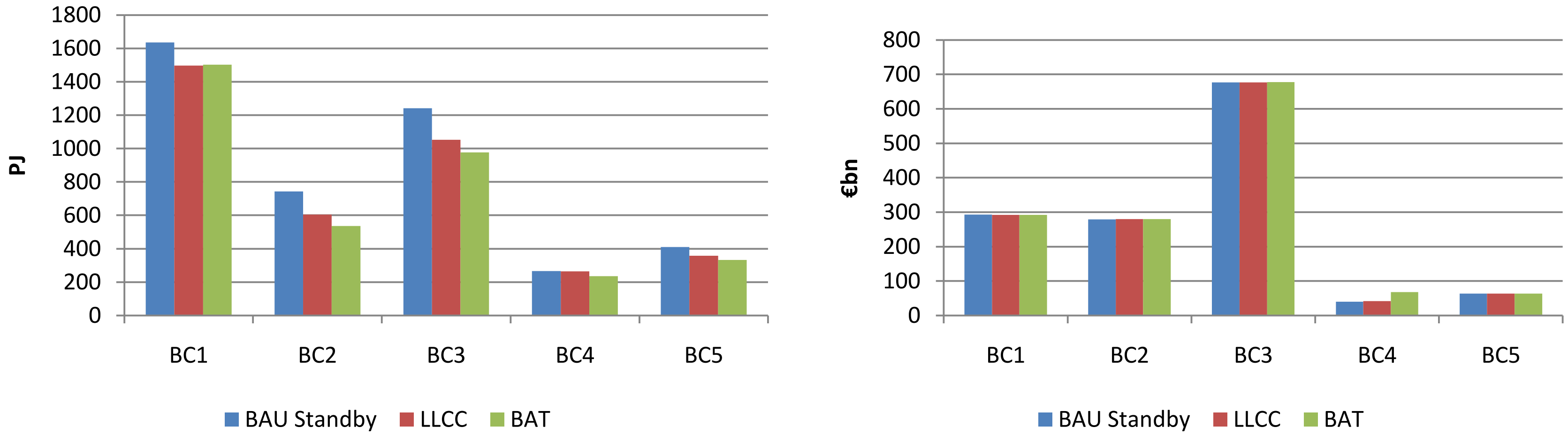

Figure 8-14: Primary energy consumption and consumer expenditure by Base-Case over the period 2010-2025

8.4. IMPACT ANALYSIS

8.4.1. IMPACTS ON MANUFACTURERS AND COMPETITION

All the technologies described in this study and considered as improvement options in the scenarios are already available on the market today, if only in a few models. As a result, the possible implementation of MEPS dealing with relevant targets should not have a major negative impact on manufacturers, especially because the non-tertiary coffee machine sector is competitive and has been continuously improving product performance.

Regarding the definition of a timeline to implement standards, it should take into account the time necessary to adapt production lines. This redesign time varies depending on the type of change to be achieved: it has been estimated that between 6 and 12 months are needed to replace a single part of the appliance, which is the case for every improvement option presented within the study. Assuming the development of the required standards (see section 2.2.4) is finished by 2012, Tier 1 has thus been set at 2014 for the MEPS and the scenario model.

Most manufacturers seem to have similar BAT products, with the implementation of the same improvement options. The manufacturers of most of the non-tertiary coffee machines on the European market are large international companies, but a few smaller manufacturers also exist. If minimum performance standards were set, it is believed that all manufacturers should be able to keep up with the market requirements, using common technology or their own technological developments. However, smaller manufacturers might face some difficulty to react as quickly as the larger ones. Therefore, appropriate and progressive targets should be set, both in terms of performance and timeline.

EU manufacturers claim to produce amongst the most efficient coffee machines manufactured worldwide. Therefore, the implementation of minimum performance standards is not expected to hamper the economic development of large EU manufacturers to the benefit of extra-EU competitors. However, impacts on smaller manufacturers deserve further assessment.

8.4.2. MONETARY IMPACTS

The scenario analysis partly addresses monetary impacts. The possible implementation of MEPS may require additional capital investment from manufacturers to adapt manufacturing techniques to produce the more efficient products (e.g. changing production lines). However, these investments should not represent a significant burden for manufacturers as they are used to continuously improving the efficiency of their appliances. Investment costs may also be partly offset by slightly higher selling prices of more efficient machines. Besides, economies of scale may enable manufacturers to have a larger margin and/or drop prices when selling efficient appliances.

On the consumer side, purchasing a more efficient coffee machine may represent a larger initial investment but if performance requirements are set based on LCC calculations, the investment becomes beneficial in the long term. Some buyers could even be eager to buy more efficient products provided they are economic in the long run, and policy options could also aim to encourage this long-term vision, which is beneficial both from the environmental and economic points of view.

8.4.3. IMPACTS ON CONSUMERS

For the improvement options presented, the functional unit and the service given by the improved product remains the same as the Base-Case (this is a necessary condition to make a relevant comparative LCA): this is a key criterion to assess their implementation in non-tertiary coffee machines. There should be no trade-off in terms of functionality (e.g. reduced coffee quality or loss of important features), as a result of the increased energy efficiency. For example, if MEPS is thermoblock or flow-through heater, it should not affect coffee quality.

8.4.4. IMPACTS ON INNOVATION AND DEVELOPMENT

BNATs and current research axes in the sector were not very thoroughly described in this study because of a lack of data. Such information is obviously very sensitive and manufacturers were not willing to share. In addition, little or no independent research has been carried out. The possible implementation of MEPS can be seen as an opportunity for manufacturers to look for innovative and efficient technological solutions in order to decrease costs. Again, given the competitiveness of the sector, it seems that following the current trend regarding research and development is feasible for the manufacturers and should enable them to meet proposed requirements.

8.4.1. SOCIAL IMPACTS (EMPLOYMENT)

Most EU manufacturers have their production plants within the EU. If performance standards were set, they should not have a detrimental impact on the number of jobs or the well-being of the EU manufacturers' employees. Indeed, the non-tertiary coffee machine sector has been improving performance continuously so that the companies have experience in carrying out continuous production transitions. In addition, the improvement options presented do not require any specific material that might be difficult to obtain within the EU so that the supply chain would not be unduly affected nor EU industries disadvantaged.

8.5. SENSITIVITY ANALYSIS

Scope: The sensitivity analysis checks the robustness of the overall outcomes. It should cover the main parameters as described in Annex II of the Ecodesign Directive (such as the price of energy, the cost of raw materials or production costs, discount rates, including, where appropriate, external environmental costs, such as avoided greenhouse gas emissions), to check if there are significant changes and if the overall conclusions are reliable and robust.

The parameters that would be considered the most relevant for this sensitivity analysis (because of their importance and/or uncertainty) in the case of non-tertiary coffee machines are listed below:

- Electricity rates;
- Discount rate;
- Product price;
- Product lifetime;
- Number of cycles per year.

Parameters such as electricity rates, discount rates and product purchase prices have a direct influence on the LCC calculations of the Base-Cases and their improvement options (but not on the environmental impacts of the products) while others (time in on-mode per year) will influence both the environmental impacts of the products and the LCC through operating costs.

Note that we use average EU prices for all calculations but there are significant differences between Member States. The BAT might be cost-effective in one Member State and not cost-effective in another. The options and scenarios evaluated are listed in Table 8-911.

Table 8-9: Description of options and scenarios applied to the Base-Cases

Option	Description
Option 0	Standby Regulation
Option 1a	AutoPowerDown 60 minutes
Option 1b	AutoPowerDown 30 minutes
Option 1c (not for BC 1)	AutoPowerDown 5 minutes
Option 2	Zero watt standby
Option 3	Flow-through heater
Option 4	Additional insulation (or thermos jug)
Scenario A	0+1c+2 (0+1b+2 for BC 1)
Scenario B (not for BC 1)	0+1c+2+4

In Task 4, average product prices and data on energy consumption in on mode were determined for the base-cases. Given the uncertainty that remains regarding the definition of "average market" products, the sensitivity analysis will consider an error margin on the given values. The tested values are therefore presented in Table 8-10, Table 8-11, Table 8-12, Table 8-13 and Table 8-14.

8.5.1. ASSUMPTION RELATED TO THE ELECTRICITY RATES

Table 8-10: Variation of electricity rates for each Base-case

Base-case	Current value (euros)	Lower value	Upper value
Base-case 1	0.1658	0.0823	0.2698
Base-case 2	0.1658	0.0823	0.2698
Base-case 3	0.1658	0.0823	0.2698
Base-case 4	0.1658	0.0823	0.2698
Base-case 5	0.1658	0.0823	0.2698

Figure 8-15to Figure 8-19 show the influence of the variation of the electricity rate on the life-cycle costs of the different base-cases and associated improvement options. Please note, that the scale does not start from 0€, in order to show the differences between the options and between the scenarios more clearly. Therefore, a comparison between the Base-Cases should be made using the absolute values and not the position on the figures.

Regarding costs, the option 1c and scenario A are the LLCC for Base-Cases 2, 3, 4 and 5, and also for the minimum and maximum values. The option 1b and scenario A are the LLCC for base case 1.

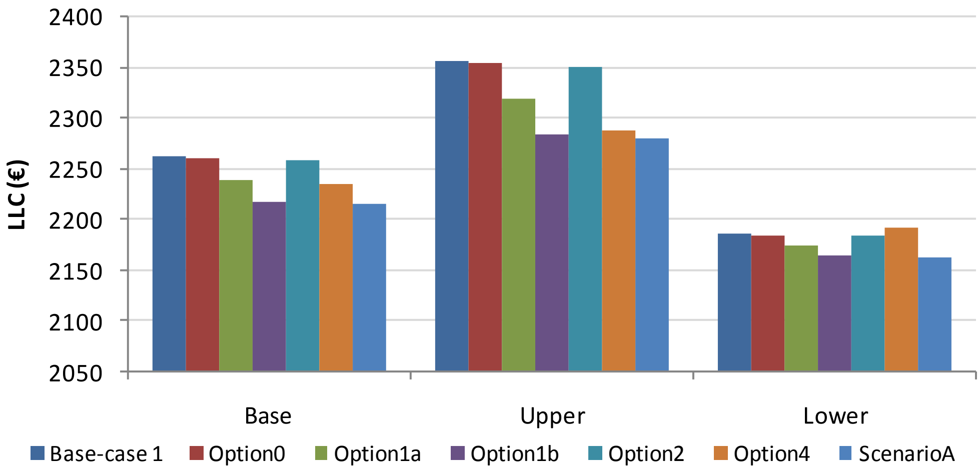

Figure 8-15: Sensitivity to electricity rates for Base-case 1 Life Cycle Cost

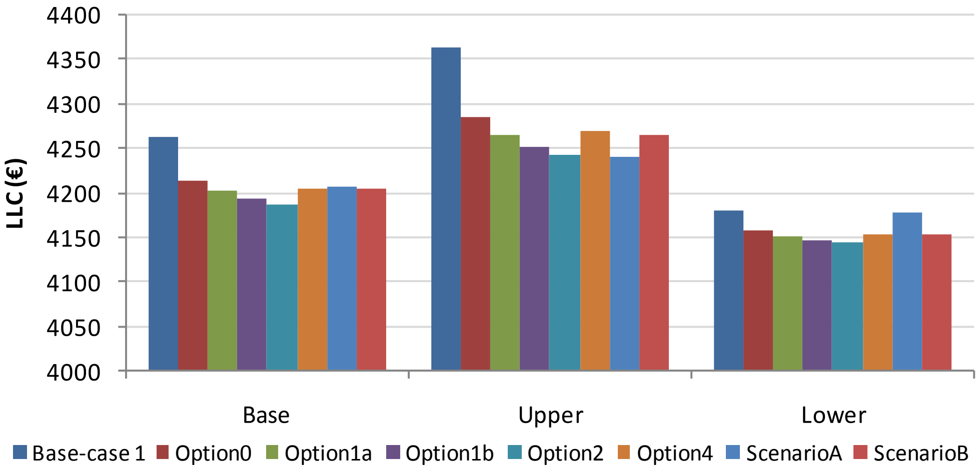

Figure 8-16: Sensitivity to electricity rates for Base-case 2 Life Cycle Cost

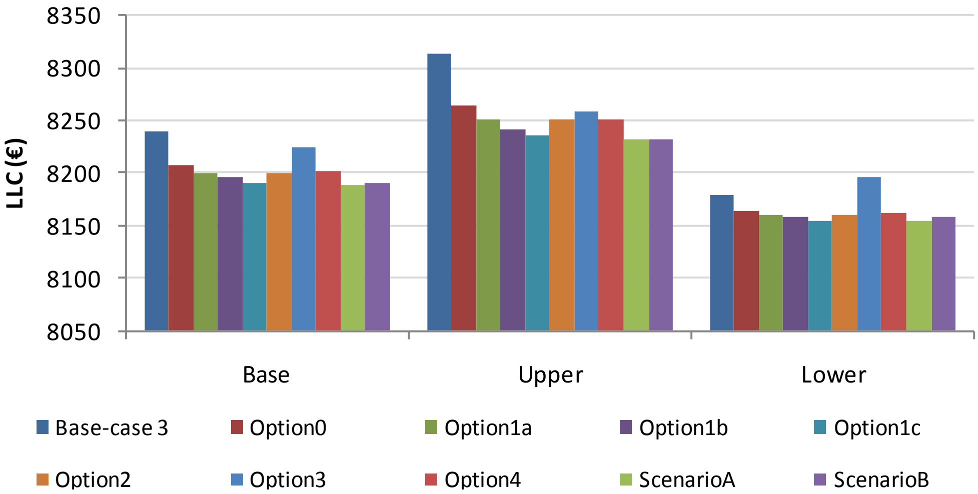

Figure 8-17: Sensitivity to electricity rates for Base-case 3 Life Cycle Cost

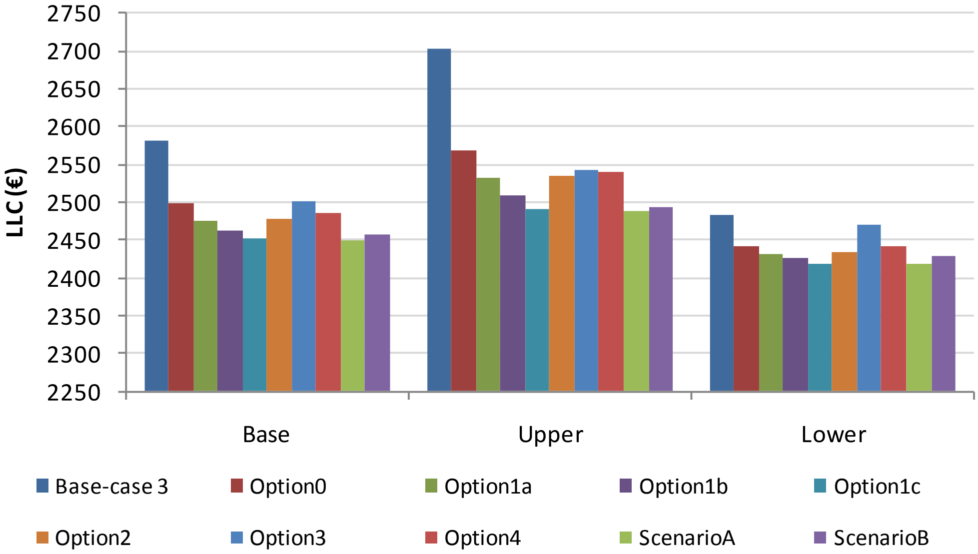

Figure 8-18: Sensitivity to electricity rates for Base-case 4 Life Cycle Cost

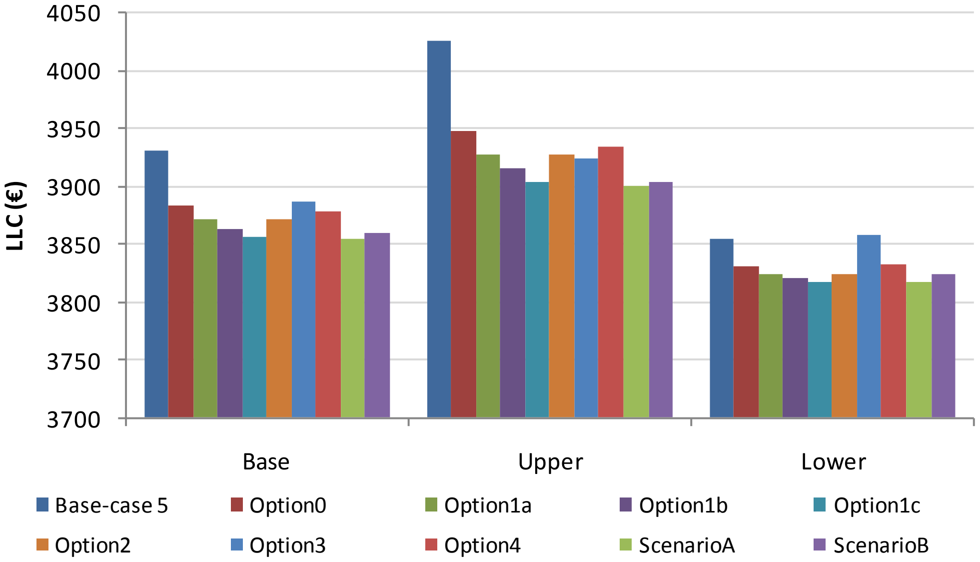

Figure 8-19: Sensitivity to electricity rates for Base-case 5 Life Cycle Cost

8.5.2. Assumption related to the discount rate

Table 8-11: Variation of discount rates for each Base-case

Base-case	Current value	Lower value	Upper value
Base-case 1	4%	2%	6%
Base-case 2	4%	2%	6%
Base-case 3	4%	2%	6%
Base-case 4	4%	2%	6%
Base-case 5	4%	2%	6%

Figure 8-20 to Figure 8-24 show the influence of the discount rate on the life-cycle costs of the different base-cases and associated improvement options. For all situations, despite the expected variations in absolute values, the ranking of the different improvement options remains the same whether the minimum or maximum parameter is used.

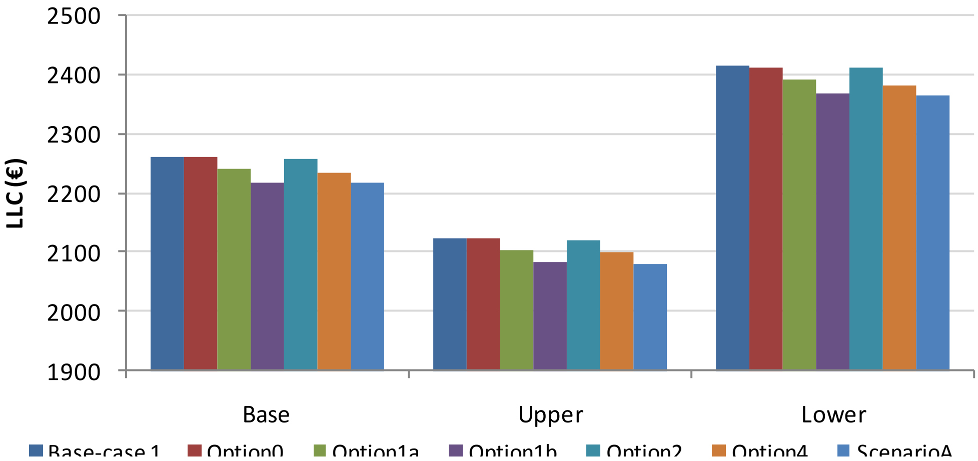

Figure 8-20: Sensitivity to discount rates for Base-case 1 Life Cycle Cost

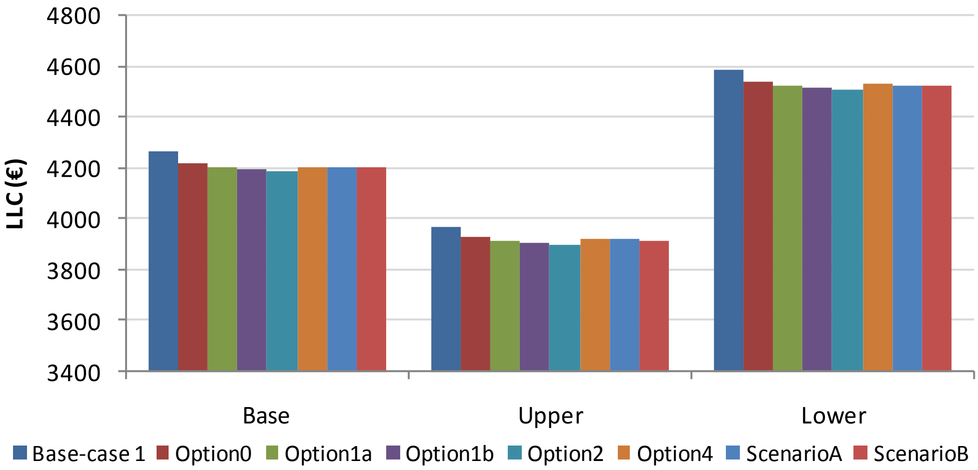

Figure 8-21: Sensitivity to discount rates for Base-case 2 Life Cycle Cost

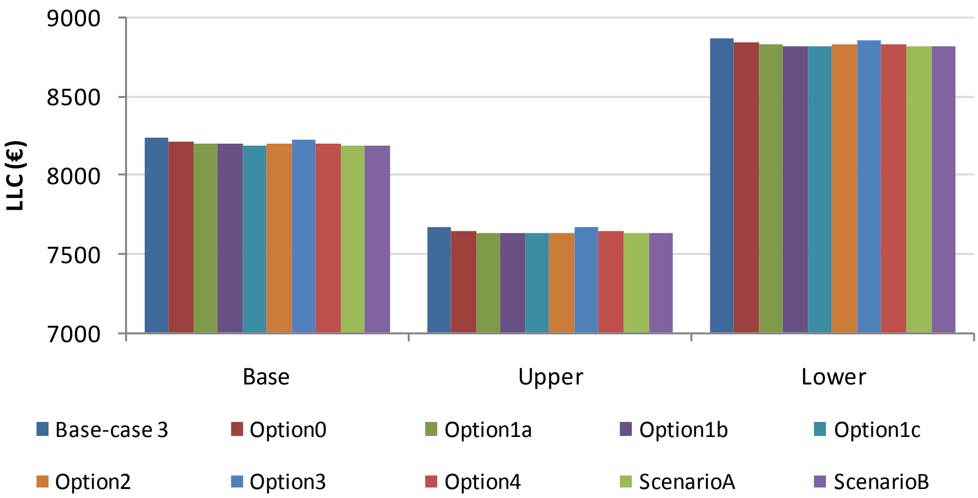

Figure 8-22: Sensitivity to discount rates for Base-case 3 Life Cycle Cost

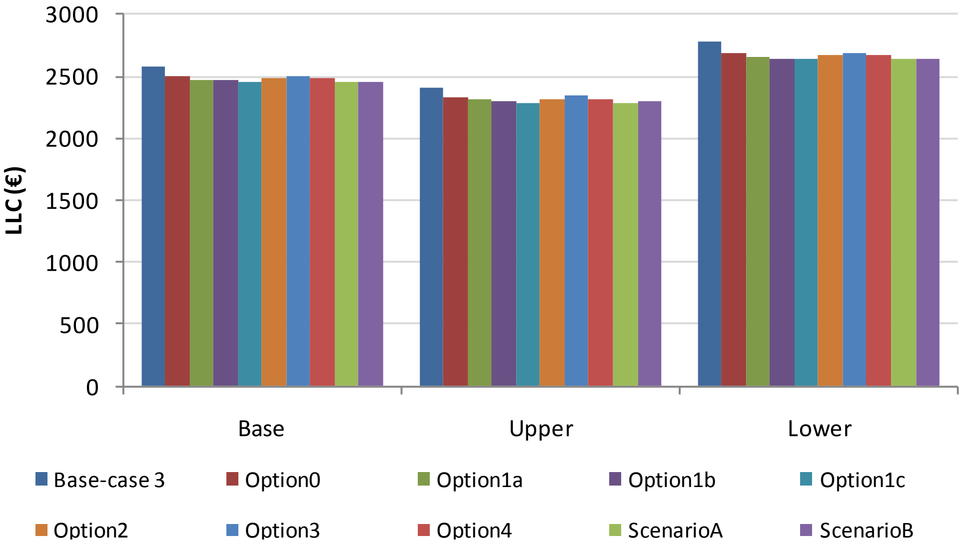

Figure 8-23: Sensitivity to discount rates for Base-case 4 Life Cycle Cost

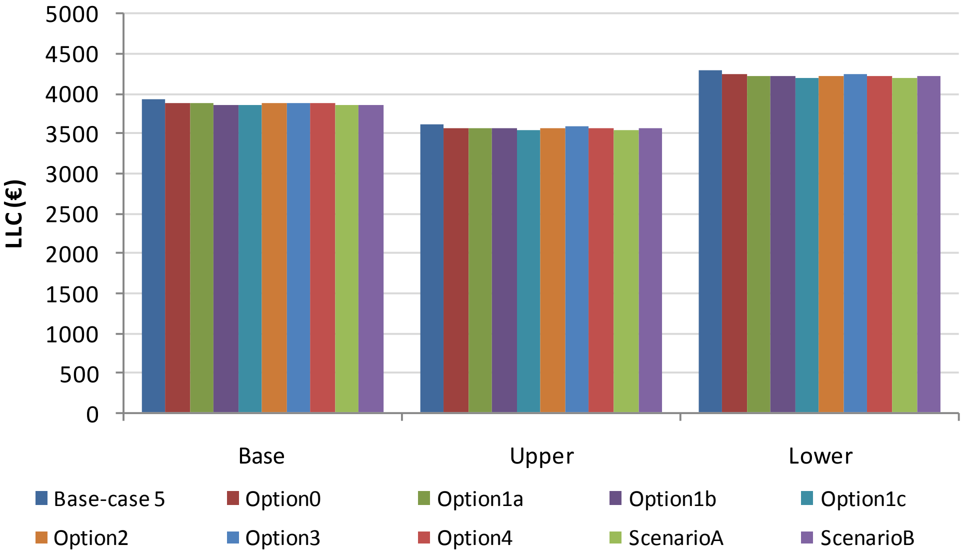

Figure 8-24: Sensitivity to discount rates for Base-case 5 Life Cycle Cost

8.5.3. Assumption related to the product price

Table 8-12: Variation of product price for each Base-Case

Base-case	Current value (euros)	Lower value	Upper value
Base-case 1	35	28	42
Base-case 2	81	64.8	97.2
Base-case 3	156	124.8	187.2
Base-case 4	103	82.4	123.6
Base-case 5	595	476	714

Figure 8-25 to Figure 8-29 show the influence of the product price on the life-cycle costs of the different base-cases and associated improvement options. For all situations, despite the expected variations in absolute values, the ranking of the different improvement options remains the same whether the minimum or maximum parameter is used.

The LLCC is option 1b and scenario A for base case 1, option 2 for base case 2, option 1c and scenario A for base cases 3, 4 and 5.

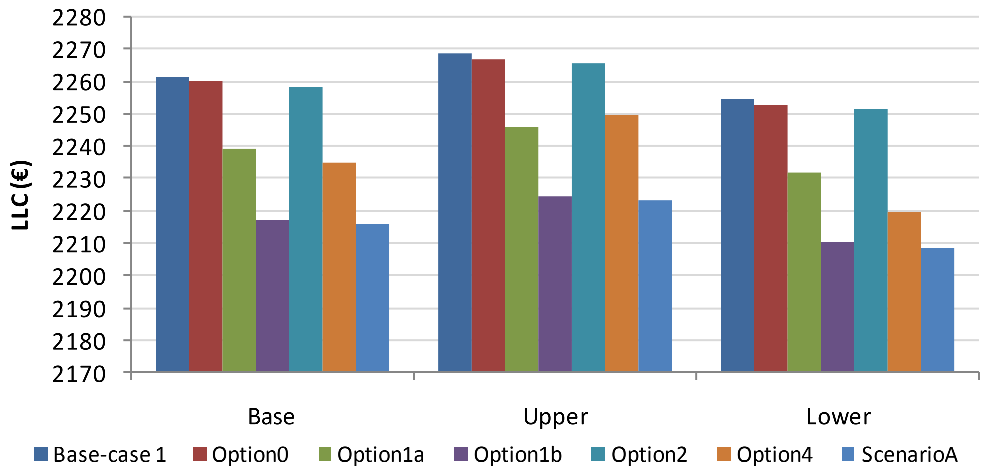

Figure 8-25: Sensibility to product price for Base-Case 1 Life Cycle Cost

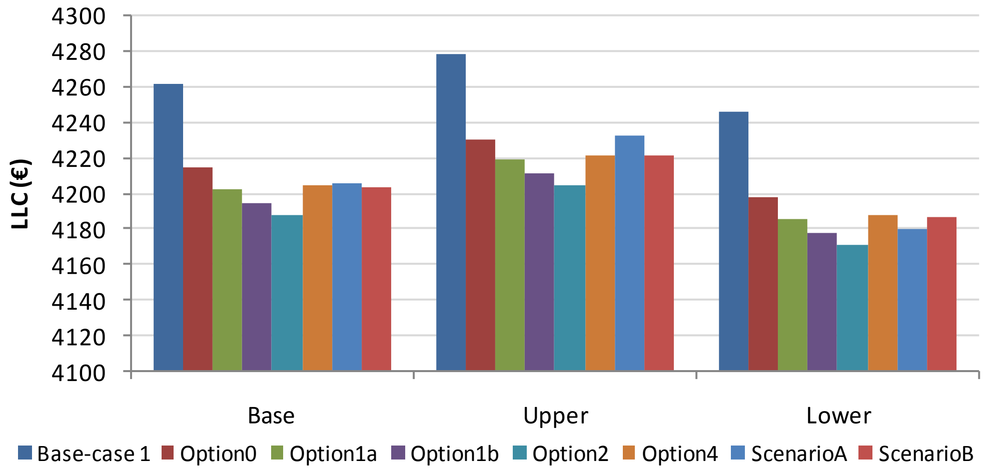

Figure 8-26: Sensitivity to product price for Base-Case 2 Life Cycle Cost

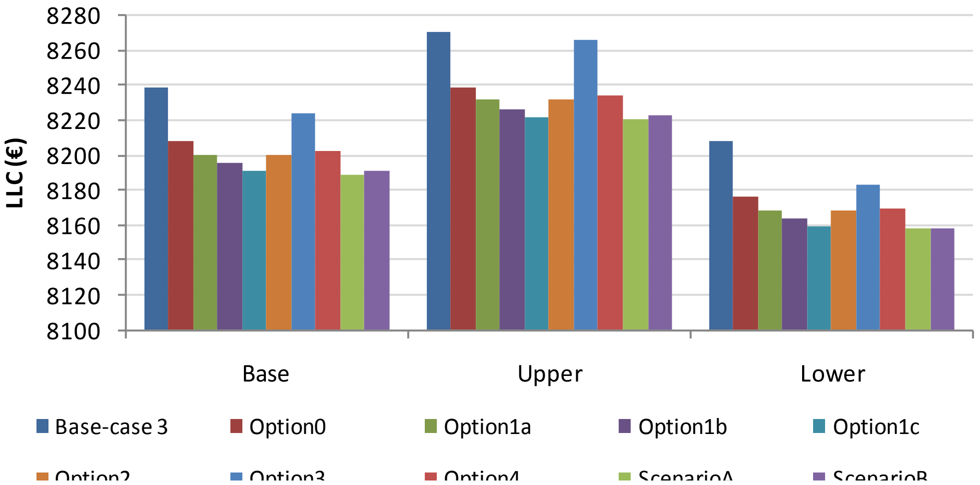

Figure 8-27: Sensitivity to product price for Base-Case 3 Life Cycle Cost

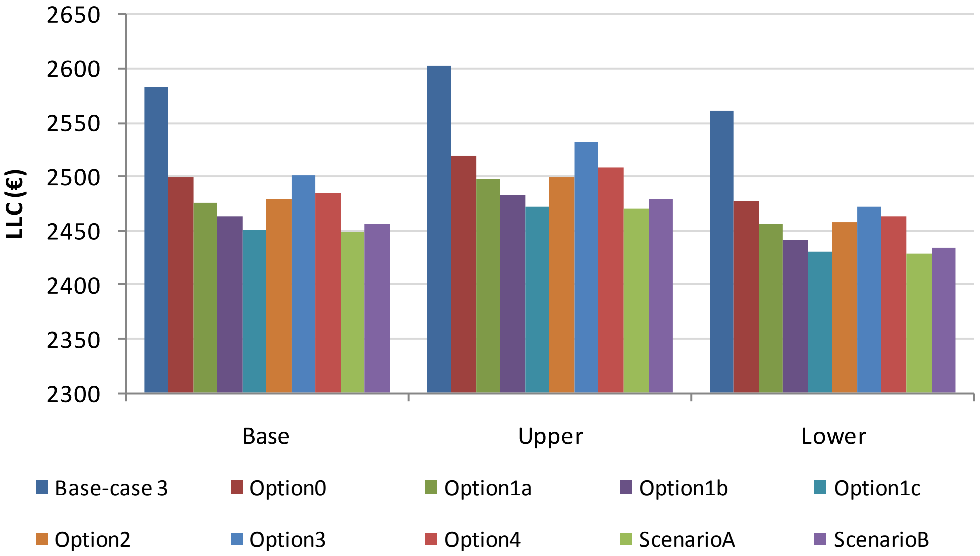

Figure 8-28: Sensitivity to product price for Base-Case 4 Life Cycle Cost

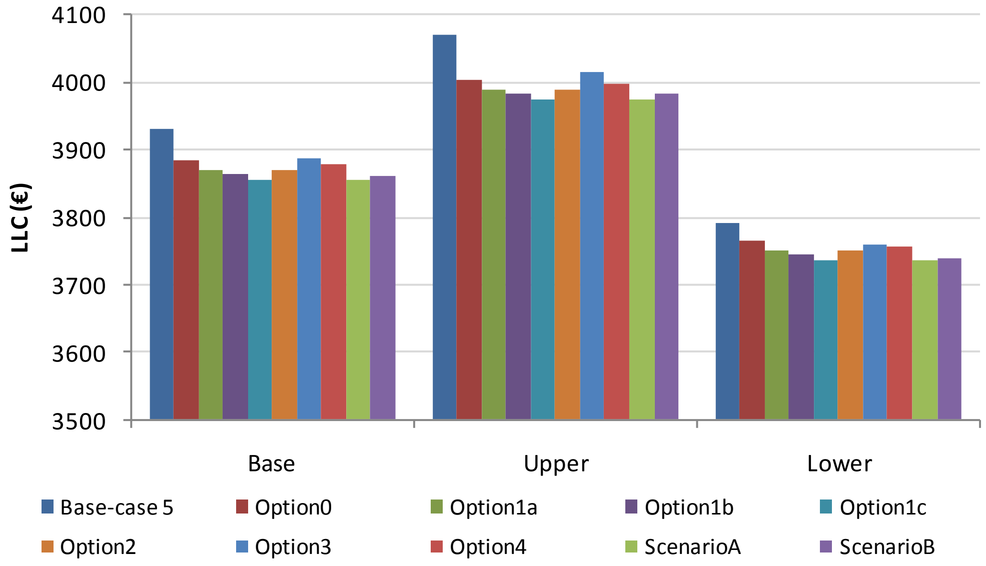

Figure 8-29: Sensitivity to product price for Base-Case 5 Life Cycle Cost

8.5.4. Assumption related to the product lifetime

Table 8-13: Variation of product lifetime for each Base-Case

Base-case	Current value (in years)	Lower value	Upper value
Base-case 1	6	3	9
Base-case 2	7	3.5	10.5
Base-case 3	7	3.5	10.5
Base-case 4	7	3.5	10.5
Base-case 5	10	5	15

Figure 8-30 to Figure 8-39 show the influence of the product lifetime rate on the total energy consumption and life-cycle costs of the different base-cases and associated improvement options. For all situations regarding the costs, despite the expected variations in absolute values, the ranking of the different improvement options remains the same whether the minimum or maximum parameter is used.

Regarding the energy consumption, the LLCC is option 4 for base case 1, scenario A for base case 2, option 3 for base case 3, option 1c and 3, with scenarios A and B for base case 4, and option 3 for base case 5.

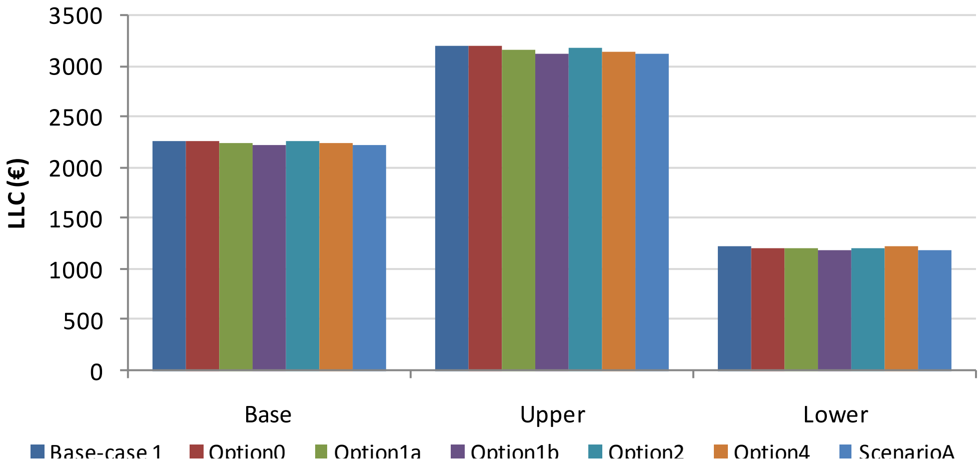

Figure 8-30: Sensitivity to product lifetime for Base-case 1 Life Cycle Cost

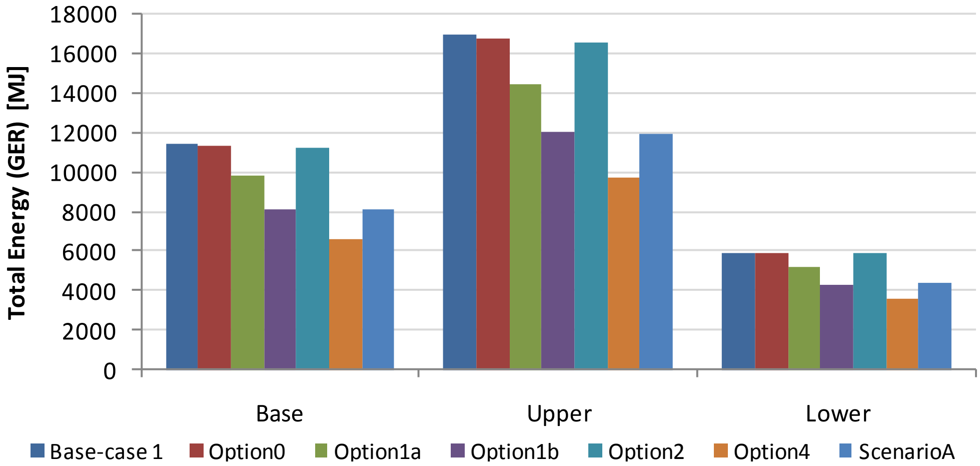

Figure 8-31: Sensitivity to product lifetime for Base-Case 1 Total Energy

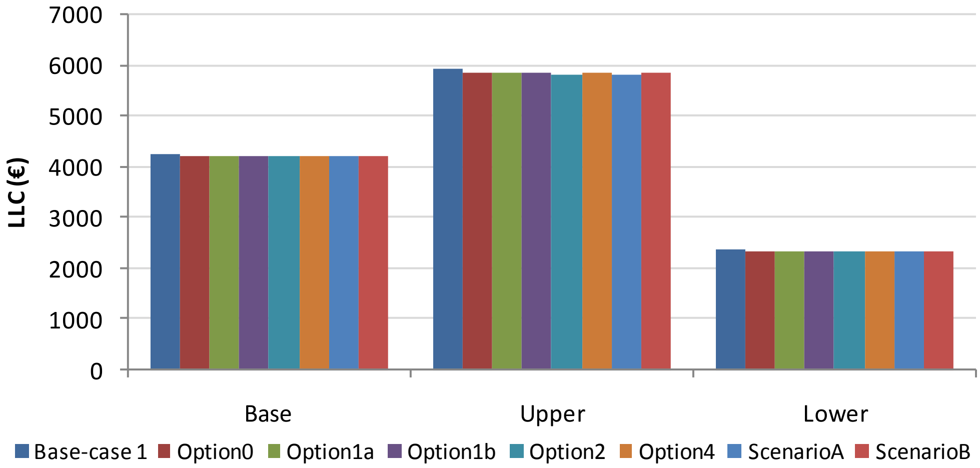

Figure 8-32: Sensitivity to product lifetime for Base-Case 2 Life Cycle Cost

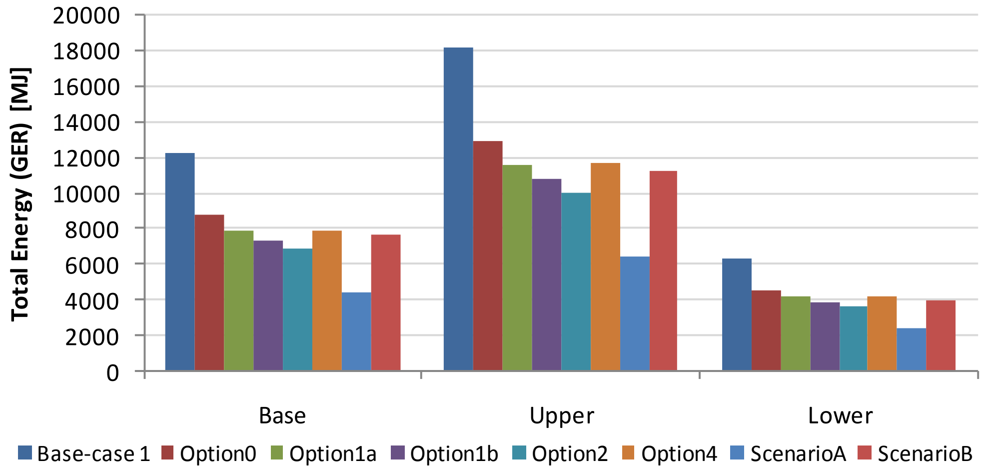

Figure 8-33: Sensitivity to product lifetime for Base-Case 2 Total Energy

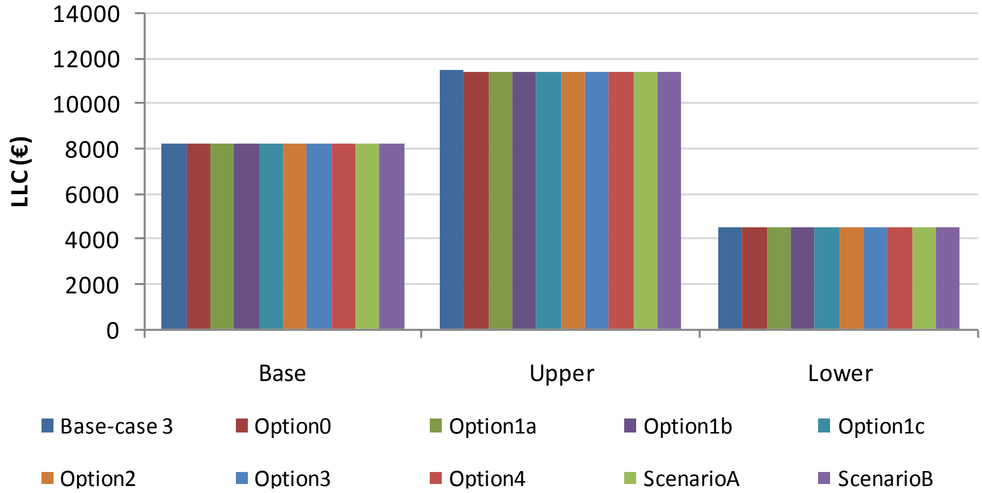

Figure 8-34: Sensitivity to product lifetime for Base-Case 3 Life Cycle Cost

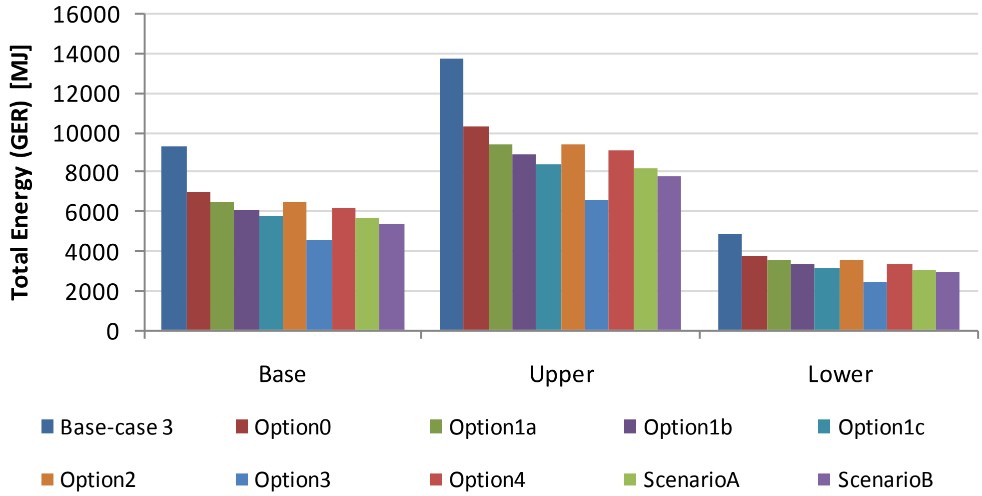

Figure 8-35: Sensitivity to product lifetime for Base-Case 3 Total Energy

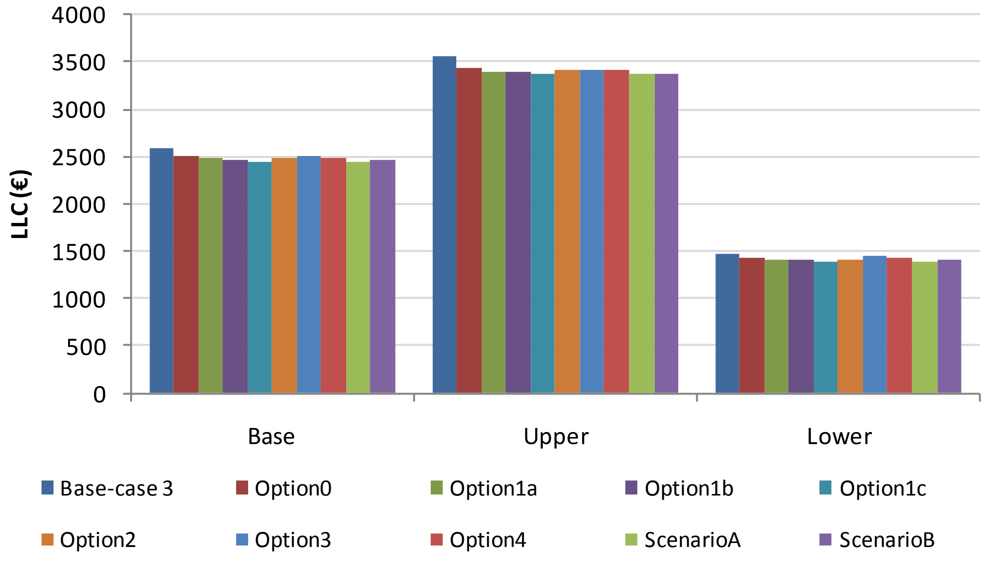

Figure 8-36: Sensitivity to product lifetime for Base-Case 4 Life Cycle Cost

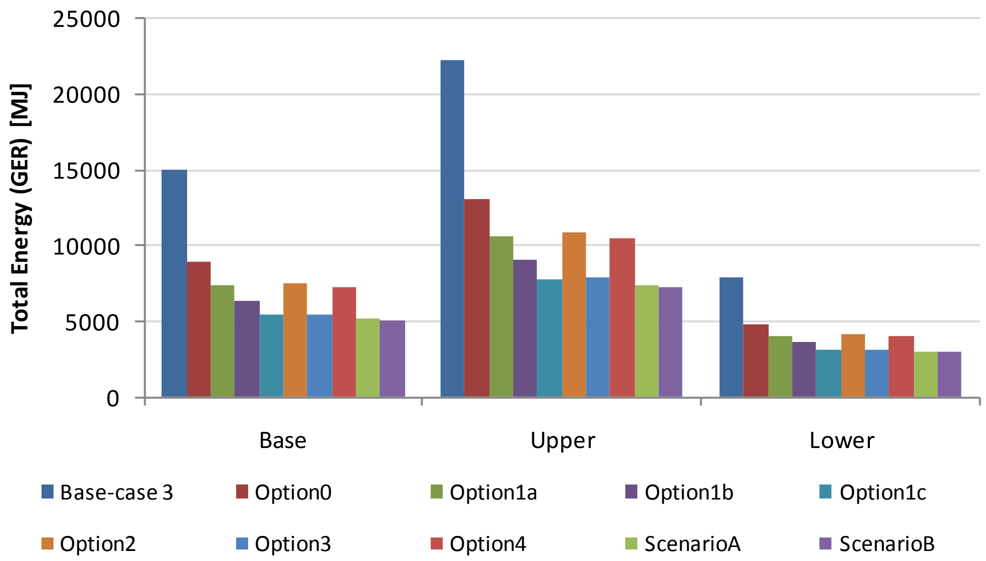

Figure 8-37: Sensitivity to product lifetime for Base-Case 4 Total Energy

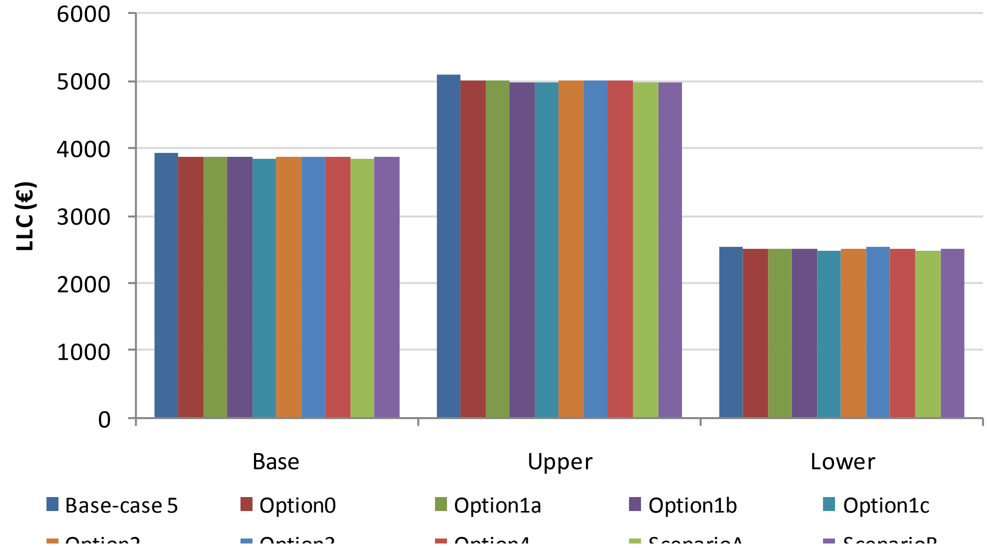

Figure 8-38: Sensitivity to product lifetime for Base-Case 5 Life Cycle Cost

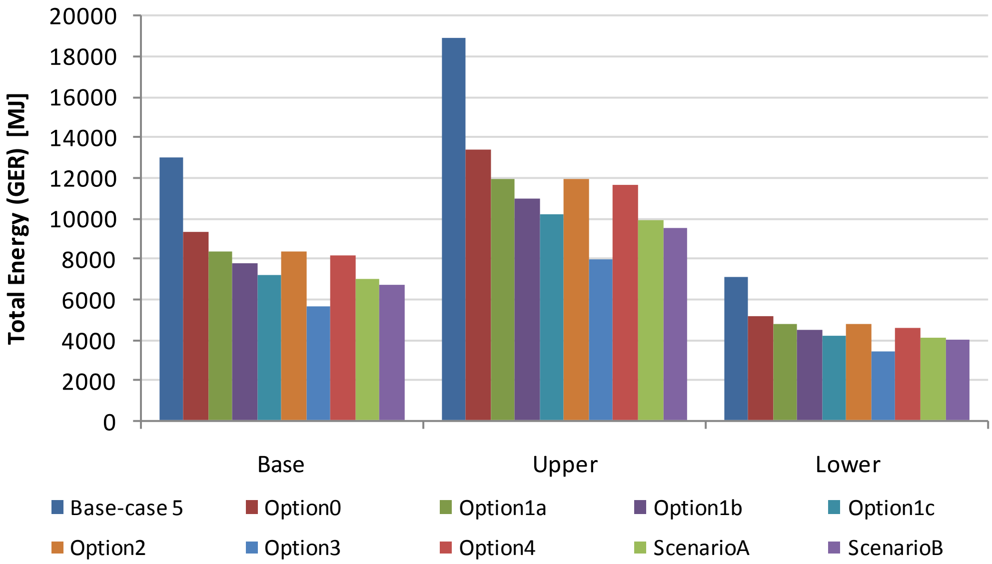

Figure 8-39: Sensitivity to product lifetime for Base-Case 5 Total Energy

8.5.5. ASSUMPTION RELATED TO THE NUMBER OF CYCLES PER YEAR

Table 8-14: Variation of number of cycles per year for each Base-Case

Base-case	Current value	Lower value	Upper value
Base-case 1	730	365	1 095
Base-case 2	1 095	730	1 460
Base-case 3	1 095	730	1 460
Base-case 4	1 095	730	1 460
Base-case 5	1 095	730	1 460

Figure 8-40 to Figure 8-49 show the influence of the number of cycles per year on the total energy consumption and life cycle cost of the different base-cases and associated improvement options.

Regarding the primary energy consumption, for base-case 1, the option 4 is the LLCC. For base-case 2 and 3, scenario A is the LLCC. For base-case 4, option 3 is the LLCC. For base-case 5, options 1c and 3 with scenarios A and B are the LLCC.

Regarding costs, for base-cases 1 and 3, the scenario A the LLCC option. For base-case 2, option 2 is the LLCC. For base-cases 4 and 5, both option 1c and scenario A are the LLCC.

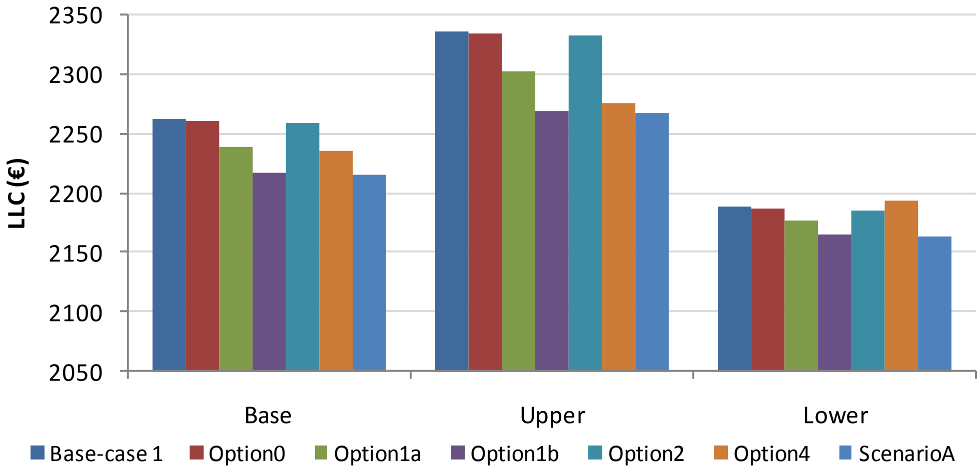

Figure 8-40: Sensitivity to the number of cycles per year for Base-Case 1 Life-Cycle Cost

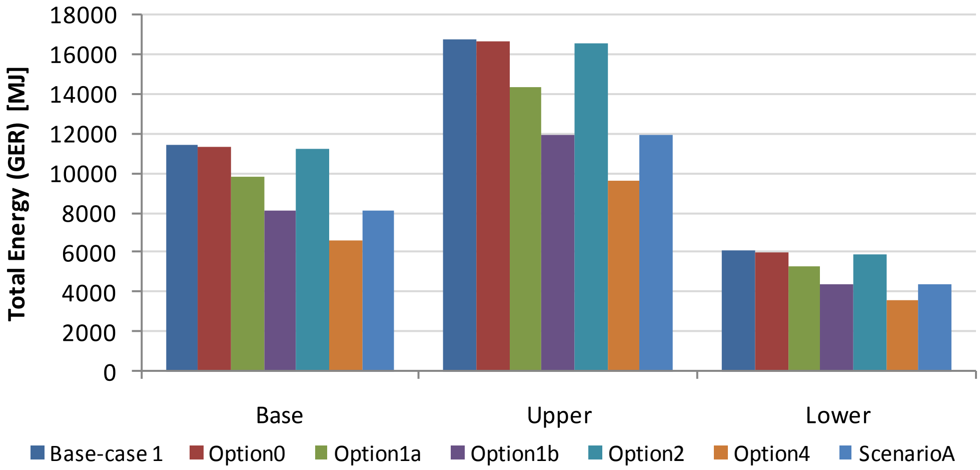

Figure 8-41: Sensitivity to the number of cycles per year for Base-Case 1 Total Energy

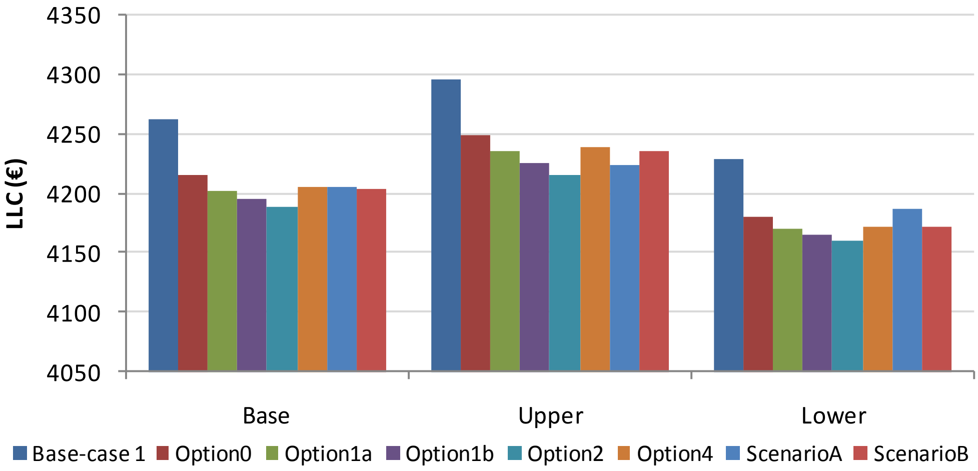

Figure 8-42: Sensitivity to the number of cycles per year for Base-Case 2 Life-Cycle Cost

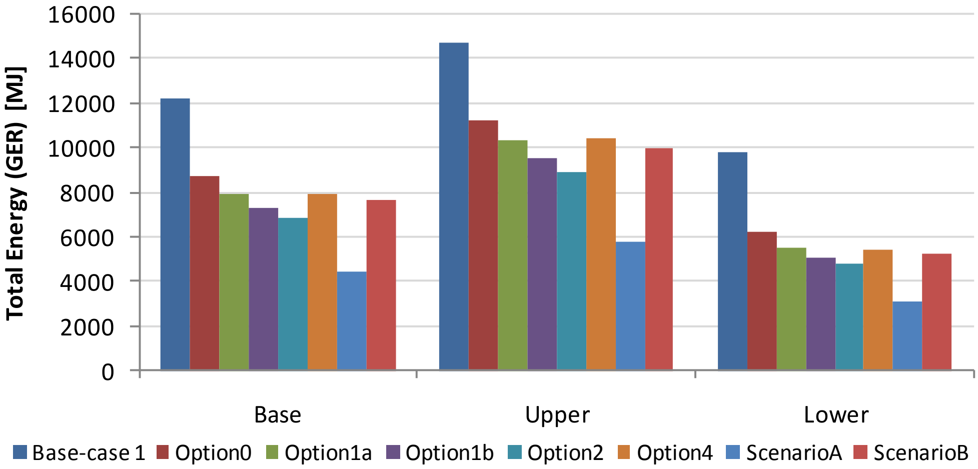

Figure 8-43: Sensitivity to the number of per year for Base-Case 2 Total Energy

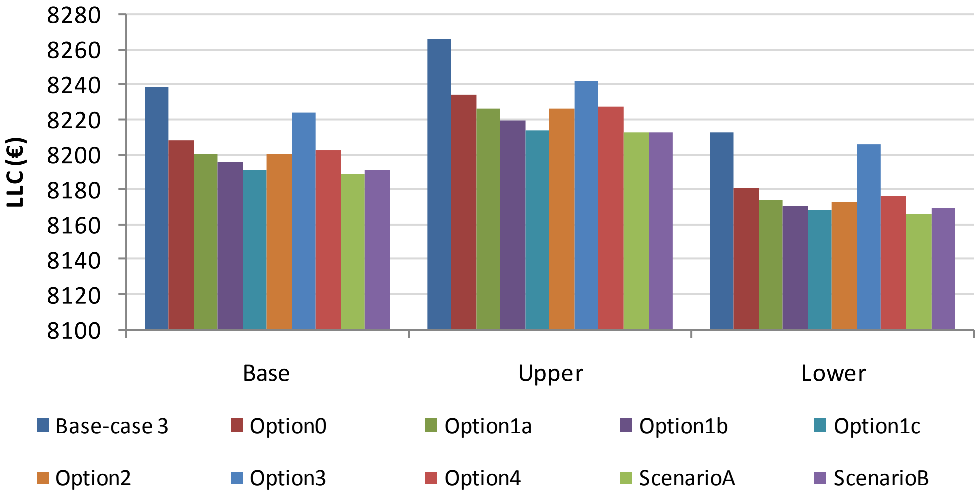

Figure 8-44: Sensitivity to the number of cycles per year for Base-Case 3 Life Cycle Cost

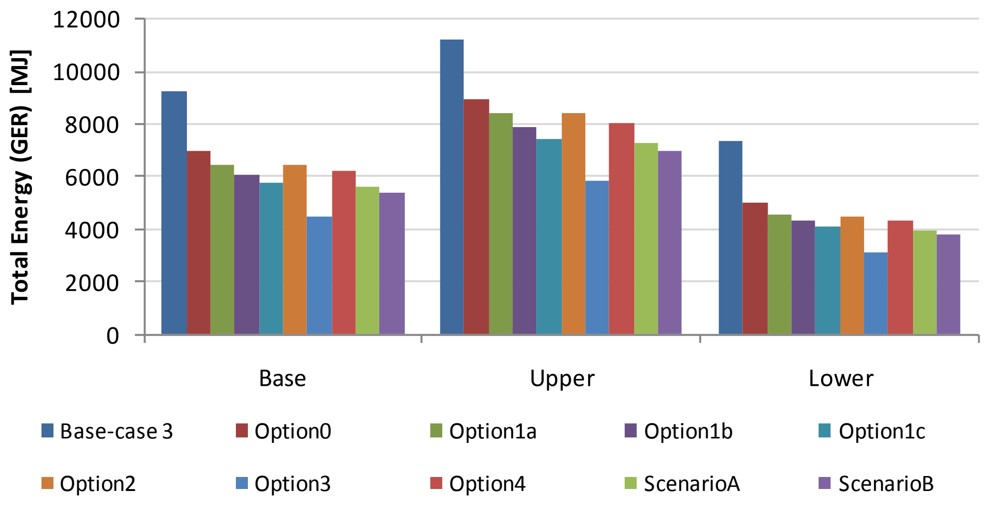

Figure 8-45: Sensitivity to the number of cycles per year for Base-Case 3 Total Energy

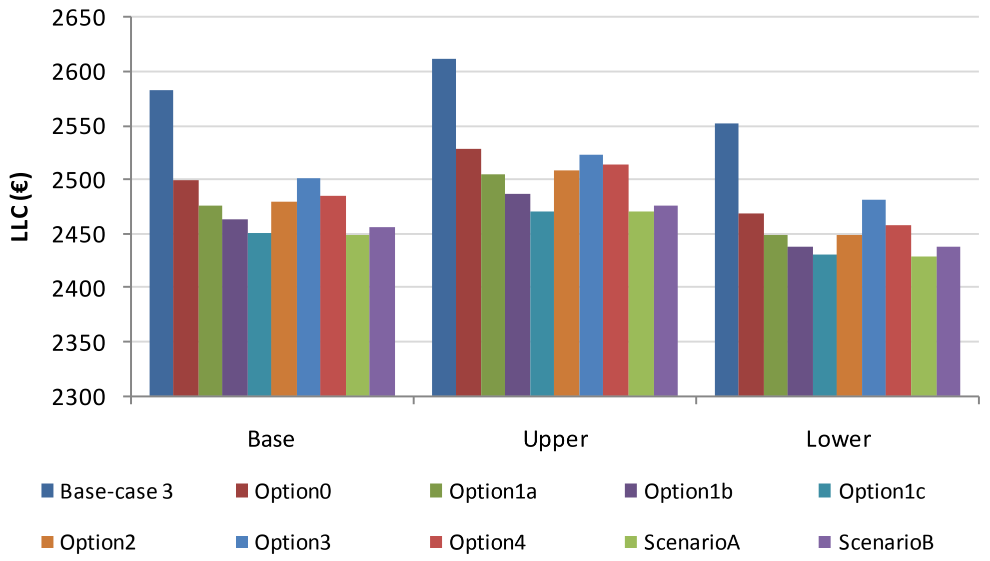

Figure 8-46: Sensitivity to the number of cycles per year for Base-Case 4 Life Cycle Cost

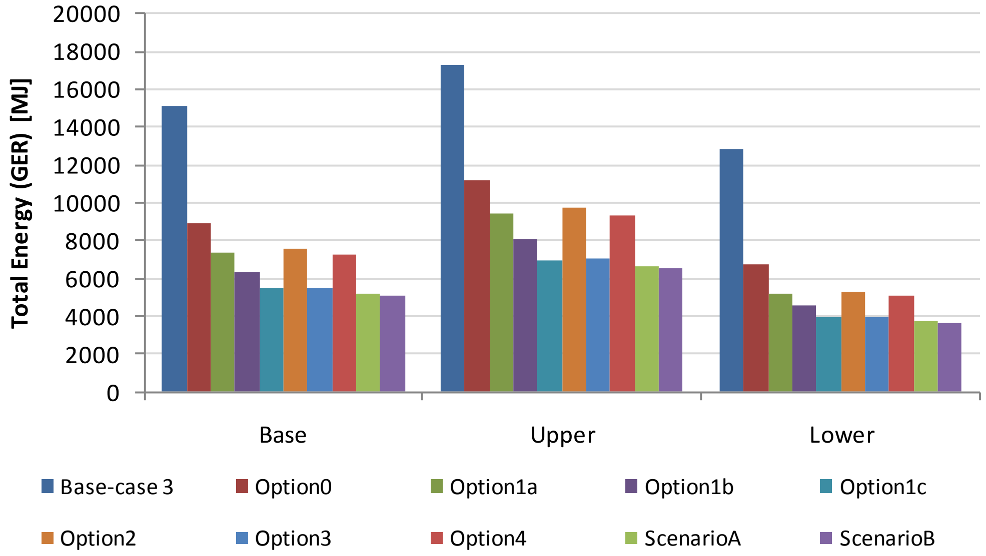

Figure 8-47: Sensitivity to the number of cycles per year for Base-Case 4 Total Energy

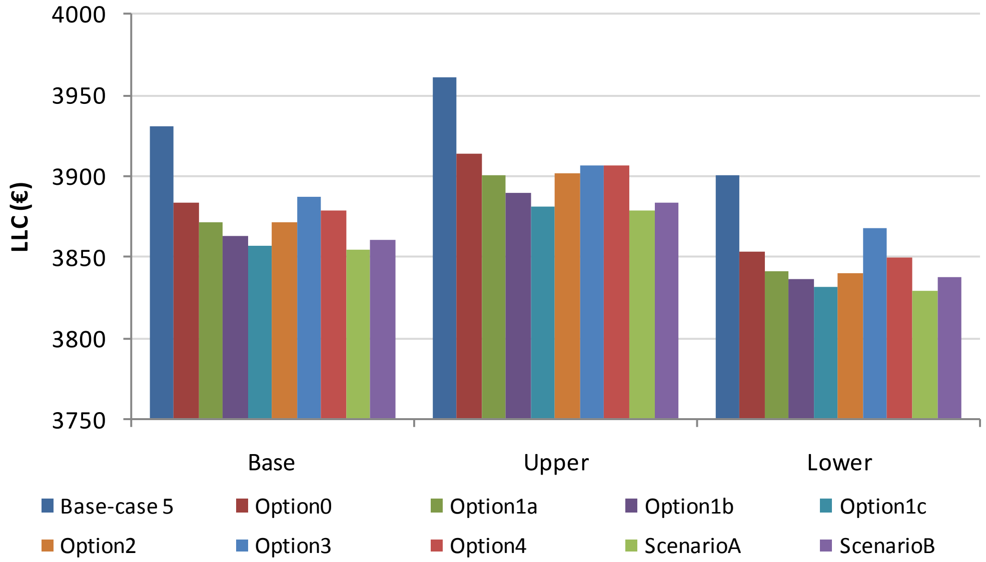

Figure 8-48: Sensitivity to the number of cycles per year for Base-Case 5 Life Cycle Cost

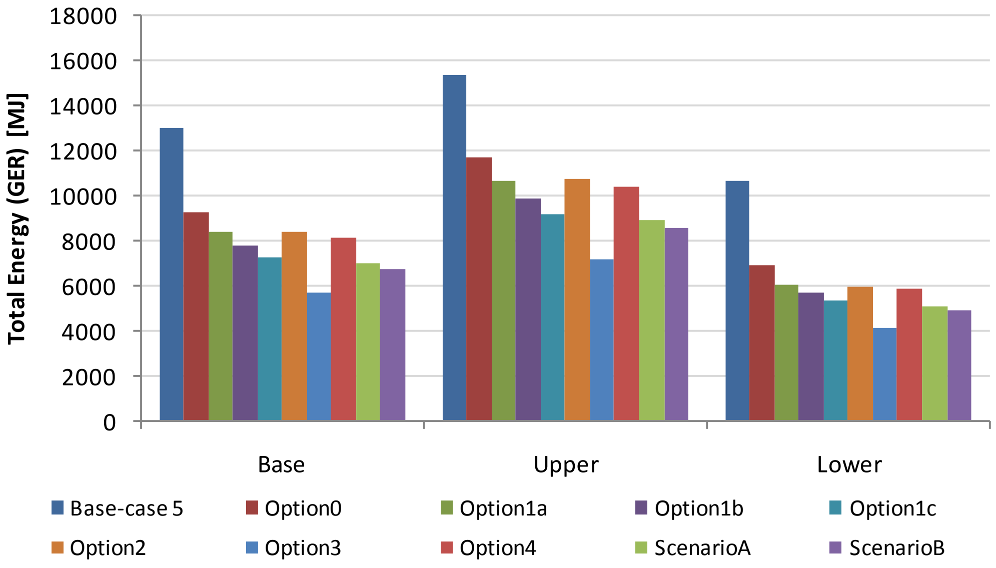

Figure 8-49: Sensitivity to the number of cycles per year for Base-Case 5 Total Energy

8.6. CONCLUSIONS

This chapter summarises the final outcomes of the preparatory study. It looked at suitable policies and measures to achieve the environmental improvement potential, notably implementing ecodesign requirements, and introduction of a mandatory energy label. Scenarios were projected over the period 2010-2025 to quantify the improvements that can be achieved with respect to a BAU with Standby Regulation scenario. Finally, a sensitivity analysis was made with respect to the main assumptions used in the study.

According to the Standby Regulation (1275/2008) an auto-power down function is mandatory from January 2013 onwards when the machine is not providing its "main function". However, there is no definition of "main function" and manufacturers can interpret it in various ways. In this preparatory study, the consultants considered the "main function" to be making coffee, and thus the ready-to-use function is not the "main function". Therefore, under such a definition, the implementation of a power management system is mandatory from January 2013. Also, it is stated in the Regulation that the delay should be "as short as possible", which could lead to different interpretations.

Two distinct categories of machine are distinguished that merit separate treatment in any policy: drip filter machines and pressure machines. Minimum Energy Performance Standards are proposed based on the results of Task 7 and the identification of the LLCC option for each-Base-Case. However, due to some uncertainties they should be considered with caution and may even not be relevant if instead maximum values of the auto-power down function are defined.

Among filter machines, those with a thermos jug are more energy efficient (as not using a warming plate compared to the glass jug machines), but some consumers may still prefer machines with a glass jug and warming plate. In the short-term (2013 or 2014), it is recommended that filter machines with a warming plate should incorporate an auto-power down function of 30 minutes (maximum value). In the medium-term (2018), drip filter machines with warming plate may be banned by defining MEPS that could not be reached by such appliances.

Also for pressure coffee machines, it is important to set maximum time-delay for the auto-power down function because the current Standby Regulation leaves some room for interpretation. It is proposed that a maximum delay of 15 to 30 minutes could be set for portioned machines and 30 minutes for semi-automatic and fully automatic machines (due to their more sophisticated functionality).

Consumers could also be given the possibility to adjust their machines to save even more energy, e.g. through a display panel/knob where the consumer could further reduce the auto-power down time, or a hard-off switch that would disconnect a machine from the mains, so that power input is zero.

As an alternative or in complement to ecodesign requirements, an energy label could be implemented. For drip filter coffee machines, an energy label was not recommended, though it remains an option, because the level of differentiation did not seem to warrant it. However, it could be an effective measure for the transforming the market of pressure machines (high and low pressure portioned machines, semi-automatic and fully automatic espresso machines). A voluntary label already exists in Switzerland but it does not apply to low pressure portioned machines. An energy label could be introduced whether through the energy labeling Directive or as a specific ecodesign requirement through the Ecodesign Directive. Progressively, least efficient models could be removed from the market, e.g. classes F and G could be eliminated in five to eight years.

The details of the final policy mix and energy label classifications should be informed by a database of market data and energy consumption measurements using the new CENELEC standard, once adopted,, as well as further consultation.

In addition to these recommendations, the European Commission could consider a policy intervention to reduce the environmental impacts of the coffee pads, capsules and other consumables used with non-tertiary coffee machines.

Scenario analysis shows that the Standby Regulation for non-tertiary coffee machines will save 1.37 TWh in 2020 and 6.45 Wh cumulatively to 2020. However, the potential savings for coffee machines are much greater than that. If in addition, from 2014 only improved products were sold, up to a further 4.77 TWh could be saved in 2020, or a further 25.92 TWh cumulatively. Therefore, there is great potential for reduced environmental impacts, with negligible impacts for European consumers and industry.

When varying the input data on 5 parameters: energy rate, discount rate, product purchase price, product lifetime and number of coffee periods per year, the ranking of the Base-Case and the different improvement options / scenarios vary according to the five different Base-Cases.