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COMMISSION STAFF WORKING DOCUMENT

IMPACT ASSESSMENT

Accompanying document to the

Draft Commission Regulation implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for household washing machines

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Lead DG: TREN

Associated DG: ENTR

Other involved services: COMP, ECFIN, ENV, INFSO, LS, MARKT, RTD, SANCO, SG, TRADE

Agenda planning or WP reference: 2009/TREN/023

EXECUTIVE SUMMARY

Household washing machines are currently addressed in Commission Directive 95/12/EC implementing Council Directive 92/75/EC with regard to energy labelling of household washing machines. Unlike, for instance, refrigerating appliances, household washing machines are not subject to requirements regarding minimum energy efficiency or other performance aspects.

Directive 2009/125/EC of the European Parliament and of the Council (the Ecodesign Directive) lays down a framework for the Commission, assisted by a Regulatory Committee, to set ecodesign requirements for energy-related products. It is one of the priorities of the European Economic Recovery Plan — COM(2008) 800.

The approach to developing the proposed ecodesign implementing measure for household washing machines and its impact assessment is structured in four steps:

Step 1: assessment of the criteria for an ecodesign implementing measure as set out in Article 15(2)(a)–(c) of the Ecodesign Directive, taking into account the ecodesign parameters listed in Annex I and the method for setting specific requirements laid down in Annex II of the Ecodesign Directive;

Step 2: consideration of relevant EU initiatives, market forces and disparities in the environmental performance of equipment on the market with equivalent functionality, as set out in Article 15(2) of the Ecodesign Directive;

Step 3: establishing policy objectives, including the desirable level of ambition, the policy options to achieve them, and the key elements of the ecodesign implementing measure as required by Annex VII of the Ecodesign Directive;

Step 4: assessment of the impact on the environment, consumers and industry, with a view to the criteria for implementing measures set out in Article 15(5) of the Ecodesign Directive.

Step 1: Legal base for an implementing measure: compliance with the Ecodesign Directive, Article 15

In order to assess the criteria for ecodesign implementing measures as set out in Article 15(2) of the Ecodesign Directive, the Commission carried out a technical, environmental and economic analysis ('preparatory study') of household washing machines[1] in accordance with Article 15(4)(a) and Annexes I and II of the Ecodesign Directive.

The study has shown, as illustrated in Table A, that (1) household washing machines are placed on the EU market in large quantities, (2) the environmental impact of household washing machines is to a large extent related to the consumption of electricity and water during use, and remains significant despite ongoing improvements, and (3) regarding water consumption, there is a wide disparity in the performance of appliances currently on the market, and technical cost-effective solutions exist that could lead to significant improvements. The existing disparity in electricity consumption is limited, since the majority of appliances are in the same energy efficiency class. However, the preparatory study identified a substantial potential for improvement (10% cost-effective energy savings in the short term, 14% in the medium term, using the standard 60ºC cycle, and up to 20% using 'benchmark' technologies).

The economic value and the environmental impacts in 2020 were calculated on the basis of a business-as-usual scenario.

Table A: Total household washing machines in the EU-27 in 2005 and 2020

Article 15(2)(a):	Annual sales volume in the EU	2005: 14 million units per year, representing an economic value of EUR 6.1 billion
Article 15(2)(b):	Environmental impact: electricity and water consumption of appliances (business-as-usual — BaU — scenario)	Electricity: – 2005: 35 TWh/yr or 18 million t/yr CO_2 equivalent[2] – 2020: 37.7 TWh/yr or 19.6 million t/yr CO_2 equivalent Water: – 2005: 2213 million m^3/yr – 2020: 2051 million m^3/yr
Article 15(2)(c):	Improvement potential for household washing	Relative potential: – 10% cost-effective energy savings in the short term

[1] Preparatory study for ecodesign requirements of EuPs, Lot 14: 'Domestic Dishwashers and Washing Machines'. Available on: www.ecowet-domestic.org.

[2] This represents 1% of the total EU electricity consumption of about 2760 TWh in 2005.

	machines (applying existing cost-effective technology)	– 14% in the medium term (using the standard 60ºC cycle) and up to 20% using 'benchmark' technologies Potential in absolute term: Between 1.2 and 1.5 TWh/yr, depending on the sub-options, in 2020 compared with the BaU scenario (in 2025, the energy-savings potential increases to 2.2-2.7 TWh/yr compared to the BaU scenario). Between 64 to 83 million m^3/yr water saved in 2020 (use phase).

Step 2: Existing initiatives and capacity of market forces to address the issue

Further to Articles 15(2) and 15(4)(c) of the Ecodesign Directive, relevant EU and national environmental legislation was considered. Related (voluntary) initiatives at both EU and Member State level were taken into account, and barriers leading to market failures and preventing market take-up of technologies with improved environmental performance were analysed.

As a result of energy labelling[3], combined with voluntary commitments by industry between 1997-2008 to phase out the least efficient household washing machines, household washing machines have improved their energy efficiency by some 24%[4] in the last 10 years, with the EU Energy Label becoming one of the most important market drivers.

However, as a consequence of the success of the labelling scheme and the voluntary commitments, over 90% of household washing machines are now in the energy label's highest efficiency class. In addition, the industry has decided not to make new voluntary commitments because market actors have become too scattered for proper and fair implementation.

This can be called a **regulatory failure**, as an outdated labelling scheme means that there are no market incentives to further improve the energy efficiency of household washing machines. Consumers are no longer able to differentiate between products on the basis of their energy efficiency (all models are in the same labelling class), retailers lose interest in drawing attention to the energy label, authorities have difficulties in promoting the most efficient models, and the industry is not motivated to invest in energy efficiency, but might instead invest in other features (possibly more energy-consuming) in order to differentiate their products from those of their competitors.

Furthermore, not all environmental costs are included in electricity and water prices. Consequently, consumer (and producer) choices are made on the basis of lower prices that do not reflect environmental costs for society (**negative externality**).

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[3] Commission Directive 95/12/EC implementing Directive 92/75/EEC with regard to energy labelling of household washing machines, amended by Commission Directive 96/89/EC and 2006/80/EC.

[4] Based upon an average energy consumption per cycle of 0.245 kWh/kg in 1997 and 0.185 kWh/kg in 2005.

Although the total energy consumption of household washing machines has been slowly decreasing, since the market is largely saturated and many older, less efficient appliances are continuously replaced by new, more efficient appliances, the decrease in energy consumption could be greater if the stagnation in product innovation was overcome. Stakeholders, including industry and consumer organisations, have unanimously called for the combined introduction of ecodesign requirements and a revised labelling scheme for household washing machines[5].

From the first two steps, it is concluded that the criteria for ecodesign implementing measures as set out in Article 15(2) of the Ecodesign Directive are met, and household washing machines should be covered by an ecodesign implementing measure in accordance with Article 15(1) of the Ecodesign Directive, complemented by an upgraded energy labelling scheme.

Step 3: Policy objectives and levels of ambition

Annex II of the Ecodesign Directive provides that the level of ambition for improving environmental performance and electricity consumption is to be determined by an analysis of the least life-cycle cost for the end-user. Furthermore, benchmarks for technologies yielding best performance, as developed in the preparatory study and the discussions with stakeholders during the meeting of the Ecodesign Consultation Forum[6] on 4 December 2008, are considered. The minutes of this meeting are attached in Annex III of this Impact Assessment. The results are reflected in the objectives that the proposed Regulation aims to achieve.

The objective is to trigger a market transformation to realise the improvement potential. Several policy options were considered, including self-regulation, revision of just the energy labelling and introduction of minimum energy performance requirements alone. Considering the strong interrelationship between the energy labelling scheme and the ecodesign requirements, and given the request by Member States, the industry, consumer organisations and environmental NGOs for a coordinated revision of the existing legislation, this impact assessment considers, in sections 5 and 6, the combined impact of both measures.

Step 4: Environmental, economic and social impact assessment

An assessment of the proposed implementing measure is carried out. Considering that the most significant environmental impact of household washing machines is their energy consumption during use, sub-options for gradual ecodesign requirements together with revised energy efficiency classes are analysed in section 6. The sub-options considered (along with a business-as-usual scenario) are as follows:

– **BaU:** Business-as-Usual scenario, i.e. continuation of current policy measures at EU level (current labelling scheme only) and no further action at EU level;

– **Sub-option A**:

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5 In the past, Member States have launched fiscal incentive programmes to foster the market take-up of energy-efficient appliances, but the uncertainty surrounding the future of the energy efficiency classes has prevented them from initiating new support programmes. Furthermore, the Ecodesign Directive implies that legislative action on domestic appliances cannot be taken at Member State level.

6 The Consultation Forum is a balanced grouping of Member State representatives and stakeholders such as industry, consumer bodies and environmental NGOs, called upon to express their views.

– Introduction of minimum energy efficiency requirements, i.e. EEI<68 in 2011 and EEI<59 in 2015,

– Introduction of a minimum washing performance requirement, i.e. Wp>1.03 in 2011 (Wp>1.00 for machines of max. 3 kg load capacity).

– Introduction of maximum water consumption requirements (litres/cycle, depending on rated load capacity) in 2011 and 2015 (based on part load);

– **Sub-option B**:

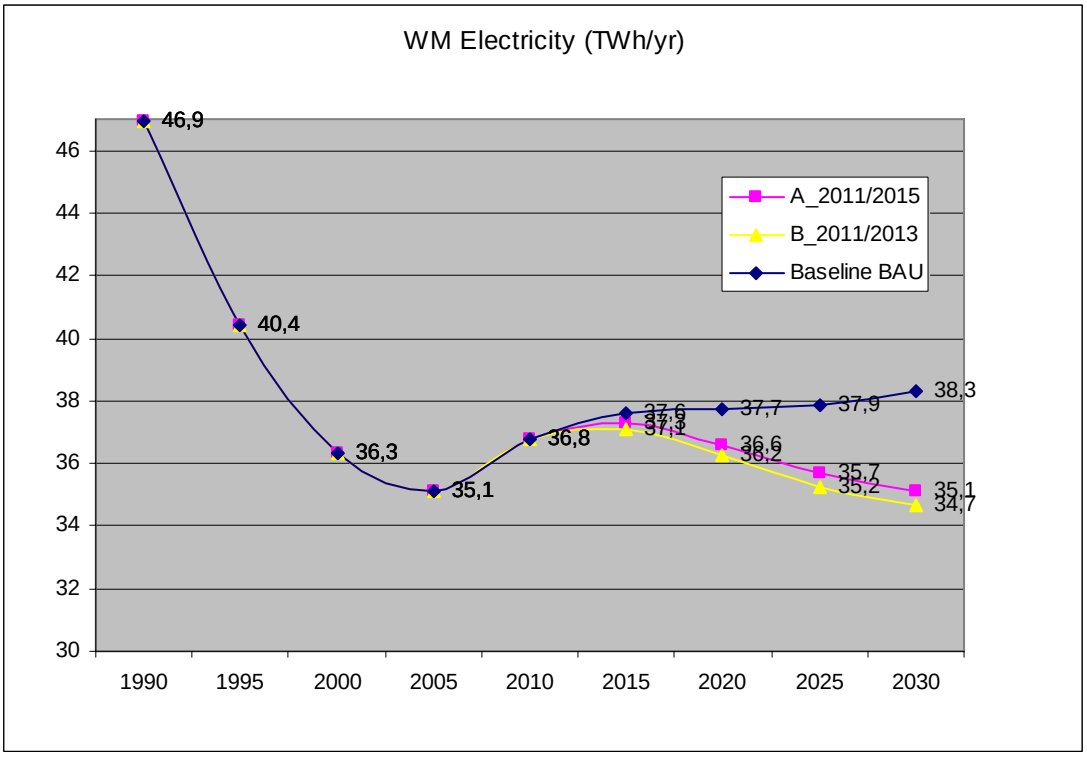
– Introduction of minimum energy efficiency requirements, i.e. EEI<68 in 2011 and EEI<59 in 2013,

– Introduction of a minimum washing performance requirement, i.e. Wp>1.03 in 2011 (Wp>1.00 for machines of max. 3 kg load capacity),

– Introduction of maximum water consumption requirements (litres/cycle, depending on rated load capacity) in 2011 and 2015 (based on part load).

The following graph illustrates the possible energy savings with each scenario.

Figure A: EU-27 total electricity consumption of household washing machines under sub-options A and B in TWh/year (EU-27 demand in 2005: 3106 TWh)



Source: Input to this Impact Assessment from VHK

The graph shows that from 1990 to 2005 energy consumption decreased, because the reduction in energy consumption of new appliances outweighed the increase of sales. After 2005 (approximate value) the reduction of energy consumption slowed down and eventually

came to a standstill (situation 2010). The resulting energy consumption of the stock increased because of continuous increase of stock. From 2015 onwards the graph shows that the energy consumption of household washing machines is expected to increase slightly in the business-as-usual scenario. To bring about a decrease in energy consumption, while ensuring that measures remain cost-effective, the existing legal framework needs to be upgraded.

Compared with 1990 — the reference year for climate change policy — the annual energy consumption and carbon emissions of household washing machines in 2020 will be 20% lower in the BaU scenario (1990: 47 TWh/yr; 2020: 37.7 TWh/yr). The estimated savings for sub-options A and B are 3.1 to 3.9% with respect to the baseline scenario in 2020. In 2025, savings are projected to be around 5.9 and 7.1% (compared to BaU 2025).

Sub-option B (EEI<68 in 2011 and EEI<59 in 2013) delivers the greatest savings without negative impact on other functionalities.

The analysis demonstrates that the appropriate policy option for realising the environmental improvement potential of household washing machines is the combined introduction of ecodesign requirements and revision of the labelling scheme in two stages (one year and four years after entry into force). This approach ensures that:

– no high energy-consuming household washing machines will be placed on the market and competition will continue to operate on energy efficiency and not only price;

– ongoing energy improvements are maintained and fostered by setting a transparent legislative framework that will provide the industry with the long-term security it needs to invest in innovative technology;

– fair competition and product differentiation continues to operate on energy improvements by providing consumers with an effective and reliable tool to compare the energy consumption of products in the context of strong market demand for energy-efficient appliances;

– by 2020, absolute energy savings of 3-4% (i.e. 1.2 to 1.5 TWh/yr) can be achieved compared with the Business-as-Usual scenario in 2020. Due to market inertia (i.e. the full replacement of old models by new ones takes about 15 years), the effects of the new measures up to 2020 will be very limited with respect to the baseline scenario, but in 2025 savings will increase to 6-7% (i.e. 2.2 to 2.7 TWh/yr);

– between 65 and 82 million m3/yr in water will be saved during the use phase compared to the BaU scenario;

– more energy-consuming products are quickly removed from the market, securing electricity and CO_2 savings in the EU while reducing the life-cycle costs of household washing machines for consumers. Calculated in terms of 'net present value' (EUR 2005), consumer expenditure — i.e. annual purchase and running costs for the EU27 population — will drop from around €13.2bn today to €12.3bn in 2020 and approximately €11.7bn in 2025 (mainly due to the increased efficiency of the installed base, BaU scenario). The difference in expenditure between the proposals is minimal.

– a level playing field for all manufacturers is guaranteed, ensuring fair competition and free movement of products;

– disproportionate burdens for manufacturers are avoided due to transitional periods that duly take into account redesign cycles.

The question of the proportionality of the measures in terms of administrative burden compared with the apparently limited potential for energy savings (1.5 TWh by 2020 compared to the BaU scenario) may be raised. However, one should consider first that the savings resulting from the implementing measures will take time to occur given the strong market inertia of this sector, so that the full impact of the measures will be seen only by 2025-2030. In addition, the BaU option (i.e. current labelling scheme left unrevised and no ecodesign requirements adopted) was strongly rejected by the industry and a majority of Member States on the grounds that it would deprive the industry of a marketing tool necessary to ensure a return on its investment in innovation. Finally, it might have a negative impact on public opinion, which is used to the labelling scheme and welcomed it as a very useful tool provided by the European Union. Consumers are likely not to understand why they are deprived of a very popular purchasing tool enabling them to obtain fair, reliable and comparable information on the performance of products.

Finally, SMEs are considered to represent 30% of manufacturers (mainly OEMs, i.e. suppliers of components like thermostats, shelves, etc.) and 80% of retailers. The analysis shows that the policy options will have no negative impact on them. On the contrary, they will benefit from stronger demand for new technologies and higher turnover.

As set out in Section 7, the impacts of the legislation will be monitored mainly through market surveillance by Member State authorities to ensure that the requirements are met, whereas the appropriateness of the scope, definitions and concepts will be monitored through ongoing dialogue with stakeholders and Member States.

1. PROCEDURAL ISSUES AND CONSULTATION OF INTERESTED PARTIES

1.2 Organisation and timing

Household washing machines are covered by *Commission Directive 95/12/EC implementing Council Directive 92/75/EEC with regard to energy labelling of household washing machines*[7]. No ecodesign requirements have been set on this product group.

Washer-driers that are covered by Commission Directive 96/60/EC of 19 September 1996 implementing Council Directive 92/75/EEC with regard to energy labelling of household combined washer-driers are outside the scope of this assessment.

Since recent market transformation calls for a revision of the labelling scheme, the *Action Plan for Energy Efficiency: Realising the Potential*[8] identified 'wet' household appliances (i.e. household washing machines and washing machines) as one of the 14 priority product groups for which an up-date of the existing labelling together with minimum energy performance standards should be adopted.

This impact assessment considers the adoption of ecodesign requirements in compliance with article 15.4 of Directive 2009/125/EC of the European Parliament and of the Council

[7] Amended by Commission Directive 96/89/EC and 2006/80/EC.

[8] COM(2006) 545

establishing a framework for the Commission to set ecodesign requirements for energy-related products (hereafter referred to as the Ecodesign Directive)[9]. The option of having only a revised labelling scheme is discussed in section 4.1.

The impact assessment was launched in November 2008 supported by an Interservice Steering Group including COMP, ECFIN, ENTR, ENV, INFSO, LS, MARKT, RTD, SANCO, SG, TRADE.

1.2 Impact Assessment Board

This impact assessment was scrutinised by the Commission's Impact Assessment Board (IAB). In its opinion, the IAB concluded that the impact assessment contains an adequate and proportionate analysis. The analytical steps based on the requirements of the Ecodesign Directive 2009/125/EC have been respected.

This impact assessment integrates the additional recommendations for improvements advocated by the IAB.

1.3 Transparency of the consultation process

A background preparatory study was carried out in 2007-2008 in order to give input to this impact assessment[10]. The preparatory study provided the European Commission with the technical background supporting the design of eco-design requirements following the methodology defined in Annex I and II of the ecodesign Directive.

The opinion of stakeholders was gathered consistently throughout the process through bilateral meetings and the Consultation Forum which was created in compliance with Article 18 of the ecodesign Directive (see minutes of the Consultation Forum in Annex III). The Commission's minimum standards on public consultation can thus be considered to be met.

- The preparatory study was consulted with manufacturers in bilateral meetings and through their European Federation, CECED. Their input was instrumental in drafting first the life cycle analysis of wet appliances, second in confirming the base case appliances representative of the EU market and third the technological means and costs of ecodesign improvements. CECED in particular provided the consultants with yearly databases on EU washing machine production which were extremely useful in drafting the policy options and calculating their economic impact. The preparatory study is published and publicly available on the ECOWET website: http://www.ecowet-domestic.org/index.php?option=com_docman&task=cat_view&gid=27&Itemid=40

- An extensive consumer survey was run in 2007 in order to better understand and identify consumer's needs, expectation and daily use of wet appliances. The opinion of 2 497 European households (250 per country in average) was gathered with the aid of an external

[9] Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products, *OJ L 285, 31.10.2009, p. 10.*

[10] By ISIS/ENEA, preparatory study for Lot 14 (Task 1-7), Domestic Dishwashers and Washing Machines.

market research institute ODC Services. The results are available on the ECOWET website quoted above[11] (Task 3 report).

- The Ecodesign Consultation Forum was consulted on 4 December 2008 with the participation of Member States, consumer organisations, environmental NGO's and the industry represented by CECED. The working document presenting the policy options for ecodesign requirements and implementing Directive 2009/125/EC, together with a revised labelling scheme, were sent one month in advance of the meeting. All replies to the working documents as well as the minutes of the meetings are available on CIRCA website.

- A second Consultation Forum meeting was held on 26 March 2010 to discuss the options for Ecodesign requirements and Energy Labelling of household washing machines under the recast of the Energy Labelling Directive 92/75/EEC (now Directive 2010/30/EU). This recast process has enforced a delay on related measures and the scenario analysis takes this into account by introducing first tier measures from 2011 onwards (at least one year after entry into force assumed for 2010).

1.4 Outcome of the consultation process

All respondents throughout the consultation process supported in general the adoption of ecodesign requirements. The following issues were raised and taken into account within this impact assessment:

- A number of Member States and environmental NGOs requested the second stage to be implemented earlier than what was proposed in the working document submitted to the Consultation Forum. A sub-option based on a second stage two years earlier than before was considered in the assessment of policy options.

- The revision of the calculation of the energy consumption of washing machines was discussed with a view to better reflect real life energy consumption[12]. In addition, a number of stakeholders raised concern about the current energy efficiency index on which the energy efficiency classes are based which seem to be more 'advantageous' to larger washing machines (capacities 6,5 kg and higher) than to smaller machines.

- The approach on low power modes (including off mode and left-on mode, see definition in box 1) appeared to be controversial. While the preparatory study considered the inclusion of the consumption of low power modes into the calculation of the annual energy consumption of the appliances (which would influence the ranking of the appliances, hence give incentives to manufacturers to reduce the consumption of low power modes), other stakeholders, advocated the implementation on washing machines of the horizontal requirements laid down in the standby Regulation. This impact assessment addresses the issue in section 2.2.3.2.

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[11] See results of preparatory study, task 3: Economic and Market Analysis

[12] The analysis performed within the preparatory study shows that the average real life washing temperature is 45,8ºC and the average real life load 3,2 kg per cycle while the current energy label is based upon the performance of the machine for a standard 60ºC cotton cycle at full load.

- A ranking or requirement for rinsing performance was desired by many stakeholders, but since no good testing standard exists to assess this performance the rinsing performance could not be included in the proposal(s) as requirement or element for labelling.

- The proposal contains a requirement for maximum water consumption as desired by many stakeholders. Some stakeholders even asked for a stricter requirement, whereas others warned for detrimental effects on the rinsing performance of washing machines (which, as is stated above, cannot be adequately addressed to this date).

- The working document submitted to the consultation forum proposed to reduce the allowed measurement uncertainty from the 15% laid down in the current energy labelling Directive on washing machine to 10%. Some stakeholders asked for the verification limit to be further tightened to 3 or 5%. This impact assessment assesses the scope for further reduction in section 5.2.

Box 1: Definition of low power modes (or stand-by modes)[13]

Off mode: is where the product is switched off using appliance controls or switches that are accessible and intended for operation by the user during normal use to attain the lowest power consumption that may persist for an indefinite time while connected to a main power source. It is a common understanding, supported by the results of the preparatory study, that in washing machines the off mode supports active sensor based protection function(s) to protect the user from for example accidental water leakage. The presence of such active function(s) is promoted to insure the highest level of consumer protection.

Left on mode: is the lowest power consumption mode that may persist for an indefinite time after the completion of the programme and unloading of the machine but not switched off by a user intervention or automatically; again sensor based protection function(s) are in general active. In some products this mode may be an equivalent power to off mode.

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2. PROBLEM DEFINITION

Until recently household washing machines have shown an impressive continuous improvement in energy efficiency, driven in general by a strong market demand for energy efficient products and more specifically by two initiatives: (1) the labelling directive 95/12/EC[14] and (2) the voluntary commitments of the industry to phase out the least efficient models from the market.

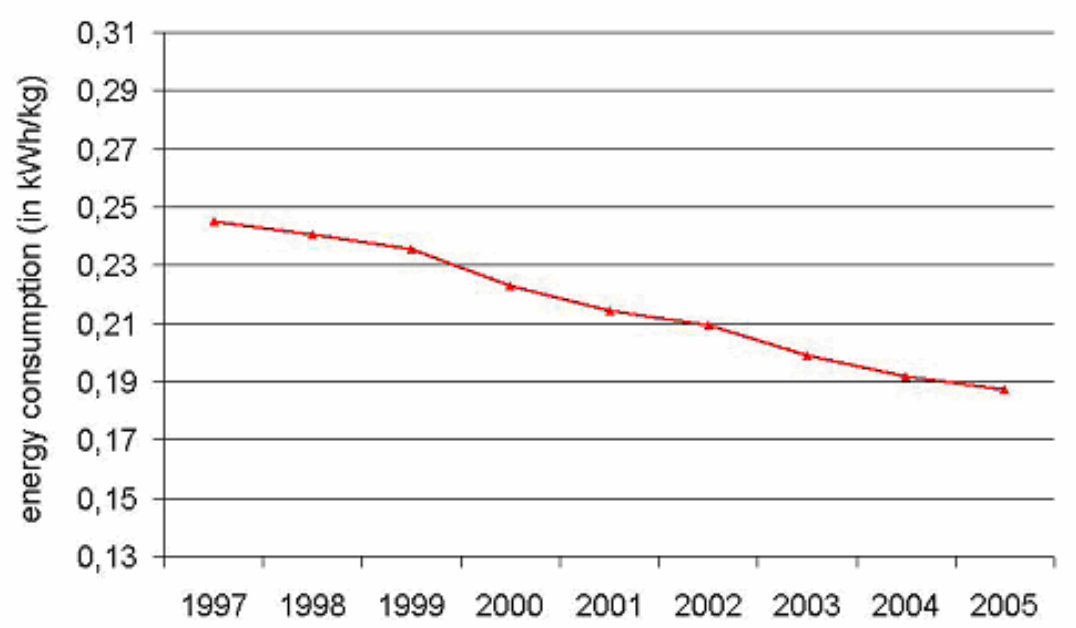
These two measures/initiatives resulted in an energy saving of some 24%[15] between 1997 and 2005. Part of these savings were also rendered possible by the detergent industry who helped by developing detergents that work effectively on lower cleaning temperatures, thus decreasing the energy consumption necessary to heat water.

Figure 1: Average energy consumption per loading

[13] Definition provided in the preparatory study, task 7, p. 89

[14] Including amendments Commission Directives 96/89/EC and 2006/80/EC.

[15] Based upon an average energy consumption of of 0,245kWh/kg in 1997 and 0,185 kWh/kg in 2005.



However, in the most recent years the improvement of energy efficiency seems to have halted. The highest energy efficiency class is now populated by an extremely large proportion of available models (in major categories over 90% to 100% of models), leaving fewer options for consumers to identify the more efficient appliances and depriving manufacturers of options to highlight their best performing products. The preparatory study identified that further energy savings are possible and economical for consumers, but the existing measures and initiatives are not able to unlock this potential.

2.1 Existing legislation and other relevant initiatives

2.1.1 Energy labelling of washing machines

The current Directive 97/17/EC implementing Council Directive 92/75/EEC *with regard to energy labelling of household washing machines* provides consumers with the following information (see layout of label in Annex I):

- Ranking of the energy consumption by means of seven energy efficiency classes (A-G scale) and energy consumption per cycle (kWh/cycle);
- Ranking of washing performance by means of seven energy efficiency classes (A-G scale);
- Ranking of spin drying performance by means of seven energy efficiency classes (A-G scale) and indication of spin speed (rpm);
- Capacity (in kg cotton load)
- Water consumption (litres per cycle);
- Noise emissions for washing and spinning (dB(A)).

The introduction of the label helped consumers in identifying the most efficient models on the market and weigh energy efficiency against the other performance aspects. At the same time, the label benefited manufacturers who could state the energy efficiency of their appliances

through a neutral (and mandatory) informative label which spurred a competitive race in achieving the highest energy efficiency scores. The preparatory study shows indeed that the appliances on which the benefit margin is the highest are those which are in the upper classes.

2.1.2 Voluntary commitment

The washing machine manufacturing industry represented by CECED, the European Committee of Domestic Equipment Manufacturers, agreed upon two Voluntary Commitments (the first in 1997, the second in 2002) which proved to be very successful in driving energy efficiency of washing machines. The participants of the 1st commitment agreed to remove from the market the least efficient washing machines in two steps[16]:

- *Step one by December 1997:* commitment to stop producing or importing in the EU Market washing machines which belong to the energy efficiency classes E to G. For washing machines with capacity up to 3 kg, the E-class was still allowed (and vertical axis machines were allowed).

- *Step two by December 1999:* commitment to stop producing or importing in the EU Market washing machines which belong to the energy efficiency class D, except for 3 kg washing machines, washing machines with no internal heater and vertical axis machines.

The participants of the 2nd commitment agreed on the following:

- *Step one by December 2003:* commitment to stop producing for or importing in the EU Market washing machines which belong to the energy efficiency classes D to G, except for washing machines with no internal heater and vertical axis machines.

- More importantly the manufacturers also decided to support the introduction of an extra, not EU officially recognised, "A+" energy class for machines that use maximum 0,17 kWh/kg, combined with minimum A class washing performance[17].

This 2nd Voluntary Commitment ended in December 2008 and the Industry did not consider it appropriate to renew it.

Although there is a high concentration of sales among EU producers, voluntary agreements are becoming more difficult in practice because of the growing share of imports from non-EU based manufacturers (e.g. Japan, China and South Korea). As a consequence the European industry association fears not to be able to capture important actors on the EU market for a

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16 CECED Voluntary Commitment on Reducing Energy Consumption of Household Washing machines – September 1997, downloadable from www.ceced.org

17 A CECED proposal of similar meaning was put up to a vote by the Commission. Unfortunately, the 15 member States failed to reach a majority for a positive vote and the EU Commission withdrew the legislative proposal. As the proposal was withdrawn and manufacturers wanted to have some discipline on the market about super efficiency claims, they agreed to subscribe the following agreement about the threshold to be used for better than A claims: manufacturers must link the better-than-A declaration also to a minimum washing performance level in order to prevent any distortion and consumer misleading. This minimum performance level is set at the higher rate of the labeling scheme. In other words, a washing machine from CECED member companies can claim energy-efficiency better than energy class A, only if the washing performance is an A class, according to the official CENELEC EN test standard.

voluntary agreement to be effective and foresees difficulties in avoiding free riders. The industry therefore has called instead for legally binding energy efficiency requirements[18].

In addition, consumer organisations are sceptical about the value of such voluntary agreements and favour a harmonised ecodesign and labelling scheme[19].

2.2 Market failures

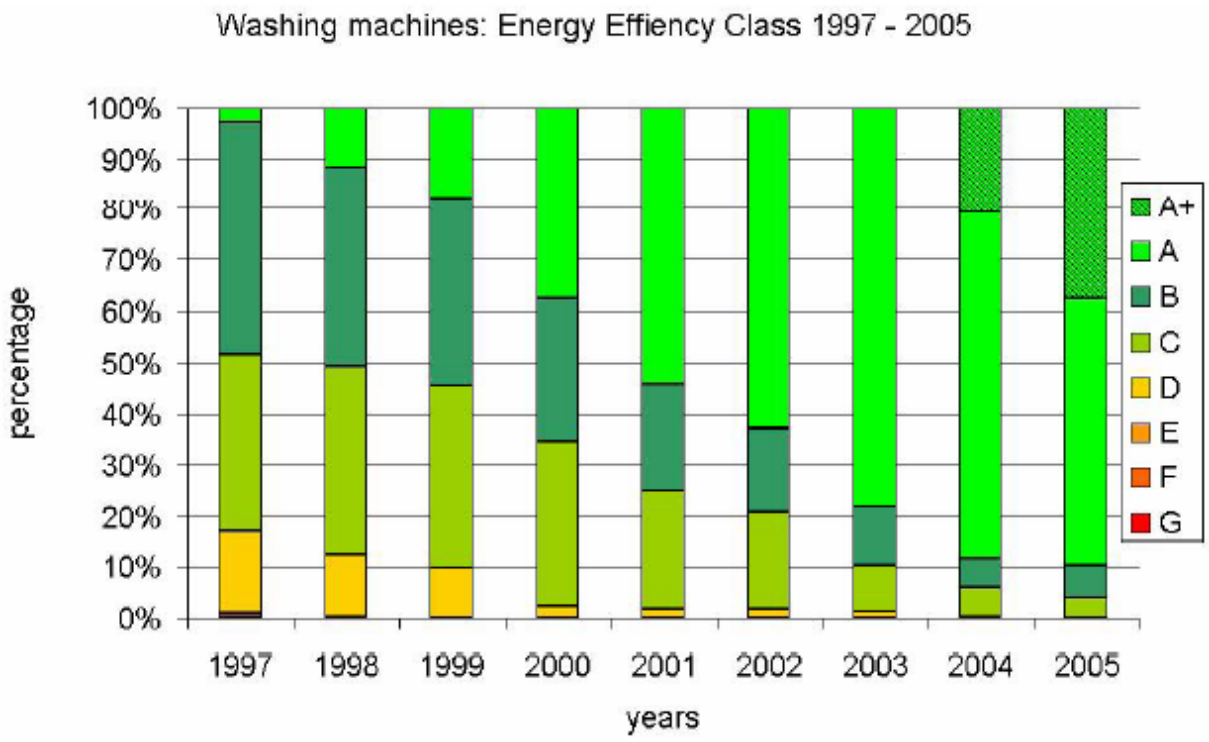
2.2.1 Clustering of products in highest efficiency classes

Energy efficiency

By 2005 the success of the label (and the voluntary commitment) led to a situation that most (90%) of the washing machines carried the same highest energy efficiency label A. The label's primary function of identifying the more efficient models is therefore considered lost (the only aid is the 'unofficial' class A+ that almost 38% of available models are carrying in 2005).

The figure 2 below illustrates the development of the market between 1998 and 2005.

Figure 2: Market distribution of washing machines by energy efficiency classes



Source: Preparatory study, task 2, p.55

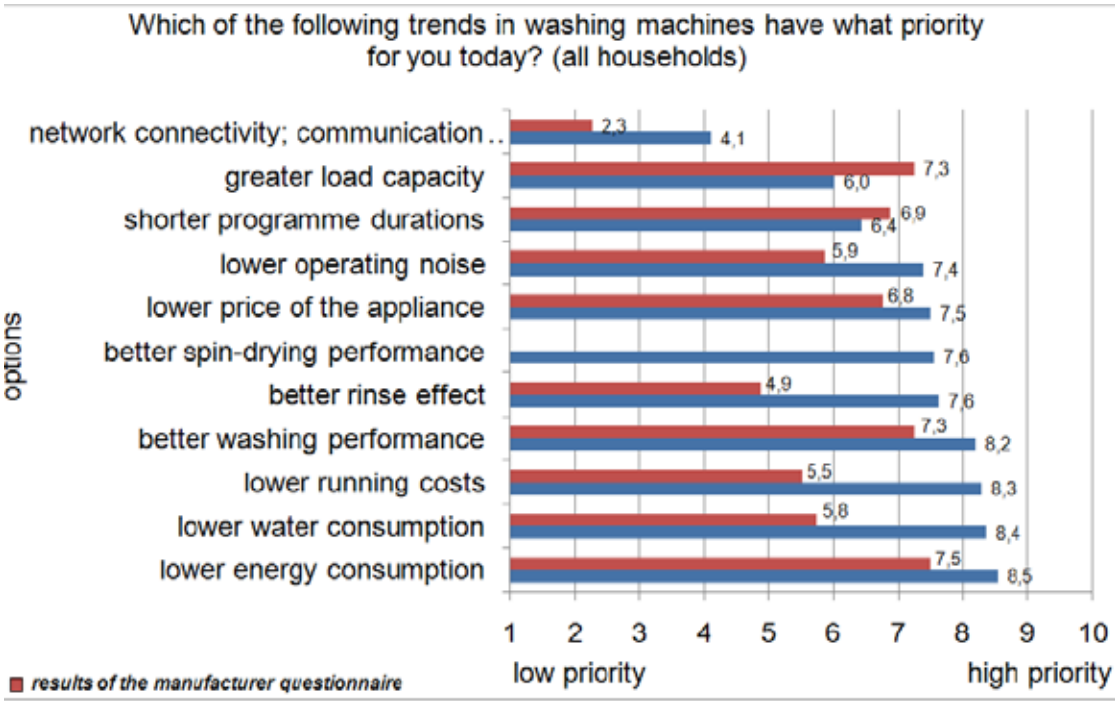
[18] See CECED press release on 21 March 2007, "Top executives Discontinue Voluntary Energy Efficiency Agreements for Large Appliances", downloadable from http://www.ceced.org.

[19] See among others ANEC/BEUC contribution to the revision of the Energy-using Products Directive (Dir. 2005/32/EC), *Consumer interests in Eco-design (of energy-using products),* Sylvia Maurer, 2008

When assessed per size category[20], it becomes apparent that already in 2005 in almost every category half or more of the appliances are energy class A or A+. In the 5 and 6 kg capacity categories (that make up 78% of the market in 2005) at least nine out of ten machines are class A/A+. This can be called a **regulatory failure** as due to an outdated labelling scheme there are no market incentives to further improve energy efficiency of washing machines. There is indeed in the current system, only very limited means for manufacturers to claim higher energy performances than current class A (or class A+ introduced on a voluntary basis by the industry[21]), hence convince consumers to pay more for lower energy using products (energy savings imply higher purchase costs). In this situation, it appears rationale for manufacturers not to place washing machines on the market above the threshold necessary to be classified in energy efficiency class A (or A+).

The stand-still in development of energy efficiency of washing machines is undoubtedly a sub-optimal situation since consumer surveys reveal that energy consumption is one of the main criteria in consumers purchasing decision (Figure 2).

Figure 3: purchasing criteria of consumers



Source: Preparatory study, task 2, p.77

Other performance aspects

Although less pronounced, the clustering of washing machines in the highest efficiency class also happened for washing performance. Technological improvements led to a situation in 2005, where 90% of the appliances were labelled with washing performance class A.

[20] See Preparatory study, task 5, table 5.8, p.18.

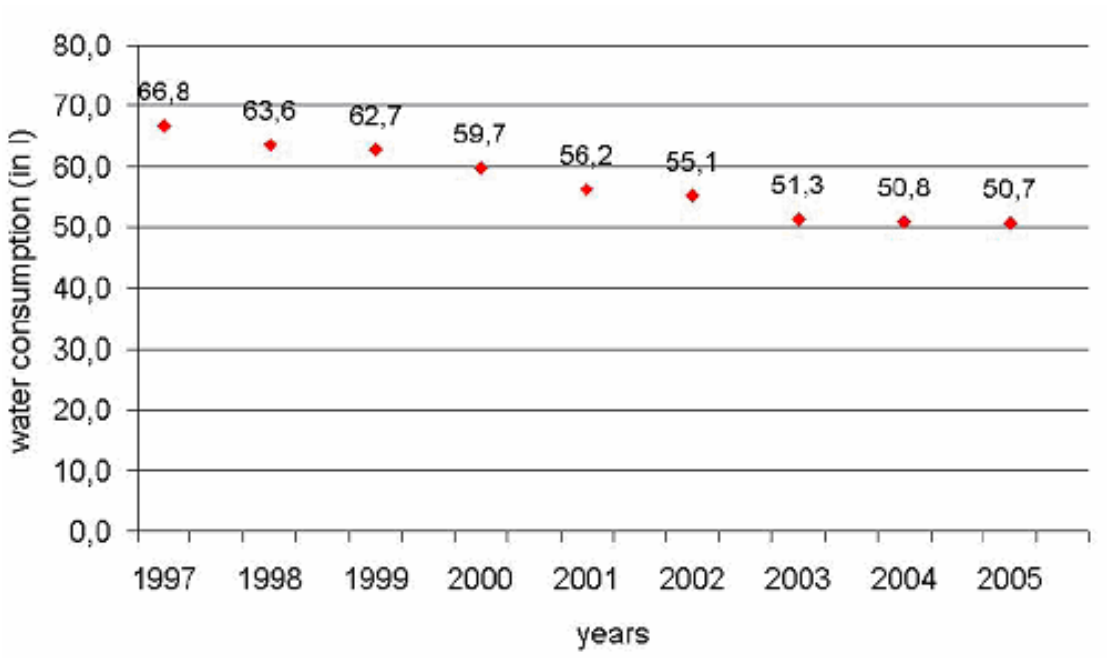
[21] See preparatory study, task 7, p.106. Manufacturers display class A+ on the current label even though there is no legal basis for this.

For drying performance the picture is more diverse, because of varying drying habits (and needs) throughout Europe, with some 13% of models in class A, 41% in class B and 26% in class C (remaining 21% of models in class D or worse), all related to year 2005. Spin-drying performance (expressed as residual moisture of the load) is very important considering that many people use a clothes drier for drying the wash load.

As regards water consumption no ranking was initially provided on the ground that there is a positive relationship between water and energy consumption (lower energy consumption is often directly related to lower water consumption, because there is less water to heat for the washing cycles). In addition, improvements on water consumption may be achieved at costs of the cleaning performance of washing machines which may have negative impacts on health.

The decline in average water consumption is obvious from Figure 4[22].

Figure 4: Average water consumption per cycle by year



Source: Preparatory Study, Task 2, p. 59

However not all water consumption is linked to energy consumption, e.g. cold rinses add significantly to the total water consumption but have little impact on energy consumption. A market survey performed by the UK Market Transformation Programme showed indeed that there is a great variability in water consumption of washing machines in the same energy efficiency class A. This appears to be a sub-optimal situation since water consumption is one of the main purchasing criteria of consumers as highlighted in Figure 3.

[22] The apparent stand-still between 2004 and 2005 is no actual standstill since the average capacity of the machines has grown in those years. The water consumption as L/kg shows an ongoing decline.

2.2.2 Negative externality

There is a negative externality related to energy use: not all environmental costs are included in electricity prices. That is why consumer (and producer) choices are made on the basis of lower electricity price not reflecting environmental costs for the society.

2.3 Grounds for an implementing measure

Taking into account on one hand the strong market demand for more efficient appliances and on the other hand the rejection of a new Voluntary Commitment as an alternative to address the environmental impact of washing machines, Member States, the industry and consumer organisations have asked for both, a revision of the labelling directive and the adoption of eco-design requirements.

The Ecodesign Directive sets in Article 15 (§1) and (2) the criteria upon which a new implementing measure on ecodesign may be adopted:

(1) the energy using product shall "represent a significant volume of sales and trade, indicatively more than 200 000 units a year";

(2) it shall "have a significant environmental impact within the EU";

(3) it shall "present significant potential for improvement in terms of its environmental impact without entailing excessive costs, taking into account in particular:

- the absence of other relevant EU legislation or failure of market forces to address the issue properly;
- a wide disparity in the environmental performance of energy using products available on the market with equivalent functionality."

2.3.1 Washing machine volume of sales & trade

The total sales of domestic washing machines in the EU-27 is close to 14 million units in 2005, which is far beyond the indicative threshold of 200 000 units set by the ecodesign framework Directive to define whether the sales volume are significant.

With an average product price of 443,50 EUR (incl. VAT, 2005 [23]) the total trade represents a value of 6.12 billion EUR.

Of these almost 14 million washing machines the 5 and 6 kg capacity machines are the most popular (they represent almost 80% of the models available, 4,5 kg is another 10% of the market). The market split up by size category (as number of models in database) and the presence of models by efficiency class is given in table below.

[23] From Task 6, par. 6.4.3.1, p.64

Table 1: Models by energy efficiency class and capacity

Capacity	% of models in energy class					# of models	% of models
(kg)	A+	A	B	C	D	technical database	
3		0,2%		0,2%		17	0,3%
3.5		0,7%	0,1%	0,2%		52	1,0%
4		0,7%	0,1%			37	0,7%
4.5	1,3%	4,8%	1,8%	1,3%	0,0%	481	9,3%
5	11,6%	32,1%	3,9%	2,4%		2597	50,0%
5.5	1,3%	3,4%	0,0%	0,0%		250	4,8%
6	19,9%	8,3%	0,2%			1471	28,3%
6.5		0,0%				2	0,0%
7	3,0%	0,5%				182	3,5%
7.5	0,4%	1,1%				79	1,5%
8	0,0%	0,3%				14	0,3%
9		0,1%	0,1%			10	0,2%
Overall	37.6%	52.1%	6.2%	4.1%	0.0%	5192	100%

Source: Preparatory Study, task 5, table 5.12, p.22 and table 5.14, p.30

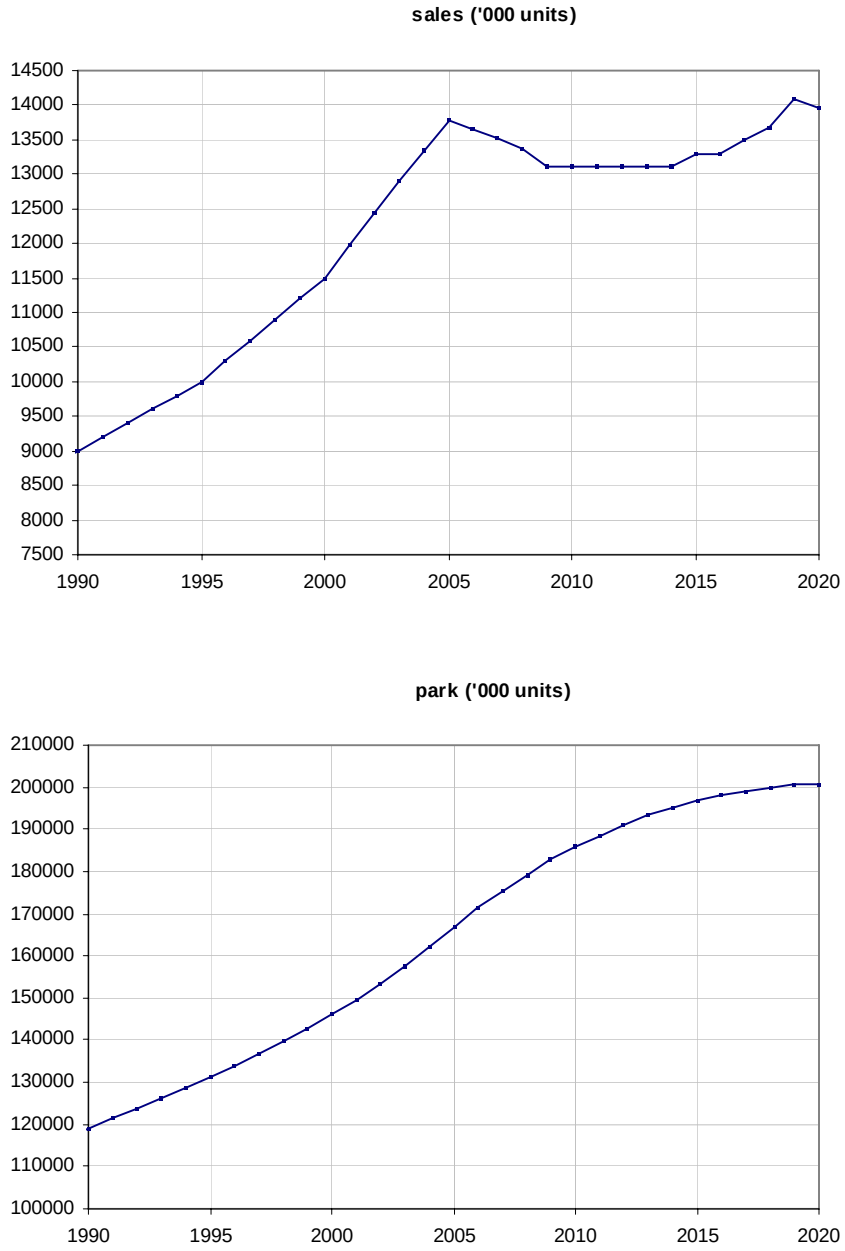
The sales show a slow growth up to 2005, indicating that the EU27 market for washing machines is close to its saturation point. In Western-Europe penetration rates of 90 to 95% are not uncommon, indicating a saturated market, dominated by replacement sales. In Eastern-Europe there is slightly more potential with penetration rates of 80 to 90% for countries such as Czech Republic and Poland. The overall drivers of the market are mainly replacement sales and the increase of number of households [24].

Baseline scenario (BAU)

For the Baseline scenario-analysis (see results in section 5) the sales are assumed to steady themselves after 2005 in order to maintain an overall penetration rate of maximum 95% in 2015. The graph shows that for certain years the sales even decline in order to keep penetration at maximum 95%. The calculated stock is therefore somewhat smaller than in the preparatory study[25] (where no check on household saturation was found). The installed base is some 167 million appliances in 2005 and 202 million in 2025 for the EU 27. The stock calculation is thereby based on an average product life of 15 years.

[24] See preparatory study, task 2, p. 33-40.
[25] Task 7, table 7.16, p.47

Figure 5: Baseline sales ('000) and installed stock ('000)



Source: Input to this impact assessment by VHK

2.3.2 Washing machine environmental impact

A life-cycle analysis (LCA) was run within the preparatory study to identify the environmental impact of washing machines following the methodology defined in the ecodesign framework Directive, annex I, part 1. The life cycle analysis was based upon:

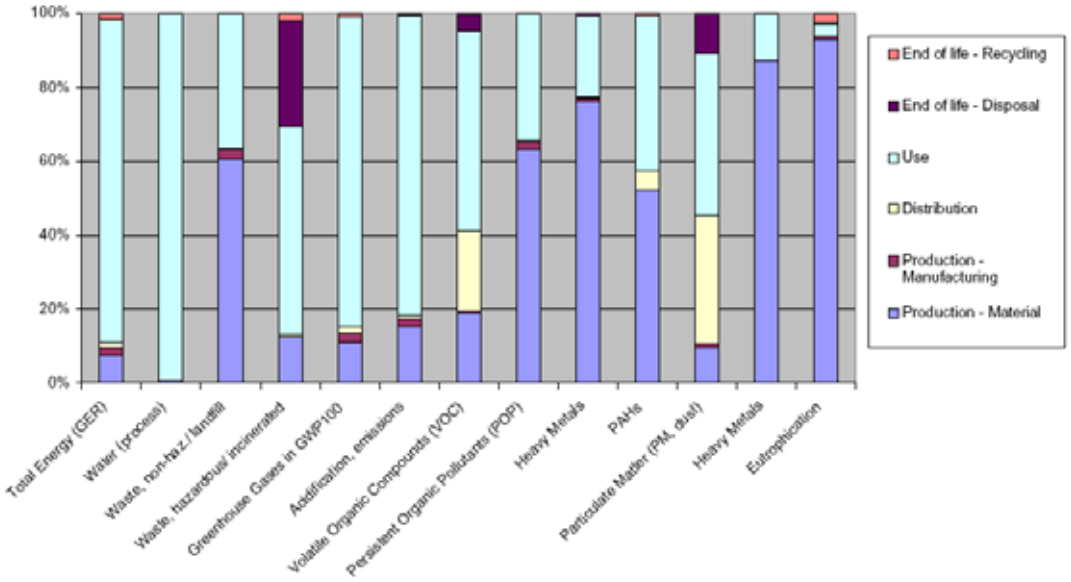
- the definition of a base case, representative of the most common washing machine: a 5,36 kg machine;
- inventory tables received from manufacturers that include data on raw material, manufacturing, transport, distribution, use and end-of-life of the base case appliances;

- aggregation of the results using the EuP EcoReport and the SimaPro software.

The analysis illustrated in figure 6 shows that for most environmental impacts, the most dominant phase is the use-phase, except for the emissions of hazardous substances and waste which are mainly production related (production of raw materials and manufacturing).

The use-phase is characterised by high (over 90% of total) energy related emissions (such as greenhouse gas and acidifying emissions). Water consumption over the lifecycle is also highest in the use-phase (almost 100% of total).

Figure 6: Life cycle impacts of a washing machine



Source: Preparatory study, task 5, p.57

The use of (product related) hazardous substances during the production phase is dealt with by Directive 2002/95/CE on the Restriction of Use of Hazardous Substances in Electrical and Electronic Equipment (RoHS Directive).

The end-of-life phase is addressed in the Waste of Electrical and Electronic Equipment Directive 2002/96/CE (WEEE Directive). Since washing machines comprise many materials that are recyclable and have a very high economical value (e.g. stainless steel, aluminium, copper), the majority of materials are recycled at the end-of-life. The WEEE Directive states that entities responsible for bringing washing machines onto the market are also responsible for adequate take-back.

Considering the total scope of product policies already in place, covering many aspects of lifecycle emissions (RoHS and WEEE), it appears appropriate to focus ecodesign requirements on energy and water consumption.

Baseline scenario

The baseline scenario indicates that the total energy and water consumption of washing machines will respectively grow by 7% in 2020, due to a growing stock (see detailed

assessment in section 5). The scenario is based upon average of 234 washing cycles per year[26] and includes a correction for real-life energy consumption of 0,69 (from 2005 on).

- Electricity: in 2005 35 TWh/y (equivalent to 316 PJ/y primary energy), in 2020 37,7 TWh/y (339 PJ/y primary energy);

- CO_2 Emissions: in 2005 18.2 mton/y, in 2020 19.6 mton/y;

- Water consumption (use phase only): in 2005 2213 million m^3/y, in 2020 2051 million m^3/y.

2.3.3 Potential for improvement

Energy consumption

With 90% of products in energy efficiency class A (or class A+, the class introduced by the industry on a voluntary basis -see Table 1), there is a limited disparity in the energy performance of washing machines currently available on the market. This may imply that the third criterion of the Ecodesign Directive is not met.

The identified regulatory and market failures indicate however that this situation may in fact result from outdated energy efficiency classes.

Water consumption

In water consumption certain disparity also exists: the range in water consumption of washing machines within the same size clearly indicates room for improvements.

[26] Which corresponds roughly to the real life behaviour of end-users. Although the preparatory study identified an average of 4,9 cycles/week (see task 3, p. 48) in task 7. table 7.13 (p.44) 234 cycles/year have been used. This impact assessment also uses 234 cycles/year. Task 6 (p. 90) shows that various figures for cycles/year have been used in relevant literature (ranging from 200 to 245 cycles/year).

Table 2: Energy and water consumption of washing machines by size in 2005

Capacity (kg)	Energy consumption (kwh/cycle)			Water consumption (litre/cycle)			% models
	average	min	max	average	min	max	
3	0.686	0.570	0.790	42.2	39.0	45.0	0.33
3.5	0.722	0.660	0.940	45.3	39.0	63.0	1.00
4	0.722	0.750	0.920	44.6	37.0	70.0	0.71
4.5	0.917	0.760	1.300	53.2	37.0	75.0	9.26
5	0.956	0.830	1.370	50.4	35.0	74.0	50.00
5.5	1.012	0.920	1.450	50.9	39.0	69.0	4.82
6	1.057	0.950	1.380	49.2	37.0	69.0	28.30
6.5	1.200	1.200	1.200	50.0	50.0	50.0	0.04
7	1.208	1.020	1.330	52.6	43.0	72.0	3.51
7.5	1.381	1.270	1.450	70.3	64.0	72.0	1.52
8	1.466	1.360	1.520	68.1	60.0	78.0	0.27
9	1.780	1.700	1.900	75.0	69.0	84.0	0.19
average/total	0.998			50.7			100

Source: Preparatory study, task 5, p.29

2.3.3.1 Life cycle cost analysis

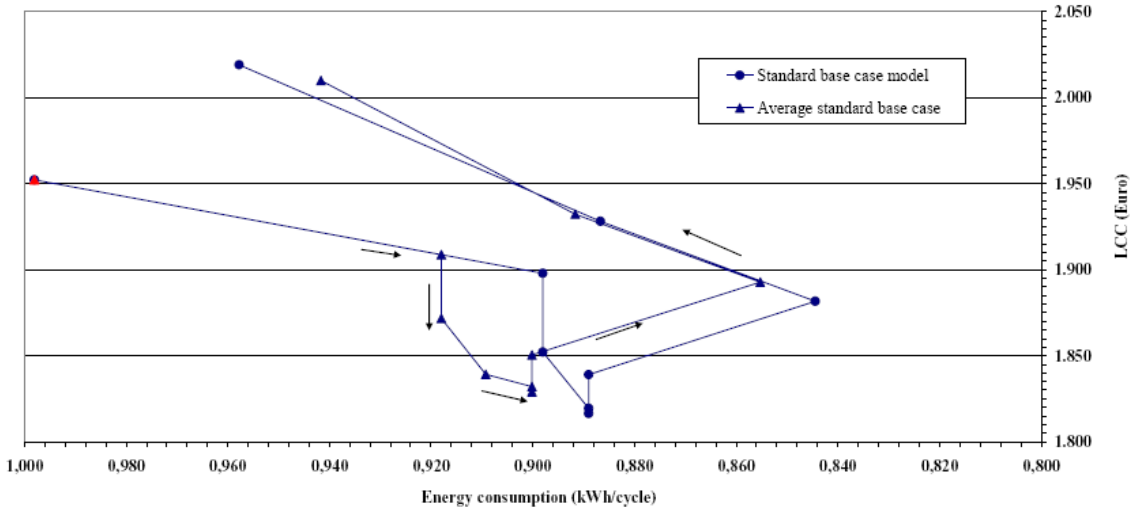
A list of possible technological innovations (already applicable and/or estimated to be available in the future) that improve energy consumption of washing machines has been gathered in close cooperation with manufacturers, together with the price increase and environmental impact of each of the identified technological option[27].

Applied to the standard base case, it is possible to identify the lifecycle costs (LCC) for each (combination of) option(s) that reduce the energy consumption. Figure 7 illustrates the results of the analysis[28].

[27] See results in the preparatory study, task 6, p.21-31.

[28] Task 6, p.64: Key economic assumptions: product life: 15 years; cycles per year: 220; discount rate: 5%/year; electricity price: 0,17 €/kWh; water price: 3,7€/m3; detergent, softener, rinsing agent: 2,34 €/kg, 0,6 €/kg and 2,4 €/kg respectively; maintenance and repairs: 5,5€/year; disposal and recycling: 61 €/life (at end of life); average machine price: 443,50€.

Figure 7: Life cycle costs of options by energy consumption (kWh/cycle)



Source: Preparatory study, task 6, p.75.

– The first point on the left of the life cycle cost curves represents the base case appliance with current life cycle costs;

– The lowest point on each curve indicates the least life cycle cost point (LLCC);

– The points at the furthest right indicate consumption values at which the life cycle costs have increased beyond that of the original base case applying the best available technologies (BAT) on the market in 2005;

– Above the BAT level, technological options are applied that increase energy consumption, such as internet connectivity and voice control.

The preparatory study did not assess in-depth the effects of reducing energy consumption on washing and spin drying performance, but possible detrimental effects of energy saving options on overall product performance have been considered while selecting technological options that make up the LLCC and BAT levels. In doing so, the LLCC and BAT levels represent machines with equivalent performances as the base case machines. The market has also proven to be able to raise both energy efficiency and cleaning/drying performances (see section 2.2.1)

According to the methodology laid down in the Ecodesign Framework Directive Annex II, minimum energy efficiency requirements should aim at the point of LLCC for end-users, provided there are no significant negative impacts on the parameters listed in article 15 (5)[29].

The life cycle costs (purchase price together with the operating costs of the appliance, assuming a 15 years product life) confirm that the $LLCC_{av}$ level is cost-effective with a relatively short payback time of around 1,2 years (Task 6, p.88). It is assumed in addition that the combined effect of the labelling scheme (together with the ecodesign requirements) will

[29] "Concerning energy consumption in use, the level of energy efficiency or consumption will be set aiming at the life-cycle cost minimum to end-users for representative EuP models, taking into account the consequences on other environmental aspects".

drive innovation and progressively reduce the costs of technological options, hence the purchase price and the marginal payback time for consumers. Section 6.1.2 discusses the aggregated impact of policy options on consumers.

The sensitivity analysis performed within the preparatory study - with different assumptions for the electricity price, at 0,10 €/kWh and 0,25 €/kWh (compared to 0,17 €/kWh in the scenario presented above); water price at 3,7 €/m3, 4,8 €/m3 and 2,6 €/m3; product life of 10, 12 and 17 years (compared to 15 years assumed in the scenario presented above), washing machine price of 562 EUR in Western Europe and 326 EUR in Eastern Europe, 40ºC washing cycles and the number of cleaning cycles per year at 200 and 245 in addition to the 220 assumed - confirms the validity of the point of Least Life Cycle Cost identified[30].

LLCC level

Table 2.2 gives an overview of the levels achieved at LLCC. The cost-effective level of improvement is 10%. These values assume a noise level of 53/70 dB(A). The energy consumption levels of the base case correspond to the current threshold of energy efficiency class A.

This consumption level will be the target for the ecodesign implementing measures. Note that the water consumption at LLCC level has also been reduced by up to 24% because many design options aim to reduce the hot water consumption, thereby reducing both energy and water consumption.

Table 2: Energy and water consumption at LLCC level (average standard base case)

	Energy consumption (kWh/cycle)			Water consumption (L/cycle)			Purchase price (EUR)		
Standard average base case	Base case	$LLCC_{av}$	change %	Base case	$LLCC_{av}$	change %	Base case	$LLCC_{av}$	change %
5,36 kg	0,998	0,900	-10	50.7	38.7	-24	443.50	459.7	+3.7

Source: preparatory study, task 6, Table 6.42, p.88

BAT level

Additional energy savings can be reached by applying energy saving technologies beyond the point of LLCC. The design of the energy efficiency classes of the labelling scheme should reflect these levels so as to give incentives for further innovations.

Table 3 indicates the level of EEI achievable applying the best available technologies (BAT) on the market (i.e. technologies already commercialised), assuming the same spin drying speed, capacity and noise level of 53/70 dB(A) as the base case.

The BAT level represents savings of 14% when compared to the base cases and 5% when compared to the LLCC levels.

[30] Preparatory study, task 6, p. 87

This consumption level will be the target for labelling of efficiency classes above the LLCC/ecodesign target level.

Table 3: Energy and water consumption at BAT level (average standard base case)

	Energy consumption (kWh/cycle)			Water consumption (L/cycle)			Purchase price (EUR)		
Standard average base case	Base case	BAT_{av}	change %	Base case	BAT_{av}	change %	Base case	BAT	change %
5.36 kg	0,998	0,855	-14	50.7	38.7[31]	24	443.50	540.80	+22

Source: preparatory study, Task 6, Table 6.43, p.89

The price increase for the BAT-products appear for the time being detrimental to expect a quick take-up of these products on the market due to a long marginal payback time (> 6 years, table 6.43, p. 89). The level of BAT is however the level towards which the market may be driven if a revised, more effective, labelling scheme was introduced. In addition, the purchase price of the BAT_{av} should decrease over time due to economies of scale.

BNAT level

BNAT (acronym for Best Not Yet Available technologies) is used to indicate the energy efficiency level by applying techniques that are known, but have not yet been commercialised.

The preparatory study for washing machines identified no further energy saving technologies beyond BAT. Only options that increase energy consumption, such as internet connectivity and voice control, have been assessed. Alternative washing technologies such as re-use of rinse water and ozone purification of washing sud are mentioned but not described fully.

In addition to the analysis of the preparatory study there is information available indicating an energy consumption of certain washing machines below the level of BAT. The BAT level described above coincides with an energy consumption of 0,1596 kWh/kg[32]. The current benchmark of best performing machines on the market today[33] lies at an energy consumption below 0,15 kWh/kg (per cycle) which indicates savings of 6% on top of the BAT level, or 20% compared to the base case (0,186 kWh/kg)[34]. These machines are available with a rated capacity of 7 kg and higher.

The conclusion is that a further reduction of 20% (compared to 2005 base case) appears feasible for at least an important and growing segment of the market, especially considering that these reductions were made possible in a market that officially does not endorse a "better than A" energy performance.

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31 The BAT applied to reduce energy consumption do not reduce further water consumption compared to the LLCC level.

32 See preparatory study, task 7, table 7.24, p.58

33 Commission Working Document, Ecodesign requirements, Annex II - Benchmarks

34 There is however a difference between the BAT level identified in the preparatory study (based on technological studies and representing the actual energy consumption of options, scrutinised by experts) and the claimed energy consumption of appliances on the market today (whose real energy consumption may deviate from the declared values).

2.3.3.2 Low power modes

Low power modes have not been taken into account in the current labelling scheme. Although few data are currently available on the actual energy consumption of low power modes, it is known that that there is a wide range of performances of left-on power consumption varying.

A comparison with dishwashers may provide valuable input as they employ similar sensor-based safety functions as washing machines (see section 5.2.4 for further analysis)[35]: An assessment of low power modes of modern dishwashers reveals that left-on power consumption may vary between 0,5 and 3.2 W.

2.3.4 Conclusion

The scrutiny of criteria enshrined in Article 15 (2) of the ecodesign framework Directive shows that washing machines qualify for the adoption of an implementing measure setting new ecodesign requirements:

– sales and trade of washing machines in the EU is significant (14 million units in 2005, value of 6.1 billion EUR).

– the environmental impacts are significant (35 TWh/y of electricity used in 2005, CO_2 emissions of 18 mton/y, water consumption of 2.2 billion m3/y);

– The potential for improvement is significant (10% energy savings cost effective in the short term, 14% in the medium term when using the standard 60ºC cycle, or 20% when applying "benchmark" technologies) and can be realised without compromising overall product performance.

2.4 Legal basis for EU action

Article 16 of the ecodesign framework Directive provides the legal basis for the Commission to adopt an implementing measure on this product category.

3. OBJECTIVES

3.1 General, specific and operational objectives

As laid out in Section 2, the preparatory study has confirmed that a cost-effective potential for reducing energy consumption of washing machines exists. There is potential for water savings as well, but it should be assessed in light of other performance requirements such as the rinsing performance. This potential is not realised with the current market measures and initiatives, as outlined above.

The **general objective** is therefore to develop a policy which corrects the regulatory and market failures, and which:

[35] Data collected on the German "ecotopten"-website (http://www.ecotopten.de/prod_spuelen_prod.php) for appliances listed in March 2008..

– reduces energy consumption and related CO_2 and pollutant emissions by domestic washing machines following EU environmental priorities, such as those set out in Decision 1600/2002/EC or in the Commission European Climate Change Programme (ECCP);

– promotes energy efficiency hence contribute to security of supply in the framework of the EU objective of saving 20% of the EU's energy consumption by 2020.

The **specific objectives** are to:

– remove least efficient products from market;

– promote market take-up of more energy efficient washing machines for domestic use;

– maintain and support the past market trend towards more energy efficient and environmental friendly washing machines in addressing the current regulatory failure;

– support improvements on the energy consumption of low power modes.

The **operational objectives** are to address some of the problems resulting from the current labelling scheme (see section 2.1.2) and comply with the requirements laid down in the Ecodesign Directive, Article 15 (5):

– there shall be no significant negative impacts, from the perspective of the user, on the functionality of the product such as cleaning and drying performances or noise emissions;

– health, safety and the environment shall not be adversely affected;

– there shall be no significant negative impact on consumers in particular as regards affordability and life cycle cost of the product;

– there shall be no significant negative impacts on industry's competitiveness;

– in principle, the setting of an ecodesign requirement shall not have the consequence of imposing proprietary technology on manufacturers;

– no excessive administrative burden shall be imposed on manufacturers.

Section 4 describes which policy options have been validated to meet these objectives.

3.2 Consistency with other EU policies

Increased market take up of energy efficient washing machines, through the introduction of new energy efficiency requirements and possibly a revised energy labelling scheme will contribute to reach the 20% energy savings potential by 2020 identified in the Energy Efficiency Action Plan (COM(2006) 545). The European Economic Recovery Plan (COM(2008) 800)[36] in addition mentions energy efficiency as one of the key priorities, in particular the promotion of the rapid take-up of "green products".

Interrelation with product specific ecodesign implementing measures

[36] Published in 26.11.2008

This product specific implementing measure has relation with the Commission Regulation N° 1275/2008 of 17 December 2008 *implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for standby and off mode electric power consumption of electrical and electronic household and office equipment*, since it deals with two low power modes, namely 'off mode' and 'left on mode' (see box 1 above).

It was decided to exclude washing machines equipped with a sensor based safety function (designed to avoid water leakages) from the horizontal requirements on stand-by which are laid down in that Regulation[37]. The proposed new algorithm developed for the ecodesign measure on washing machines considers the overall annual energy consumption including the energy consumption of the two most important low power modes (the "off mode" and "left on mode"). The measurement method referred into the standby Regulation is the basis for the evaluation of the duration and the power consumption of the two modes.

In addition, if the machine does not provide in such protection function(s), it is proposed to declare the standby Regulation applicable so that the two modes are subject to the specific requirements of the standby Regulation.

4. POLICY OPTIONS

This Chapter describes the policy options, both discarded and proposed, that have been considered in the context of this Impact Assessment.

4.1 Policy options discarded

- **No EU action**

This option would have the following implications.

– The regulatory and market failures would persist. The impact of this option is described in more detail in Section 2, as the Baseline scenario.

– It is to be expected that Member States might want to take individual, non-harmonized action. This would hamper the functioning of the internal market and lead to high administrative burdens and costs for manufacturers, in contradiction to the goals of the Ecodesign Framework Directive.

– There is a risk of competitive disadvantages, in particular for very price sensitive products, for those manufacturers designing their products to good standards vis-à-vis competitors not using technology leading to such low energy consumption.

– The specific mandate of the Legislator (Article 15.1) would not be respected despite the fact that all criteria of Article 15.2 setting the rationale for an implementing measure are met.

Therefore this option is discarded from further analysis.

[37] OJ L 339, 18.12.2008, p. 45.

The "Business-as-usual" scenario is based upon this option and provides the reference for other proposed scenarios.

- **Adopt a new Voluntary Commitment**

This option is discarded for the following reasons.

– Relevant voluntary initiatives have been terminated in 2008 by industry (see section 2.1). No new initiative for self regulation has been brought forward by the relevant industrial sector. The sector advocated against such an initiative.

– The industry expressed a need for a clear legal framework ("level playing field") ensuring fair competition, while voluntary agreements could lead to competitive advantages for free-riders and/or non-participants to the "self-commitment".

– The specific mandate of the Legislator (Article 15.1) would not be respected despite the fact that all criteria of Article 15.2 setting the rationale for an implementing measure are met.

- **Adopt new ecodesign requirements only (without revising the labelling scheme)**

This option is discarded for the following reasons:

– The adoption of new ecodesign requirements will ban from the market the most energy consuming appliances but will not provide for a dynamic framework for further investments in energy improvements while the arguments to do so still persist (consumer demand for visibility of more efficient appliances, competitive advantages for industry).

– The industry, consumer organisation and Member States in the consultation forum have repeatedly asked for a combined revision of both measures (labelling and ecodesign).

- **Revise the labelling scheme only (with no new ecodesign requirements)**

In general the two main objectives of labelling schemes are to increase the market penetration of, in this case, energy efficient products by providing incentives for innovation and technology development, and to help consumers to make cost effective purchasing decision by addressing running costs. Energy labelling pursuant to the Energy labelling Directive creates market transparency, fosters awareness of consumers and creates incentives for manufacturers for innovation.

The revision of the labelling scheme alone without the adoption of minimum requirements is discarded for the following reasons:

– A labelling scheme alone does not ensure that cost effective improvement potentials are realised quickly for all products on the market, implying that the full energy and cost savings potential is not captured.

– A labelling scheme alone does not guarantee by definition that minimum energy efficiency are met. Without energy efficiency requirements there is always a risk that the market evolve towards non efficient appliances with a competition based mainly on prices.

– The speed of the market transformation is entirely determined by the voluntary take-up of labelled products. The market transformation due to the implementation of the labelling scheme will not be driven forward by the 'pushing' effect from ecodesign requirements setting minimum energy efficiency thresholds.

– The industry, consumer organisation and Member States, within the impact assessment and the consultation forum have repeatedly asked for a combined revision of both measures (labelling and ecodesign).

– Member States could set minimum requirements individually, what would be at odds with the common market and the administrative burdens for manufacturers would be higher when compared with the burdens associated to ecodesign requirements.

– The specific mandate of the Legislator (Article 15.1) would not be respected despite the fact that all criteria of Article 15.2 setting the rationale for an implementing measure are met.

4.2 Policy option proposed

The policy option which is the most recommended and advocated by a majority of stakeholders is the following.

- **Revise simultaneously the labelling scheme and introduce ecodesign requirements in a harmonised approach**

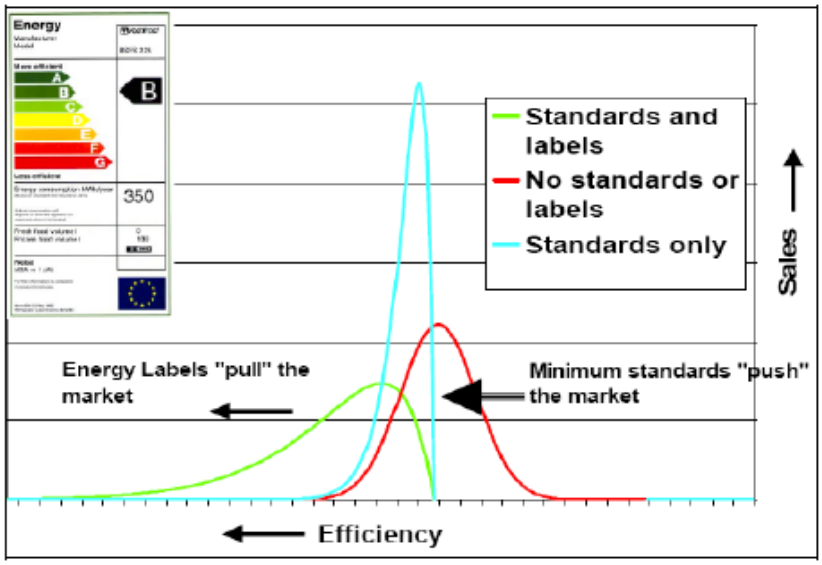
The simultaneous introduction/revision of both measures (ecodesign and labelling) will ensure that:

– the introduction of ecodesign measures will have the effect that the least efficient models are removed from the market. The simultaneous revision of the labelling scheme ensures that the revised scheme is adapted to the impacts of proposed ecodesign measures on the market and should ensure that the label is able to function as a market tool to drive washing machine efficiency;

– a synergic effect of the pushing effect of the eco-design specific requirements and the pulling effect of the new labelling energy efficiency scale, according to the qualitative but well experienced relation illustrated in Figure 7;

– complies with the demand of stakeholders for a harmonisation/rationalisation of both measures.

Figure 7: Cumulative impact of ecodesign and labelling



Source: IEA, P. Waide, International use of policy instruments: country comparisons, Copenhagen, 05 April 2006

5. ANALYSIS OF IMPACTS

This section discusses the appropriate levels of ecodesign requirements and labelling.

5.1 Policy Proposal

A proposal following the lines set out in the preparatory study was presented and discussed in the Consultation Forum meeting which was held on 4 December 2008. Comments were received and considered by the Commission to form a refined calculation method for the Energy Efficiency Index which is presented in Annex IV. The proposal below is based on that revised calculation methodology.

5.1.1 Ecodesign requirements

As highlighted in preceding sections, the minimum energy efficiency requirements should be set at the point of LLCC which was identified at 0,900 kWh per cycle (see table 2 above). Including the low power modes consumption and using the new EEI formula, this means an EEI at 59.

Since the setting of mandatory requirements should obviously not set "significant negative impacts on industry's competitiveness" as underlined in Article 15 (5), the time line set for the application of the energy efficiency requirements should take into account the design cycle and production platform change of the industry (between 4 and 5 years).

The LLCC could therefore be set as mandatory requirements either 6 years after the entry into force of the implementing measure or after 4 years (which put greater pressure on the industry but appears still realistic). Assuming the implementing measure is adopted in 2009, this would mean that the implementation date could be set in 2013 or 2015.

It is proposed to set a transitory mandatory requirement one year after entry into force. Such a tight timing (far below the 4 to 5 years platform production changes of the industry) does not allow banning out of the market a great number of products, but would aim at facilitating the transition between the current labelling scheme and the new one, especially with the new EEI formula. It would harmonise in particular the documentation ('technical file') to be provided by manufacturers for market surveillance purposes and ensure that the same calculation method for the EEI is used at the same time for both legislative initiatives (labelling and ecodesign). It would also guarantee that no products below that level are placed on the market. The most important effect of the combination of stage 1 and introduction of revised energy labelling classes would be to put again into motion the market mechanism of energy labelling, because classes beyond the current class A could become available already one year after entry into force. The market thus can develop like it did before - through the energy labelling mechanism - and prepare itself for the second stage.

Since a harmonised approach was advocated by all stakeholders, the second stage (EEI=59) should define the threshold of one energy efficiency class, and the first stage of the requirements should be aligned to the threshold of the preceding energy efficiency class. The analysis below on the design of the energy efficiency classes of the proposal concludes that this level should be set at EEI=68, which is some 13% higher than EEI 59 (59/(1-0,13)=68) and in conformity with the proposed bandwidth of labelling classes.

This first stage requirement would phase out around 16% of the models available in 2005 (assuming 1 W (off) and 2 W (left on) low power modes). These are mainly models that are currently labelled energy class B and C (or worse).

Table 5 summarizes the ecodesign requirements of the proposal with the two different timelines for the implementation of stage 2 (A/B). The limited scope for energy efficiency improvement above the level of LLCC, indicates that no tighter requirements appear cost-effective. The labelling scheme will provide the necessary incentives for further improvements.

Table 5: Ecodesign requirements in proposal

	Proposal A	Proposal B
Stage 1	2011: One year after entry into force: EEI < 68	2011: One year after entry into force: EEI < 68
Stage 2	2015: Five years after entry into force: EEI < 59	2013: Three years after entry into force: EEI < 59

5.1.2 Energy labelling proposal

This section considers only the thresholds of the energy efficiency classes, it is not in the scope of this impact assessment to discuss their name nor the layout of the label in general.

Table 6 shows the current labelling scheme (classes F and G not shown).

Table 6: Energy efficiency classes A-C as set out in Directive 95/12/EC at 60°C cycle

Washing machines	EEI 95/12/EC (kWh/cycle)				
capacity	A	B	C	D	E
(kg)	0,19	0,23	0,27	0.31	0.35
3	0,570	0,690	0,810	0,930	1,050
3,5	0,665	0,805	0,945	1,085	1,225
4	0,760	0,920	1,080	1,240	1,400
4,5	0,855	1,035	1,215	1,395	1,575
5	0,950	1,150	1,350	1,550	1,750
5,5	1,045	1,265	1,485	1,705	1,925
6	1,140	1,380	1,620	1,860	2,100
6,5	1,235	1,495	1,755	2,015	2,275
7	1,330	1,610	1,890	2,170	2,450
7,5	1,425	1,725	2,025	2,325	2,625
8	1,520	1,840	2,160	2,480	2,800
9	1,710	2,070	2,430	2,790	3,150

The current labelling scheme applied a constant reduction of 0,04 kWh/kg per class. This means however that the absolute step of 0,04 kWh/kg becomes a relative larger step when the specific energy consumption (kWh/kg) becomes smaller (when the machine is more efficient). This stands in contradiction with the fact that the amount of investments necessary for a given energy efficiency gain becomes increasingly high the higher the classes become (rising marginal cost curve). This approach is sustainable as long as the energy efficiency improvements are not too ambitious, but at one point the relative improvement of energy efficiency may become so high, so that the gain to go up one class loses its attractiveness for manufacturers: the technological investments necessary to achieve a higher class become disproportionate compared to the expected gain (of winning market share thanks to the gain of one class). In other words, going from current class D to C corresponds to an investment needed for (1-(0.27/0.31)*100) 12,9% efficiency improvement, whereas going from current class B to A corresponds to an investment needed for (1-(0,19/0,23)*100) 17,4% improvement of energy efficiency. In the current system the more efficient one gets, the 'higher' the step is to the next label class.

The revision of the labelling scheme therefore could consider the revision of the bandwidth of the energy efficiency classes to take into account this effect.

The analysis performed in section 2.2.3 identified the LLCC/BAT levels which are summarised in Table 7. Those levels designate the energy efficiency performance of washing

machines towards which the market may be reasonably driven in the short to long-run. The design of the energy efficiency classes should therefore reflect these levels.

Table 7: BAT and BNAT energy consumption levels of washing machines per 60°C cycle*

	Energy consumption (kWh/cycle)			
Standard average base case	Base case	$LLCC_{av}$	BAT_{av}	Benchmark level
5.36 kg	0.998	0.900 (-10%)	0.855 (-14%)	-20%

*using current EEI formula

Considering the elements quoted above, the following classification appears realistic. Table 8 presents the proposed new energy efficiency classes together with the reference consumption values (on annual basis) as applied in proposal A/B and the derived energy consumption per cycle (assuming 12 kWh per year low power energy consumption). The kWh/kg limit values of the current labelling scheme can not be compared with the EEI threshold of this proposal because the current 95/12/EC values are based on a 60ºC full load and do not contain low power mode consumption; this is why the corresponding energy consumption (per annum and per cycle) is given.

The bandwidth of the label classes is now set at a continuous 12-13% improvement per class (a small error is allowed for a two decimal resolution of EEI)[38]. This means that the necessary investments to gain a class are evenly spread with a continuous pace of improvement of 12-13%.

The classes are indicated by characters (D-A) and Class A is close to the BNAT level (see table 7).

[38] The classes are also spaced more than 10% apart, because 10% is the verification limit and a higher label class width avoids discussions of appliances being declared two label classes too high.

Table 8: Targeted annual energy consumption (and derived energy consumption per cycle - INDICATIVE) by size category and EEI according 3+2+2 cycle

class	**B**	**A**	**A1**	**A2**	**B (close to current class A)**	**A (at LLCC level)**	**A1 (close to benchmark level)**	**A2 (long-term target)**
capacity (kg)		Annual consumption (40/60 MIX)				Cycle consumption (40/60 MIX) (Low power assumed to be 12 kWh/year)		
EEI	**0,68**	**0,59**	**0,52**	**0,45**	**0,68**	**0,59**	**0,52**	**0,45**
3	131	114	100	87	0,541	0,462	0,401	0,340
3,5	147	128	112	97	0,614	0,525	0,456	0,388
4	163	141	125	108	0,686	0,588	0,512	0,436
4,5	179	155	137	118	0,759	0,651	0,568	0,484
5	195	169	149	129	0,832	0,714	0,623	0,532
5,5	211	183	161	140	0,904	0,777	0,679	0,580
6	227	197	174	150	0,977	0,840	0,734	0,628
6,5	243	211	186	161	1,050	0,903	0,790	0,676
7	259	225	198	171	1,122	0,966	0,845	0,724
7,5	275	238	210	182	1,195	1,029	0,901	0,772
8	291	252	222	192	1,267	1,092	0,956	0,820
9	323	280	247	214	1,413	1,219	1,067	0,916
AVERAGE target.cons.								
	206	179	158	137	0.883	0.759	0,663	0,566

cycles: 220

low power: 12 kWhyear

SAEc: gradient 47 constant 51.7

Real consumption (at 60ºC cycle)

270,2	234,5	206,7	178,8

The real consumption is the average annual consumption for 220 cycles per year divided by 0,84 (conversion to 60ºC cycle - to be corrected again for real life in the stock model) and corrected with +10% for the difference between the declared and real average consumption of appliances as results from possible tests

color legenda

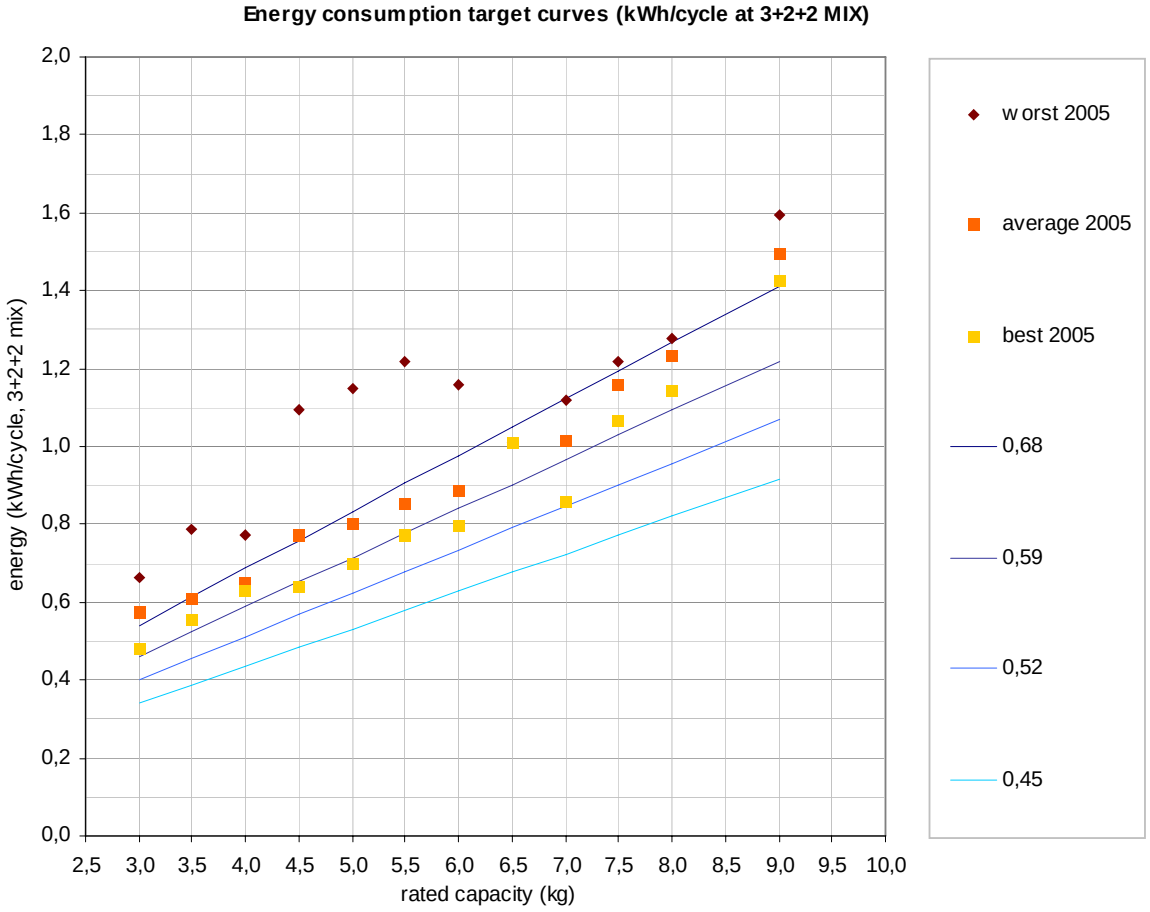
- threshold beyond 'best 2005'
- threshold between 'best 2005' and 'average 2005'
- threshold above 'average 2005'

The number of classes presented is limited to four, because the foreseeable improvements in energy efficiency indicate a limited range (from base case to BNAT level). The reason is that, unlike the previous labelling scheme, the new proposal is combined with minimum energy efficiency requirements, phasing out the least efficient appliances from the market. Therefore it is logical that fewer classes than before remain on the market.

Further classes may become relevant at a later stage (e.g. EEI 40), but given the analysis of the Preparatory Study these classes will not be populated in the near future.

Figure 8 presents the indicative energy consumption per cycle (assuming 12 kWh per year in low power mode) for the proposal at stage 1 and 2 and two further classes. Also the current 'best' / 'average' / 'worst' values are shown.

Figure 8: Indicative energy consumption per cycle for the proposed energy efficiency requirements stage 1 and 2 compared to current class A thresholds



Source: Input to this impact assessment by VHK

The stage 1 minimum level EEI 68 can be achieved by most 'average' washing machines (based on conversion of 60ºC cycle data by factor 0,84). Only the largest 9kg machines cannot meet this stage 1 target (not even the 'best'). An analysis shows that probably some 15% of the models available in 2005 can not meet this target (the figure could be higher, depending on actual low power consumption values and deviation from declared values)

The second stage EEI 59 puts the threshold for the most popular machines between 'average of 2005' and 'best of 2005' (for the 5 kg machine the threshold is at class A+, at 0,17 kWh/kg). Only the smallest (below 4 kg) and the largest machines (above 6,5 kg - except 7 kg) have difficulty achieving the stage 2 target of EEI 59.

5.2 Other performance aspects

5.2.1 Water consumption

The life cycle analysis performed on washing machines (see section 2.2.3) highlighted that water consumption over the lifecycle is the highest in the use-phase. The large variation in water consumption of machines, even in the same capacity range, seems to indicate that there is scope for the setting of minimum requirements.

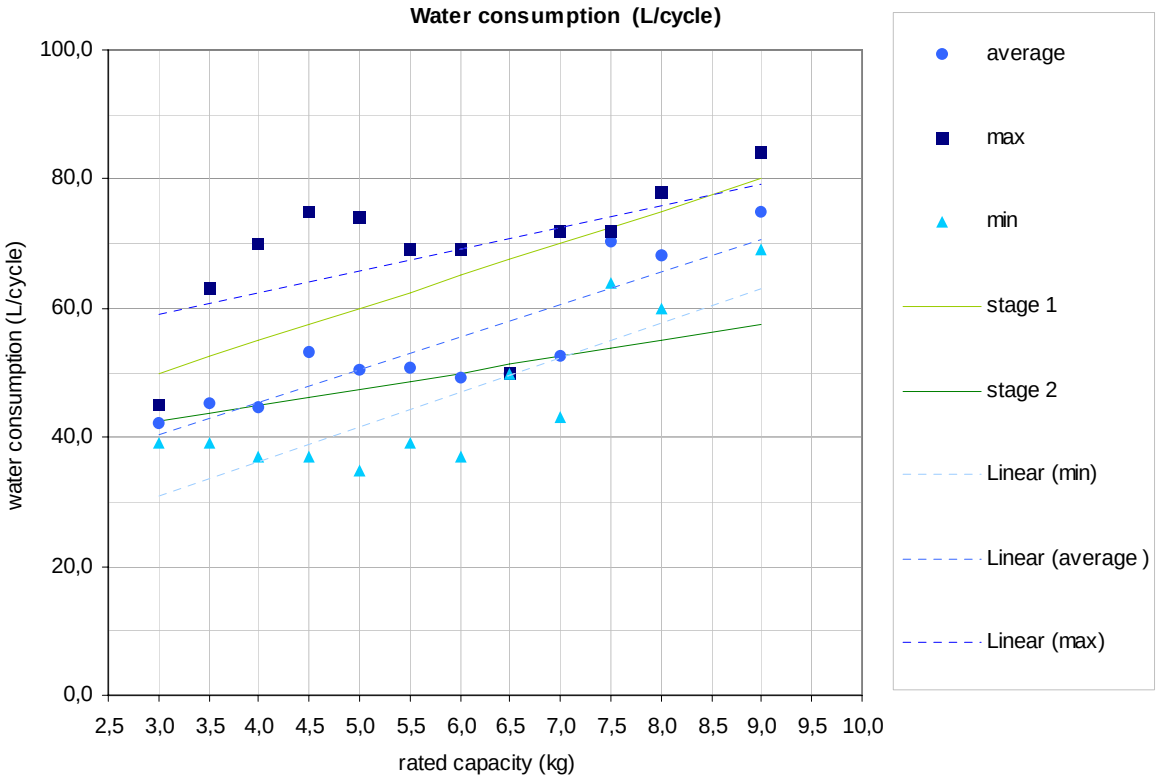
Table 9 illustrates the requirement for maximum water consumption per cycle, based on the load capacity of the washing machine (Preparatory Study Task 7, p.122).

Table 9: Requirement for maximum water consumption

Water consumption	all machines	examples
stage 1	$Wt,60 \leq 5 * c + 35$ where c is the rated capacity	for a 5 kg machines this is 60 L/cycle
stage 2	$Wt,60 \leq 5 * c\ ½ + 35$ where c ½ is the capacity for a partial load (50% of rated)	for a 5 kg machine this is 47.5 L/cycle

Figure 9 shows the water consumption of the 'worst', 'average' and 'best' washing machines from the 2005 model database, combined with the maximum consumption lines for stage 1 and 2.

Figure 9: Water consumption per cycle



Source: Input to this impact assessment by VHK

The overall impression from the figures above is that water consumption is basically linked to the size of the machine (see the trend lines), but that many exceptions to average water consumption trends occur (the 6 kg machines appears very water efficient, the 4 and 5 kg machines have an exceptionally large range, etc.).

The first stage only excludes some of the 'worst' performing machines, in order not to affect other performance aspects of average machines (i.e. rinsing performance). The second stage requirement is still achievable for most 'best' performing machines (the technology is proven). In the meantime a test standard for assessing rinsing performance can be developed.

It is noted that a significant reduction in water consumption may be achievable if and only if coupled to a rinsing performance test in order to ensure adequate rinsing.

5.2.2 Washing performance

The setting of ecodesign requirements should not adversely impact other functionalities of products as highlighted in the Ecodesign Directive. In order to avoid that the setting of tighter energy efficiency requirements have negative impacts on washing performance (given the trade-off between these performances), it is proposed to set minimum performance requirements on this parameter.

The minimum level is proposed to be set at the level which is now attainable by average machines. This coincides with washing performance class A for larger machines and washing performance class B for smaller machines (< 3kg).

Table 10: Indexes for washing performance (95/12/EC)

Washing performance	machines with c higher than 3 kg	machines with c equal or lower than 3 kg
stage 1	index Wp higher than 1,03	index Wp higher than 1,00

5.2.3 Noise emissions

There is a trade-off between noise emissions and energy efficiency; the technologies implemented to reduce noise emissions have the effect to increase the energy consumption of washing machines. At this stage, the setting of ambitious requirements with regards to the energy consumption will bring more benefits from the environmental point of view than reducing noise emissions. It is suggested therefore not to adopt minimum requirements on noise emissions within the framework of the ecodesign regulation on washing machines.

However, since consumer surveys show that noise emissions are a major concern for consumers (see Figure 3 above), it is appropriate to include noise emissions into the labelling scheme. This will give the industry strong incentives to further optimize this parameter while taking energy efficiency into account.

5.2.4 Low power modes

Few data are currently available on the actual energy consumption of low power modes. It is considered to be between 1W off mode / 2W left-on mode and 2W off mode / 3W left-on mode depending on the efficiency of the appliance.

The Preparatory Study presented the following values for low power modes (for both washing machines and dishwashers) (Task 7, p.135).

Table 11: Low power consumption by CECED and Consumer Organisations

Modes (definitions)	Average real life power consumption [W]	
	CECED	Consumer Organisations
delay-start	2.5	4.3
left-on mode (1)	1.6	3.3
off mode with functions (2)	1	2
off-mode no functions (3)	0.5	0.6

(1) considered equal to end-of-cycle mode power consumption

(2) Lot 14 estimates

(3) as defined in EuP Lot 6 study, i.e. without (safety) functions

An assessment of current dishwashers, which provides valuable input for washing machines given the similarities of the two products (but just as relevant for washing machines since these employ similar technologies), and listed on the German "ecotopten"-website (http://www.ecotopten.de/prod_spuelen_prod.php) reveals the following data (appliances

listed March 2008). Note that these data are applicable to the most efficient machines on the market today.

Table 12: Low power consumption from measurements

left-on power consumption	12 place settings	9-10 place settings
average	1.77 W	1.17 W
lowest power	0.5 W	0.1 W
highest power	3.2 W	3.0 W
% below 2 W	44%	83%
% above 2 W	34%	8%
% unknown	22%	8%
number of appliances in assessment (n=)	92 records	49 records

The data from ecotopten and consumer organisations show that a significant portion of the current market does not comply with a standby requirement of less than 2W (here interpreted as left-on mode) or off-mode of 1W (even though the CECED data seems to indicate it is possible). The conclusion is that an ecodesign-requirement for low power modes at stage 1 should be considered not feasible.

The introduction of a requirement for low power at stage 2 (minimum 4 to 6 years after entry into force) could be considered since many appliances today already meet the foreseen requirement - i.e. the technology is proven. The effects on purchase price have not been assessed.

However, the inclusion of low power modes in the calculation of the annual energy consumption is an effective solution to achieve improvements right after stage 1 and provides manufacturers with incentives to address cycle energy consumption together with low power consumption. It is to be expected that the inclusion of low power consumption in the calculation of the EEI in stage 1 thus renders the introduction of low power requirements at stage 2 less effective since progress (i.e. reduced low power consumption) is likely to take place.

The preparatory study assumed an average of 12 kWh/year for the energy consumption of low power modes. This would increase the total annual energy consumption (at 220 cycles per year) of the 5.36 kg base case with 5,5% (Note: the effect of the low power mode on total annual consumption is larger if the washing machine capacity is smaller).

5.3 Overview

Table 13: summary of Ecodesign requirements of the proposals

	Proposal	
	Proposal A	Proposal B
Energy stage 1	2011: EEI ≤ 68	2011: EEI ≤ 68
stage 2	2015: EEI ≤ 59	2013: EEI ≤ 59
Verification	step 1. max. +10% above declared for single appliance step 2: max. +10% above declared for average of three	

Water	stage 1: 5*c + 35 stage 2: 5*c ½ + 35

Washing	at stage 1: minimum class A for c > 3kg and B for c ≤ 3kg

Spin drying	(no ecodesign requirement)

Noise	(no ecodesign requirement)

Table 14: Overview of label information

		kWh/cycle (**indicative**, for a 5,5 kg machine, based on 3+2+2 cycles)
Label classes	EEI	
A2	45	0.809
A1	52	0.704
A	59	0.612
B	68	0.533

Water consumption	shown as before (L/cycle)
Washing performance	(removed from label, deemed unnecessary)
Spin drying performance	shown as before indication of spin speed (rpm) removed
Noise emission	shown as before

6. COMPARING THE OPTIONS

This section looks into the impacts of the proposed policy options (two variants corresponding to two implementation dates) for a combined introduction of ecodesign requirements and revision of the labelling scheme.

The assessment is done with a view to the criteria set out in Article 15(5) of the Ecodesign Directive. The aim is to find a balance between the quick realization of the appropriate level of ambition and the associated benefits for the environment and the user (due to reduction of life cycle costs) on the one hand, and potential burdens related e.g. to unplanned redesign of equipment for achieving compliance with ecodesign requirements on the other hand. The proposal should avoid negative impacts for the user, in particular as related to affordability and functionality.

In order to assess the impact of the policy options, the following factors are taken into account:

1. Economic impacts

Savings:

– annual electricity cost savings in 2020

– accumulated electricity cost savings

Costs:

– possible additional costs related to the improved technology, e.g. for additional and/or more expensive components (not depending on sub-option)

– re-design of products currently not compliant to the proposed requirements (depending on sub-options)

– assessment of conformity with ecodesign requirements and re-assessment of conformity with further requirements (safety etc.; depending on sub-options)

– possible reorganization of the supply chain (depending on sub-options)

2. Social impacts

– jobs related to the production/sales of affected equipment (depending on sub-options)

– affordability of equipment (not depending on sub-options, see below)

3. Environmental impacts

– annual electricity savings and reduction of CO_2 emissions in 2020

– accumulated electricity savings and reductions of CO_2 emissions

The impacts of the proposals are assessed against a baseline scenario which describes the impacts in case the Commission decides not to put forward any measures.

– Since 90% of appliances were already in class A in 2005 (of which 38% class A+, see table 1), no further energy improvement are expected beyond that class. It is thus assumed in the baseline scenario that no new technologies will penetrate the market and that 60% of appliances will be in class A and 40% in class A+ in 2010 to 2025.

– Real life use of modern day washing machines leads to lower electricity consumption than tested. A correction factor of 0.69 is therefore applied to the standardised measured energy consumption of the stock model in order to reflect real life consumption of washing machines[39].

6.1 Economic impact

6.1.1 Energy savings

Section 5 identified two sub-scenarios as follows (assuming the proposal is adopted in 2009).

Table 15: Proposal - timing for stage 1 and 2

Energy efficiency requirements	Proposal A	Proposal B
Stage 1	2011: EEI $\leq$ 68	2011: EEI $\leq$ 68
Stage 2	2015: EEI $\leq$ 59	2013: EEI $\leq$ 59

The table and graphs below show the electricity consumption of the two sub-scenarios compared with the baseline scenario. The savings in 2020 and 2025 will be reached by reducing both the cycle energy consumption and the low power consumption (lower total annual energy consumption).

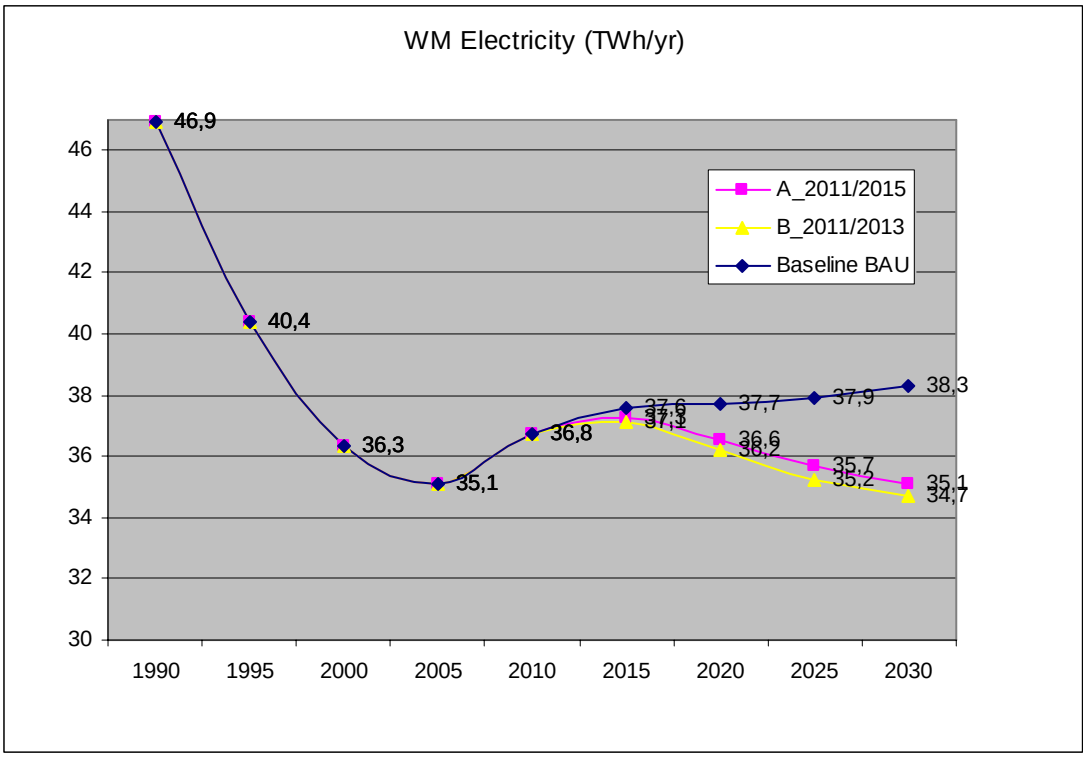
Table 16: Stock model electricity consumption and savings vs. BaU (savings are given in negative numbers)

Scenario	Total electricity consumption (stock)						Savings 2020 vs BaU		Savings 2025 vs BaU	
	Unit	2005	2010	2015	2020	2025	TWh/y	%	TWh/y	%
BaU	TWh/y	35,1	36,8	37,6	37,7	37,9	ref	ref	ref	ref
Proposal A	TWh/y	35,1	36,8	37,3	36,6	35,7	-1,2	-3,1%	-2,2	-5,9%
Proposal B	TWh/y	35,1	36,8	37,1	36,2	35,2	-1,5	-3,9%	-2,7	-7,1%

Source: input to this impact assessment by VHK

[39] The overall factor is 0,72, but this includes 0,03 low power consumption as well (see Task 5, p. 39), which in the scenario analysis is already contained in the annual unit energy consumption. The 0,69 applies to figures from 2005 and beyond. Before 2005 the value is higher (starting with factor 1,00 in 1970) since higher washing temperatures were used in real life.

Figure 10: Electricity consumption according the scenarios



The most important conclusions are that:

- the impact of the BaU scenario, going from an electricity consumption of 35.1 TWh/y in 2005 to 37,7 TWh/y in 2020 (+7%) is the most significant influence on the overall energy consumption of washing machines[40]. This slow increase is mainly due to growing stock (167 million in 2005 to 201 million in 2020, an increase of 20%). If we consider that the stock has grown by 20% and the consumption by 7 % the average appliance in stock has become some 13% more efficient.

- the policy variants A and B are very close to each other and offer a saving of up to 3.1%, and 3,9% in 2020 respectively;

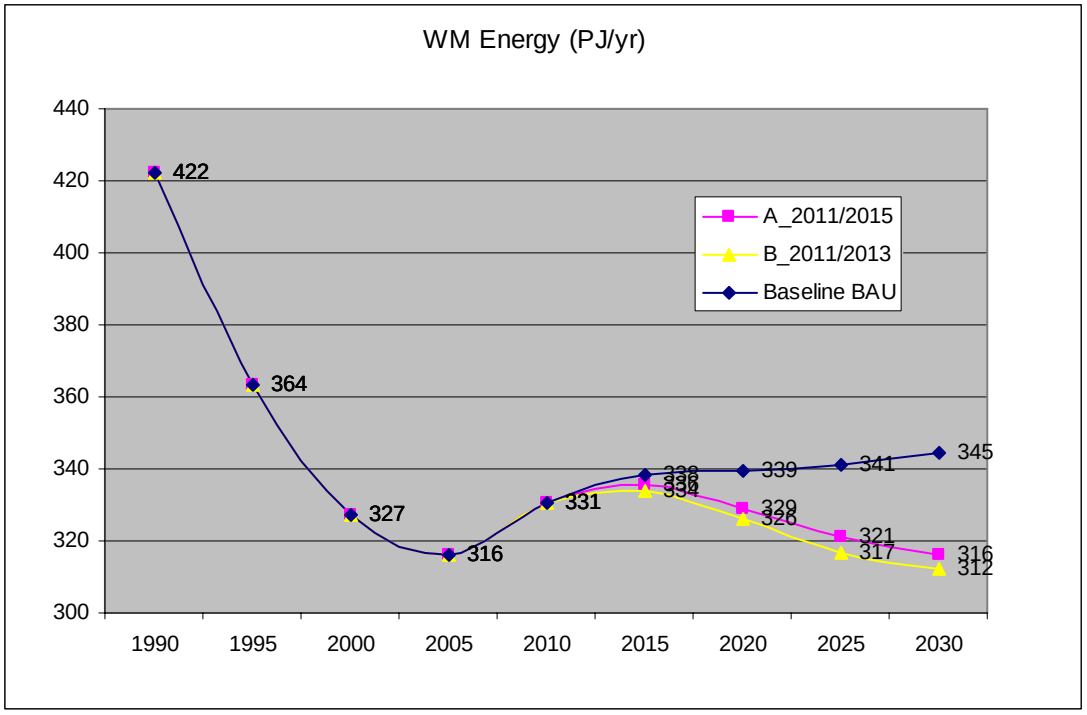
- the scenario based on Proposal B brings the highest savings, but the difference with proposal A is limited (0.8% in 2020).

Annual electricity cost-savings in 2020 and the accumulated savings over the 2010-2020 period as well as the 2010-2025 period are given in the summary Tables 17 to 20 at the end of this chapter.

The graph below presents the electricity consumption as primary energy equivalents (9 PJ = 1 TWh electric). This is a more common unit for Security of Energy Supply considerations and enables a direct comparison with the impacts of non-electric appliances (e.g. fossil fuel fired boilers, water heaters, etc.).

[40] EU-27 electricity final demand without the energy sector was 2755 TWh in 2005. With distribution losses, final demand was 3106 TWh in the same year.

Figure 11: Energy consumption (primary) according to the scenarios (values relate to A_2015)



6.1.2 Impact on consumers

Figure 12 shows the annual EU-27 total expenditure on domestic cold appliances, i.e. in purchase costs and discounted running costs (more than 95% of which are electricity costs and the rest repairs and maintenance). Water costs are listed separately in the overview tables.

The electricity rate is calculated on the basis of an annual price increase of 2% and the water rate is calculated on the basis of an annual price increase of 1%. All costs listed (purchase, electricity, water) take into account a discount rate of 2%, where the discount rate equals the annual interest rate (4%) minus inflation (2%).

For purchase price and maintenance costs, the data from the preparatory study are used as starting values for the BaU scenario (anchor year 2005). The average weighted purchase price (incl. VAT) is € 443,50/unit. For the average annual price decrease a figure of 2.2% was applied (Task 7, par. 7.4.2.1).

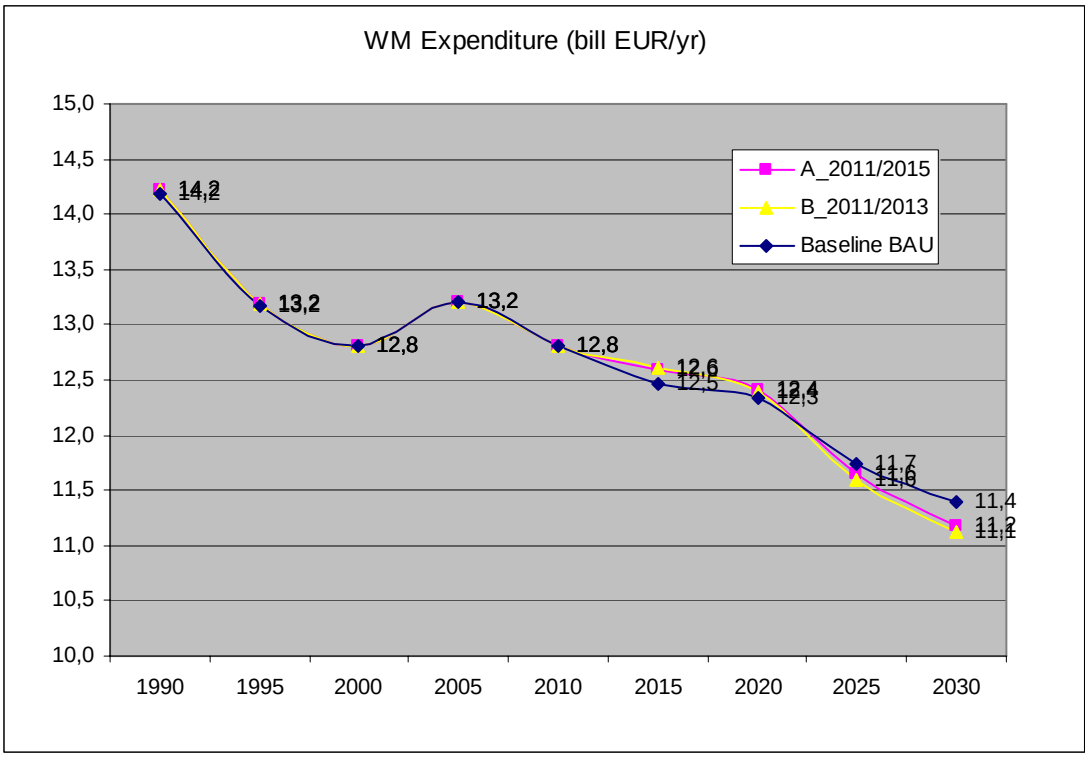
On average the cost of saving 1 kWh/yr translates in an average consumer purchase cost increase of €1.04 between the Base Case and the LLCC point.

The product life of washing machines is on average 15 years. The electricity rate is € 0,17/kWh (household tariff including taxes) with an annual increase of 2% over the scenario-period.

In accordance with the MEEUP study, the discount rate was set at 2%, derived from interest rate (4%) minus inflation (2%).

Annual maintenance and repair costs were set at €5,5/unit per year, equivalent to one or two repairs over product life (Task 6, par. 6.4.3.1).

Figure 12: Expenditure according the scenario's (electricity only)



The trend in consumer expenditure (inflation corrected) shows a steady decrease due to increased efficiency of the stock. The policy options show no significant difference from the BAU scenario.

If the price decrease through rationalisation is included then the projected average purchase price of a washing machine in the scenario Proposal A and B in 2020 is estimated to be 4% higher than in the business as usual scenario (€ 338- €340 vs. € 324)[41]; for this money the consumer should get an appliance that uses -7 to 8% less energy (244-241 versus 263 kWh/year - new appliance, uncorrected for real life consumption) in 2020.

6.1.3 Impact on manufacturers

Impact on turnover

The impact of BaU and Policy scenarios on the turnover of stakeholders has been calculated from the (increase in) product prices and partitioned as follows:

– The manufacturing selling price (MSP, excl VAT) is estimated to be 33.3% of the consumer price (incl VAT).

– Wholesalers add a mark-up of 26% on the MSP.

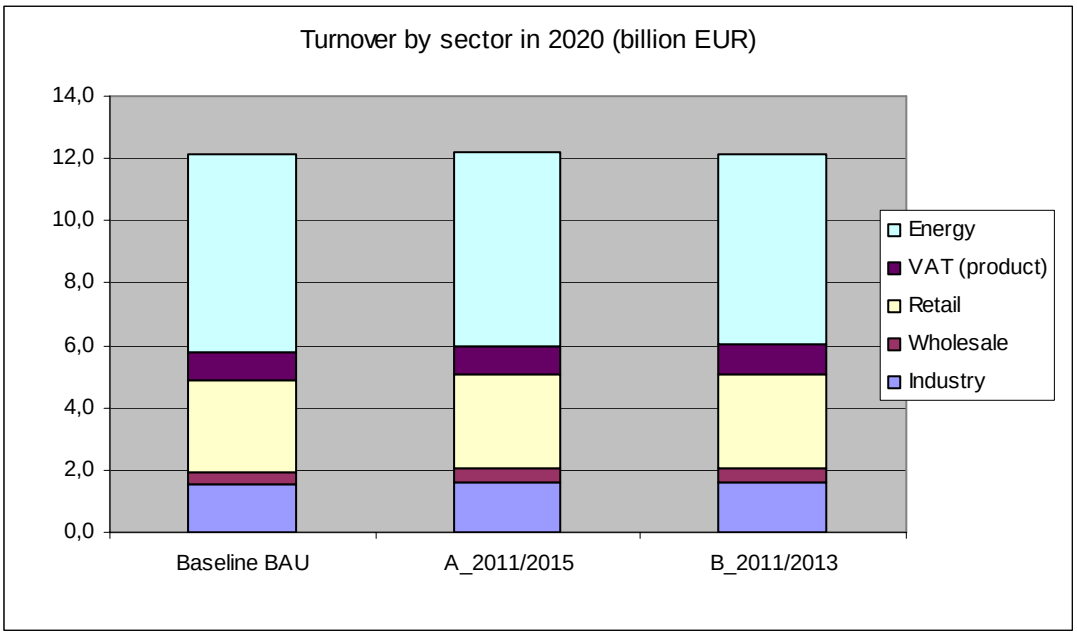
– Retail margin is estimated at 100% on the wholesale price.

[41] Calculated in Euro 2005, corrected for inflation, interest, production cost reduction through rationalisation. Prices are consumer prices including VAT.

– VAT (Value Added Tax) is estimated at 19% of the retail price.

This estimate is the best available and was checked against other sources. Local levies and recycling contributions were not taken into account for lack of specific data. The turnover of the total washing machine market per sector is presented below.

Figure 13: Turnover according the scenarios



Costs of testing

Energy efficiency will be tested according to EN 60436, based on current practice of a system of self-declaration in combination with spot-checks by the authorities. Since washing machines already have to be tested because of the labelling scheme, no extra costs are expected to occur.

6.1.4 Impact on trade

The requirements proposed are based on a technical, environmental and economic analysis, which was carried out in preparation of the draft regulation in full transparency with participation of stakeholders from around the world (reports available on http://www.ecowet-domestic.org). In addition, the most important EU-manufacturers are global players so that their consultation has ensured that EU ambition is in line with global developments. Before the proposed Regulation on ecodesign is adopted by the Commission a notification under WTO-TBT will also be issued.

Competitive disadvantages for EU manufacturers exporting wet appliances to third countries are not expected (on the contrary, leadership in efficient appliances would be reinforced). The revised labelling Directive, which is proposed for adoption simultaneously to the ecodesign requirements, will improve the competitiveness of the industry by giving value to more energy efficient appliances on the market: it will enable the industry to get better return on their investments in energy efficiency. In addition, the dates set for the implementation of mandatory requirements take into account the design cycle of the appliances and transition

period are set to leave manufacturers enough time to adapt their production to the requirements.

The foreseen requirements seem a logical step considering a history of Voluntary Commitments by industry that served similar purposes (removing least efficient models from the market). In that sense the requirements are no new "barriers" or burden on the EU industry. The Voluntary Commitments were signed by many manufacturers and importers active in the EU market, including many that have production facilities outside the EU borders.

The requirements of the regulation apply to all equipment independent from the origin of the equipment, thus ensuring that a level-playing field is achieved.

6.1.5 Administrative burden

The form of the proposed ecodesign legislation is a Regulation which is directly applicable in all Member States. The costs for national and EU administrations for transposition of the implementing legislation into national legislation is therefore limited. The Regulation also ensures timely and a harmonized entry into force in the internal market.

Awaiting the adoption of the proposed recast of the 1992/75/EEC Directive, the revision of the labelling scheme has to take the form of a Directive.

In terms of conformity assessment, there are no extra costs with respect to the current situation, where market surveillance is required to check compliance with the labelling Directive 95/12/EC. Proposal A and B entail a different calculation of the reference consumption of the most popular washing machines and may require some extra market surveillance in the first years after entry into force to ensure that the market follows the new rules correctly, but they should remain marginal compared to the current situation.

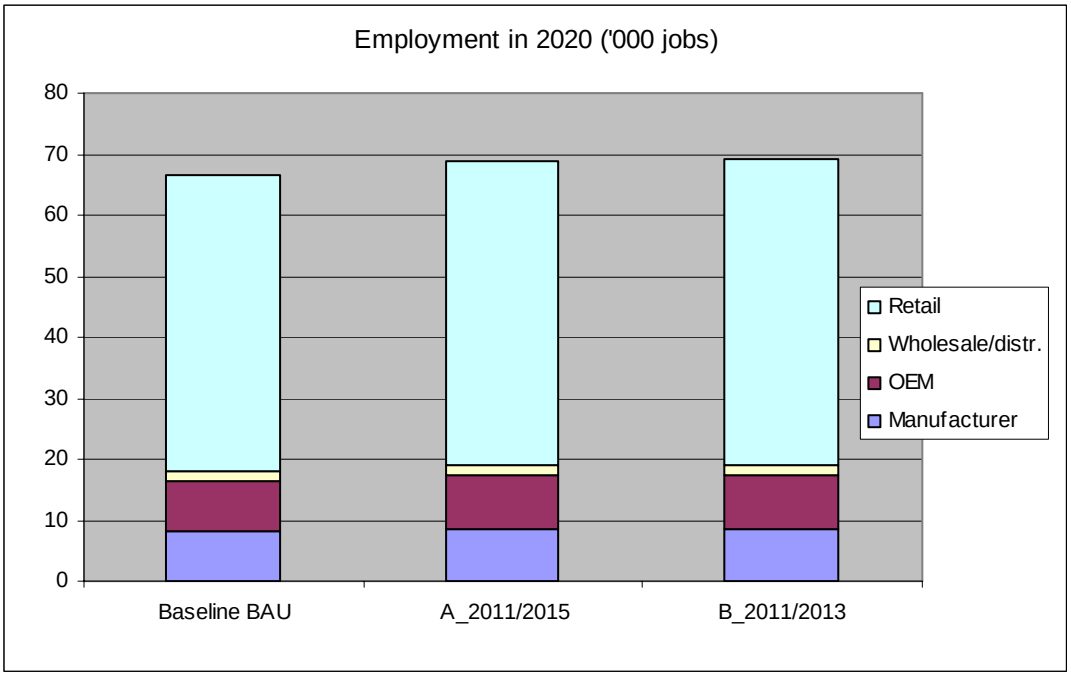
6.2 Social impact

Employment impacts were calculated on the basis of the average turnover per employee in the sector and the order of magnitude of the outcomes was checked against annual reports from individual companies. The applicable rate for industry is €188.000/employee in manufacturing and an OEM share (Original Equipment Manufacturer, i.e. the suppliers of compressors, foam, etc) that is equal to manufacturing.

In the wholesale sector a rate of €250.000,-/employee was applied and for white good retailers €60.000 per employee was taken as a basis. The number of jobs creation then follows from the expected product price increase and resulting increase in turnover due to the policy measures.

Job creation results from the application of design options needed to reach LLCC levels (and beyond) which require more R&D efforts as well as more labor- and capital intensive production. Furthermore job creation is expected in the sales/retail sectors due to increase of sales.

Figure 14: Employment according the scenarios

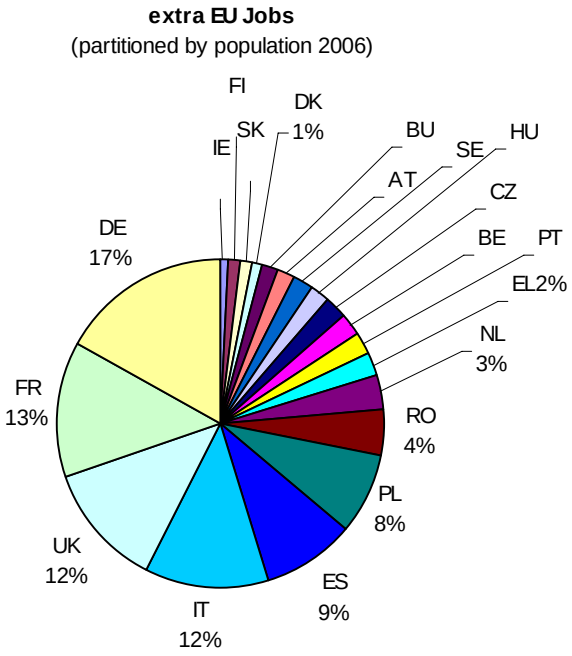


Overall, the graph shows that the difference in employment between the two variants is minimal.

The BaU scenario itself keeps employment at its current level, i.e in line with population growth but with strict pressure on prices. In this scenario the 2020 washing machine industry would employ around 17.000 persons (50/50 in manufacturing and OEM) and the wholesale/retail sector would employ around 51.000 persons.

Both policy scenarios give an employment increase of around 1%, creating some thousand new jobs compared to the BaU scenario. Considering that half of the OEM-jobs and 20% of manufacturing jobs would be outside the EU27, the EU employment would be at the most around a thousand jobs. Figure 16 shows a job distribution partitioned by population. In reality, although we have no exact data to make a quantitative estimate, Eastern European Member States –with their relatively higher retail and production plant density—will profit relatively more from any job creation for this product group.

Figure 15: EU distribution employment

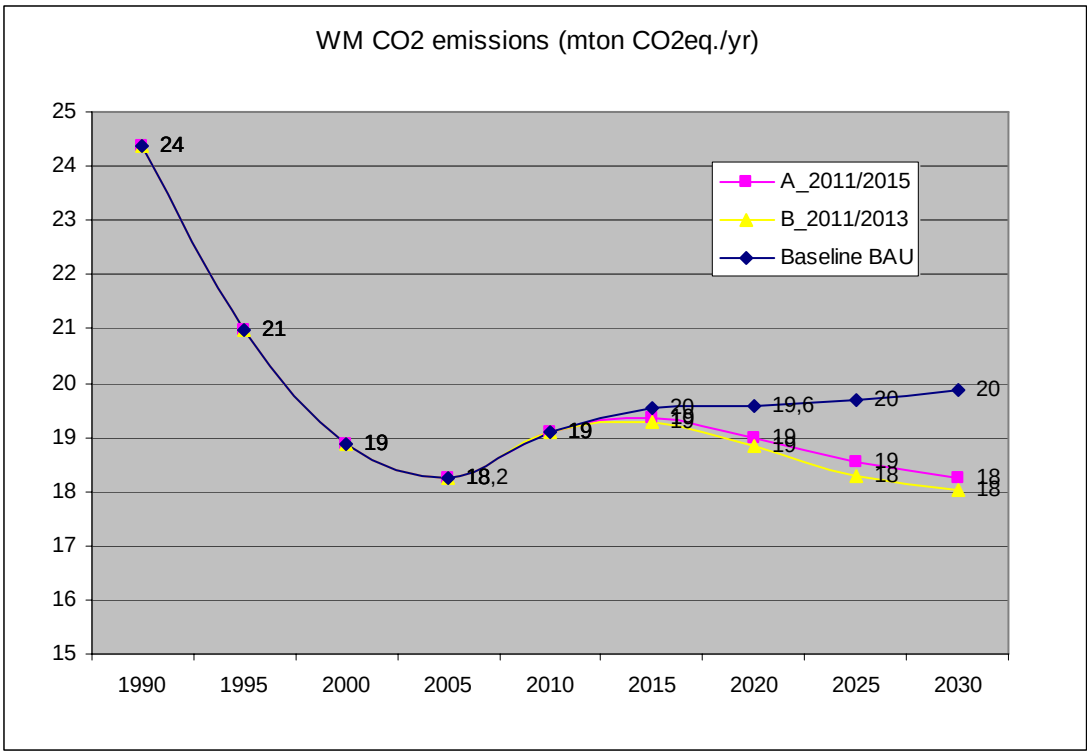


6.3 Environmental impact

6.3.1 Greenhouse gas emissions

The environmental impact in terms of greenhouse gas emissions is illustrated in the figure below.

Figure 16: Environmental impact (CO2 emissions) according to the scenarios



The reduction of carbon emissions is reflecting the reduction in electricity consumption, as the latter determines over 98% of carbon emissions.

The most effective scenario (proposal B with stage 2 in 2013) reaches a saving of around 0.8 Mt CO_2 equivalent with respect to the business as usual scenario in 2020 (3.9% saving)[42].

Scenario (proposal A with stage 2 in 2015) reaches a saving of around 0.6 Mt CO_2 equivalent with respect to the business as usual scenario in 2020 (3.1% saving) [43] .

Annual carbon emission savings in 2020 and the accumulated savings over the 2010-2020 as well as the 2010-2025 periods are given in the summary tables 18 to 21 at the end of this chapter.

6.3.2 Water consumption

The water consumption according the Baseline scenario was 2213 million m3/y in 2005, decreasing to 2051 million m3/y in 2020 (-10% of 2005) and 2061 million m3/y in 2025 (-7% of 2005). Proposal A reduces this to 1987 million m3 in 2020 (-3% of BAU 2020) and proposal B reduces this to 1968 million m3 (-4% of BAU 2020). In 2025 the reductions compared to Baseline are respectively -6% and -7%.

The Matrices below (Tables 17 to 20) give an overview of impacts versus objectives and boundary conditions. The first two matrices show the annual impacts of the BaU scenario and the two sub-options for 2020 and 2025. The last two matrices show the accumulative impacts

[42] At 0,458 kg CO2 eq/kWh electricity (source: VHK, MEEUP Report, Nov. 2005)
[43] At 0,458 kg CO2 eq/kWh electricity (source: VHK, MEEUP Report, Nov. 2005)

and savings of the BaU scenario and the two sub-options for the periods 2010-2020 and 2010-2025 respectively.

Table 17: Main annual impacts by 2020

MAIN IMPACTS 2020			Scenario's 2020		
			1	2	3
IMPACTS (as Art. 15, sub. 4.e. of 2005/32/EC)			**BAU**	**A_2011/2015**	**B_2011/2013**
ENVIRONMENT					
	ELECTRICITY	TWh/a	**37,7**	**36,6**	**36,2**
	ENERGY	PJ/a	**339**	**329**	**326**
	GHG	Mt CO2 eq./a	**20**	**19**	**19**
	WATER (use phase)	million m3	**2051**	**1987**	**1968**
CONSUMER					
EU totals	expenditure	€ bln./a***	**12,3**	**12,4**	**12,4**
	purchase costs	€ bln./a	4,8	5,1	5,1
	running costs	€ bln./a	7,5	7,4	7,3
	water costs (use phase)	€ bln./a	7	6	6
per product	product price	€	324	338	341
	install cost	€	0	0	0
	energy costs	€ /a	31	28	28
	payback(SPP)	years	reference	**6,4**	**6,4**
BUSINESS					
EU turnover	manuf	€ bln./a	**1,6**	**1,6**	**1,6**
	whole-sale	€ bln./a	**0,4**	**0,4**	**0,4**
	instal / retail / maintenance	€ bln./a	**2,9**	**3,0**	**3,0**
EMPLOYMENT					
employ-ment (jobs)	industry EU (incl OEM)	'000	12,4	12,9	13,0
	industry non-EU	'000	4,1	4,3	4,3
	whole-sale	'000	1,6	1,7	1,7
	retail	'000	48,6	50,0	50,2
	TOTAL	'000	**66,7**	**68,9**	**69,3**
	of which EU	'000	62,6	64,6	64,9
	EXTRA EU jobs	'000	reference	**2,03**	**2,35**
	of which SME		reference	1	2
***=all money amounts in Euro 2005 (inflation corrected)					
BOUNDARY CONDITIONS ("should be no negative impacts")					
			Scenario's 2020		
			1	**2**	**3**
IMPACTS "No negative impacts" following Art. 15, sub 5 of 2005/32/EC			**BAU**	**A_2011/2015**	**B_2011/2013**
functionality of product				**+**	**+**
health, safety and environment				**+**	**+**
affordability and life cycle costs				**+**	**+**
industry competitiveness				**+**	**+**
no proprietary technology				**+**	**+**
no excessive administrative burden				**+**	**+**

Table 18: Main annual impacts by 2025

MAIN IMPACTS 2025			Scenario's 2025		
			1	2	3
IMPACTS (as Art. 15, sub. 4.e. of 2005/32/EC)			**BAU**	**A_2011/2015**	**B_2011/2013**
ENVIRONMENT					
	ELECTRICITY	TWh/a	**38**	**36**	**35**
	ENERGY	PJ/a	**341**	**321**	**317**
	GHG	Mt CO2 eq./a	**20**	**19**	**18**
	WATER (use phase)	million m3	**2061**	**1939**	**1913**
CONSUMER					
EU totals	expenditure (excl. water)	€ bln./a***	**11,7**	**11,6**	**11,6**
	purchase costs	€ bln./a	4,2	4,4	4,5
	running costs (excl.water)	€ bln./a	7,5	7,2	7,1
	water costs (use phase)	€ bln./a	6	6	6
per product	product price	€	290	306	308
	install cost	€	0	0	0
	energy costs	€ /a	31	28	28
	payback(SPP)	years	reference	**5,7**	**5,7**
BUSINESS					
EU turnover	manuf	€ bln./a	**1,3**	**1,4**	**1,4**
	whole-sale	€ bln./a	**0,3**	**0,4**	**0,4**
	retail	€ bln./a	**2,7**	**2,8**	**2,8**
EMPLOYMENT					
employ-ment (jobs)	industry EU (incl OEM)	'000	11	11	11
	industry non-EU	'000	4	4	4
	whole-sale	'000	1	1	1
	retail	'000	44	46	46
	TOTAL	'000	**60,1**	**62,5**	**62,8**
	of which EU	'000	56	59	59
	EXTRA EU jobs	'000	reference	**2,2**	**2,5**
	of which SME**		reference	2	2
***=all money amounts in Euro 2005 (inflation corrected)					
BOUNDARY CONDITIONS ("should be no negative impacts")					
			Scenario's 2025		
			1	**2**	**3**
IMPACTS "No negative impacts" following Art. 15, sub 5 of 2005/32/EC			**BAU**	**A_2011/2015**	**B_2011/2013**
functionality of product				**+**	**+**
health, safety and environment				**+**	**+**
affordability and life cycle costs				**+**	**+**
industry competitiveness				**+**	**+**
no proprietary technology				**+**	**+**
no excessive administrative burden				**+**	**+**

Table 19: Accumulative main impacts 2010-2020

Totals			**Scenario's 2020**		
			1	**2**	**3**
IMPACTS (as Art. 15, sub. 4.e. of 2005/32/EC)			**BAU**	**A_2011/2015**	**B_2011/2013**
ENVIRONMENT					
	ELECTRICITY	TWh/a	**412**	**407**	**406**
	GHG	Mt CO2 eq./a	**214**	**212**	**211**
	WATER (use phase)	million m3	**22971**	**22703**	**22591**
CONSUMER					
EU totals	expenditure (excl.water)	€ bln./a***	**137,9**	**138,8**	**138,9**
	purchase costs	€ bln./a	56,0	57,3	57,7
	running costs (excl.water)	€ bln./a	81,9	81,4	81,1
	of which electricity	€ bln./a	70	69	69
	water costs (use phase)	€ mln./a	77	76	76
BUSINESS					
EU turnover	manuf	€ bln./a	**18,4**	**18,8**	**19,0**
	whole-sale	€ bln./a	**4,8**	**4,9**	**4,9**
	retail	€ bln./a	**33,4**	**34,0**	**34,1**
Savings vs. Baseline			**Scenario's 2020**		
			1	**2**	**3**
IMPACTS (as Art. 15, sub. 4.e. of 2005/32/EC)			**BAU**	**A_2011/2015**	**B_2011/2013**
ENVIRONMENT					
	ELECTRICITY	TWh/a	**ref**	**5**	**6**
	GHG	Mt CO2 eq./a	**ref**	**2**	**3**
	WATER (use phase)	million m3	**ref**	**268**	**380**
CONSUMER					
EU savings	expenditure	€ bln./a***	**ref**	**-1**	**-1**
	purchase costs	€ bln./a	**ref**	**-1**	**-2**
	running costs	€ bln./a	**ref**	**0**	**1**
	of which electricity	€ bln./a	**ref**	**1**	**1**
	water (use phase)	€ bln./a	**ref**	**1**	**1**
BUSINESS					
EU savings	manuf	€ bln./a	**ref**	**0**	**-1**
	whole-sale	€ bln./a	**ref**	**0**	**0**
	retail	€ bln./a	**ref**	**-1**	**-1**
***=all money amounts in Euro 2005 (inflation corrected)					

Table 20: Accumulative main impacts 2010-2025

Totals			**Scenario's 2025**		
			1	**2**	**3**
IMPACTS (as Art. 15, sub. 4.e. of 2005/32/EC)			**BAU**	**A_2011/2015**	**B_2011/2013**
ENVIRONMENT					
	ELECTRICITY	TWh/a	**601**	**587**	**584**
	GHG	Mt CO2 eq./a	**312**	**305**	**303**
	WATER (use phase)	million m3	**33243**	**32489**	**32259**
CONSUMER					
EU totals	expenditure (excl.water)	€ bln./a***	**197,7**	**198,5**	**198,4**
	purchase costs	€ bln./a	78,2	80,7	81,3
	running costs (excl.water)	€ bln./a	119,4	117,7	117,1
	of which electricity	€ bln./a	102	100	99
	water costs (use phase)	€ bln./a	109	107	106
BUSINESS					
EU turnover	manuf	€ bln./a	**25,5**	**26,3**	**26,5**
	whole-sale	€ bln./a	**6,6**	**6,8**	**6,9**
	retail	€ bln./a	**47,2**	**48,2**	**48,4**
Savings vs. Baseline			**Scenario's 2025**		
			1	**2**	**3**
IMPACTS (as Art. 15, sub. 4.e. of 2005/32/EC)			**BAU**	**A_2011/2015**	**B_2011/2013**
ENVIRONMENT					
	ELECTRICITY	TWh/a	**ref**	**14**	**17**
	GHG	Mt CO2 eq./a	**ref**	**7**	**9**
	WATER (use phase)	million m3	**ref**	**755**	**984**
CONSUMER					
EU savings	expenditure	€ bln./a***	**ref**	**-1**	**-1**
	purchase costs	€ bln./a	**ref**	**-2**	**-3**
	running costs	€ bln./a	**ref**	**2**	**2**
	of which electricity	€ bln./a	**ref**	**2**	**3**
	water (use phase)	€ bln./a	**ref**	**2**	**3**
BUSINESS					
EU savings	manuf	€ bln./a	**ref**	**-1**	**-1**
	whole-sale	€ bln./a	**ref**	**0**	**0**
	retail	€ bln./a	**ref**	**-1**	**-1**
***=all money amounts in Euro 2005 (inflation corrected)					

Conclusion

Sub-options B lead to additional savings compared to sub-option A. However, it leads to higher compliance costs due to an earlier introduction of phase 2.

The analysis demonstrates that the appropriate policy options for realizing the environmental improvement potential of washing machines is the combined introduction of ecodesign requirements and a revision of the labelling scheme in two stages (one year and four years after entry into force). This approach ensures that:

– no high energy consuming washing machines will be placed on the market and competition will continue to operate on energy efficiency and not only price;

– on-going energy improvements are maintained and fostered by setting a transparent legislative framework that will provide the industry with the long-term security they need to invest in innovative technology;

– fair competition and product differentiation continues to operate on energy improvements by providing consumers with an effective and reliable tool to compare energy consumption of products in a contest for strong market demand for energy efficient appliances;

– by 2020, a 3-4 % absolute electricity saving (i.e. 1,2 to 1,5 TWh/y) can be achieved versus the Business-as-usual scenario in 2020. Due to the market inertia (i.e. full replacement of old models by new types takes about 15 years), the effects of the new measures up to 2020 will be very limited with respect to the baseline scenario but in 2025 the savings will increase to 6-7% (i.e. 2,3 to 2,7 TWh/y);

– between 64 and 83 million m3/y water is saved during the use phase compared to the BaU scenario

– more energy consuming products are quickly removed from the market securing electricity and CO_2 savings in the EU, while reducing the life-cycle costs of these devices for consumers. Calculated in Net Present Value (Euro 2005) the consumer expenditure –i.e. the annual purchase and running costs of the EU27 population- will drop from around € 13,2 bln. today to € 12,3 bln. in 2020 and approximately € 11,7 bln. in 2025 (mainly due to increased efficiency of stock, BAU scenario). The difference of expenditure with the proposals is minimal.

– a level playing field for all manufacturers is guaranteed, ensuring fair competition and free circulation of products;

– disproportionate burdens for manufacturers are avoided due to transitional periods which duly take into account redesign cycles.

The question of the proportionality of the measures in terms of administrative burden compared to the apparently limited achievable energy savings (1,5 TWh by 2020 compared to the BaU) may be raised. However, one should consider first that the savings resulting from the implementing measures will take time to occur given the strong market inertia of this sector so that the full impact of the measures will be ripped only by 2025-2030. In addition, the 'no EU action' (i.e. current labelling scheme without revision and no adoption of eco-design requirements) discussed in the policy options was strongly rejected by the industry and a majority of Member States on the ground that it would deprive the industry from a

marketing tool necessary to get return on investments in innovations. Finally, it might have a negative impact on the public opinion which is used to the labelling scheme and welcomed it as a very useful tool provided by the European Union. Consumers are likely not to understand why they are deprived from a very popular purchasing tool which enables them to get access to fair, reliable and comparable information on the performance of products.

Domestic washing machines have been regulated (by the energy label) since the last 12 years leading to an energy efficiency improvement of close to 24%. The aim of the proposed implementing measures is to maintain this momentum towards further energy reduction. A potential for further reduction of the annual energy consumption and carbon emissions by 33% compared to the 1990 level (the reference for the climate policy) was estimated.

The biggest threat to success is that the legislator does not adopt ecodesign requirements and revise the labelling scheme according to the market dynamics. It could lead to consumers no longer being able to differentiate on energy efficiency because all models are in the same labelling class, the retailers not seeing the point of broadly showing the energy label, authorities not being able to promote the most efficient models and the industry no longer motivated to invest in more efficient appliances.

7. MONITORING AND EVALUATION

The main monitoring element will be the tests carried out to verify correct rating and labelling. Monitoring of the impacts on appliances should be done through market surveillance carried out by Member State authorities ensuring that the rating declared is truthful. Effective market shift towards upper labelling band will be the main indicator of progress towards market take-up of more efficient washing machines.

The appropriateness of scope, definitions, concept and possible trade-offs will be monitored by the ongoing dialogue with stakeholders and Member States. The main issues for a possible revision of the proposed labelling scheme are:

– improved test standards (mandate CEN/ CENELEC) and measurement accuracy;

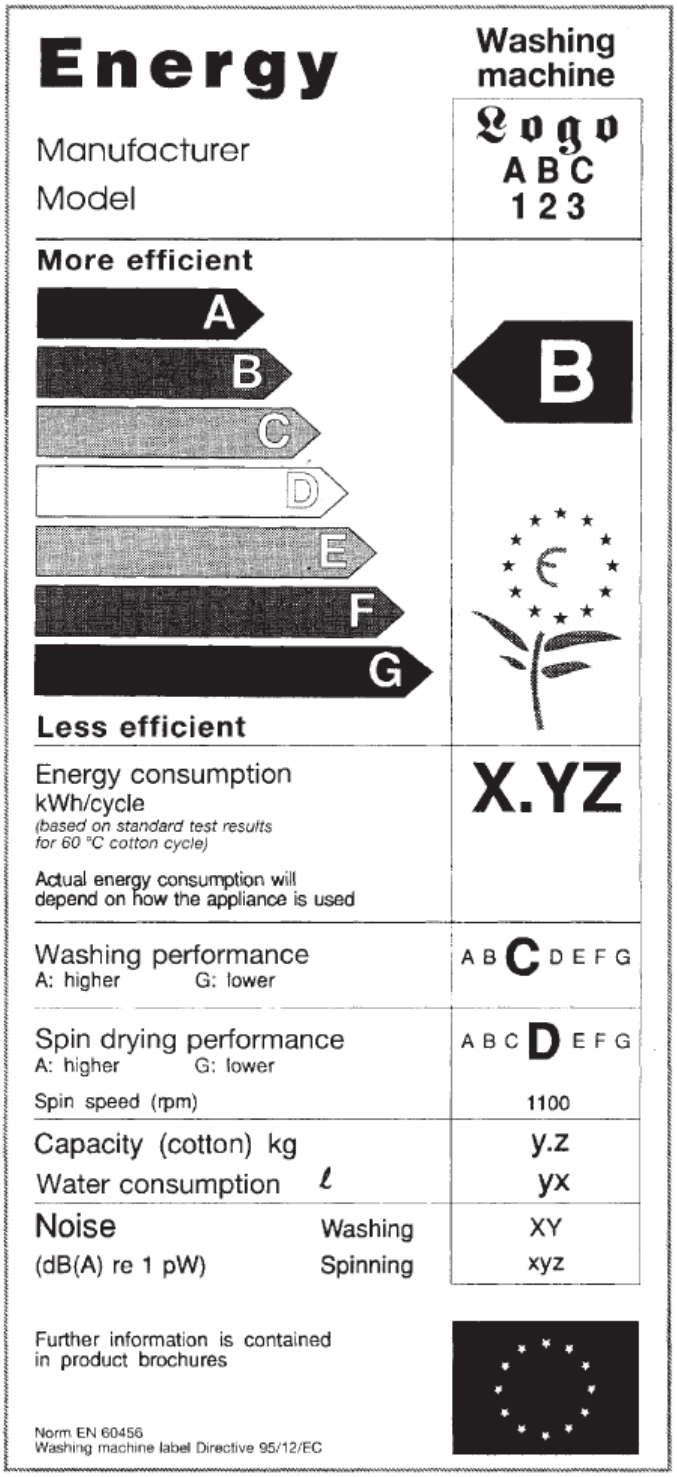
– necessity to revise the energy efficiency classification scheme according to technological improvements;

– implementation of more demanding minimum requirements.

Taking into account the time necessary for collecting, analysing and complementing the data and experiences related to the implementation of the labelling scheme and assess technological progress, a review of the main elements of the framework could be presented five years after entry into force of a labelling scheme.

Annex I

Washing machine Energy Label (95/12/EC)



Annex II
Baseline scenario

The Baseline scenario describes the impacts of the 'no action' policy. The Baseline scenario however shares a lot of main input values with the other policy scenarios. This Annex describes these shared assumptions and values.

Table 18: Sales and resulting stock

	1990	1995	2000	2005	2010	2015	2020	2025
Sales ('000, rounded to nearest 500.000)	9000	10000	11500	14000	13000	13500	14000	13500
Stock ('000, rounded to nearest 1.000.000)	119000	131000	146000	167000	186000	197000	201000	203000

The calculation of the stock is based on a product life of 15 years.

Table 19: Historical and expected energy and water consumption (new appliances, 12 place settings).

	1990	1995	2000	2005	2010	2015	2020	2025
	Historical / BAU							
Energy (kWh/cycle)	1.35	1.18	1.08	1.00	0.96	0.94	0.93	0.91
Corrections	to correct by 1,10 (from declared to real) to correct by 1 (1980) to 0.69 (2005 and beyond) for real-life consumption correction (lower washing temperatures) Annual cycles in scenario-analysis: 234 cycles/year (4,5 cycles/week) to add low power consumption (from 0 in 1990 to 12 kWh/a in 2005 and beyond)							
Water (L/cycle)	73.3	63.9	54.5	46.3	44.2	43.5	42.8	42.1
	reference is 2005 with 50,7 l/cycle corrected by -8,7% for real life consumption is 46,3 l/cycle							

The historical energy values are based on "average" machines (since historical data for all load capacities is rarely available). The error introduced by this is limited.

The stock consumption values are approximately the same as new appliances of 7,5 years old (at half product life of 15 years).

The main economic parameters used in the baseline (and other scenario) calculations are:

Table 20: Economic parameters for the calculation of baseline and other scenarios

ECONOMICS		
Base price	443,50	Consumer product price incl. VAT in year 2005 [€] (source Task 6, p.64)
PriceInc	1.04	Price increase EUR per kWh annual elec.cons. decrease (reallife consumption) [€ / kWh/a] (Task 6, p.72)
Rel	0,17	Electricity rate 2005 [€/ kWh electric] (Task 6)
Rmaint	5,5	Annual maintenance costs EUR per unit per year [€/unit,a] (Task 6, par. 6.4.3.1)
Rwater	3,7	Water rate 2005 ([€/ m3] - use phase only
Relinc	2%	Annual price increase electricity [%/ a]
Rmaintinc	2%	Annual cost increase maintenance [%/ a]
Rwaterinc	1%	Annual price increase water [%/ a]
PriceDec	2,19%	Annual product price decrease [%/ a] (Task 7, par. 7.4.2.1, p.57)
InstallDec	2,00%	Annual installation cost decrease [%/ a]
ManuFrac	33,3%	Manufacturer Selling Price as fraction of Product Price [%]
WholeMargin	26%	Margin Wholesaler [% on msp]
RetailMargin	100%	Margin RETAILER on product [% on wholesale price]
VAT	19%	Value Added Tax [in % on retail price]
ManuWages	0,188	DW manufacturer turnover per employee [mln €/ a]
OEMfactor	1	OEM personell as fraction of WH manufacturer personell [-]
WholeWages	0,25	DW wholesale turnover per employee [mln €/ a]
RetailWages	0,060	DW retail (?) turnover per employee [mln €/ a]
ExtraEUfrac	0,5	Fraction of OEM personell outside EU [% of OEM jobs]
Inflation	2%	Inflation rate [%/ a]
ProductLife	15	Product Life [years]

Energy consumption - Baseline and other scenarios

The Baseline energy consumption value for 2010 and beyond is based upon the following distribution of washing machines per energy efficiency class.

The BAU/Baseline scenario takes into account that the current situation of "unofficial" A+ labels persists.

Table 21: BAU model electricity consumption

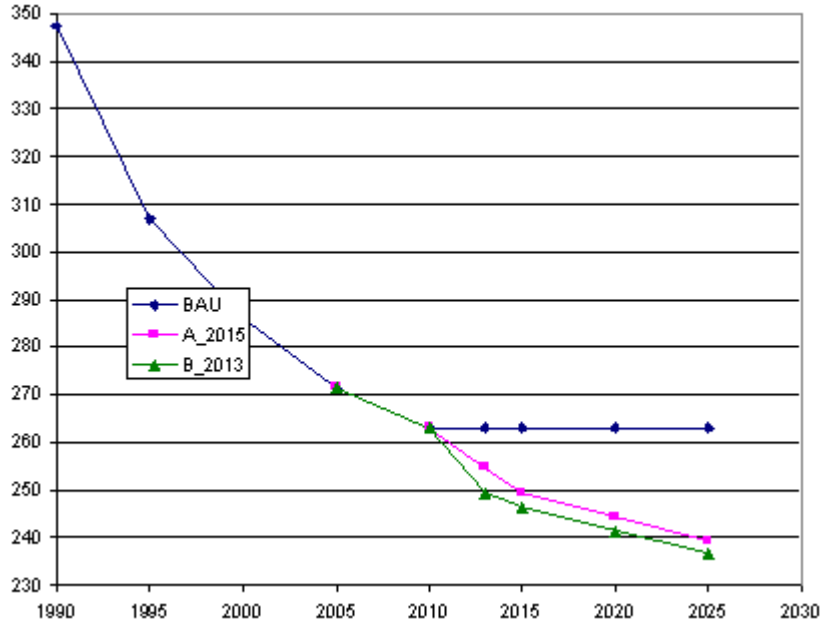
energy class (% of models in class)	[kWh/kg]	2005	2010	2015	2020	2025	2030
A+	0,17	38%	40%	40%	40%	40%	40%
A	0,19	52%	60%	60%	60%	60%	60%
B	0,23	6%	0%	0%	0%	0%	0%
C	0,27	4%	0%	0%	0%	0%	0%
Total annual consumption [kWh/year] *		271	263	263	263	263	263
* Average kWh/kg * average capacity of 5,36 kg * 1,10 (declared to real conversion) * 234 cycles/year							

The energy consumption values for new appliances are based upon the stage 1 and 2 target values as presented in section 5.1.4 (table 9, 'real' values). Although the Proposal sets stage 1 limits that are more lenient than the average of models in 2005 the scenario-analysis assumed it was not realistic to use these somewhat higher values from section 5.1.4, since the market is confronted with more stringent requirements at a later stage. New models will essentially be more efficient, not less. Therefore the stage 1 values of the proposal are kept identical to those of the baseline (ie. 263 kWh/year, without correction for real life consumption 0,69). The table below presents an overview. All intermediate years are interpolated on a linear basis. The energy consumption after stage 2 is assumed to decrease further with a rate of 2% per 5 year to emulate ongoing increase in efficiency and/or effects of labelling (this rate is less than in the period 1995-2005, but most of the 'easy' savings have been reached).

Table 22: Annual energy consumption (in kWh/year) of new appliances by year and policy option (includes correction for 'higher than declared' real value, basis 234 cycle/a, does not include 0.69 correction for higher temperatures applied by households).

	2005	2010	2013	2015	2020
BAU	271	263	263	263	263
Proposal A	271	263	-	249	2% saving per 5 year
Proposal B	271	263	249	-	2% saving per 5 year

Figure 17: Annual electricity consumption of BAU vs scenarios (uncorrected for real-life, corrected for declared values, including low power and using 234 cycles/a)



In the tables showing overall EU impacts the consumption values relate to the stock (not new appliances) and are therefore corrected for a real-life consumption that is a factor 0.69 less than calculated on the basis of appliance specifications (mainly due to smaller load, lower washing temperatures, colder water inlet temperature, but excluding low power consumption - see also Task 5, p.40).

Water consumption - Baseline and other scenarios

The water consumption values are:

– For 2005: 46.3 L/cycle (based upon 50.7 L/cycle average, corrected by -8,7% for real life consumption - see Task 6, p.40)

– at stage 1 (2010): Based on 2005 value, but corrected with the same reduction percentage for that period as applicable to energy consumption.

– at stage 2 (2013/2015): Based on 2010 value, but corrected with the same reduction percentage for that period as applicable to energy consumption.

After the last implementation year the water consumption is expected to decrease further with the reduction of energy consumption.

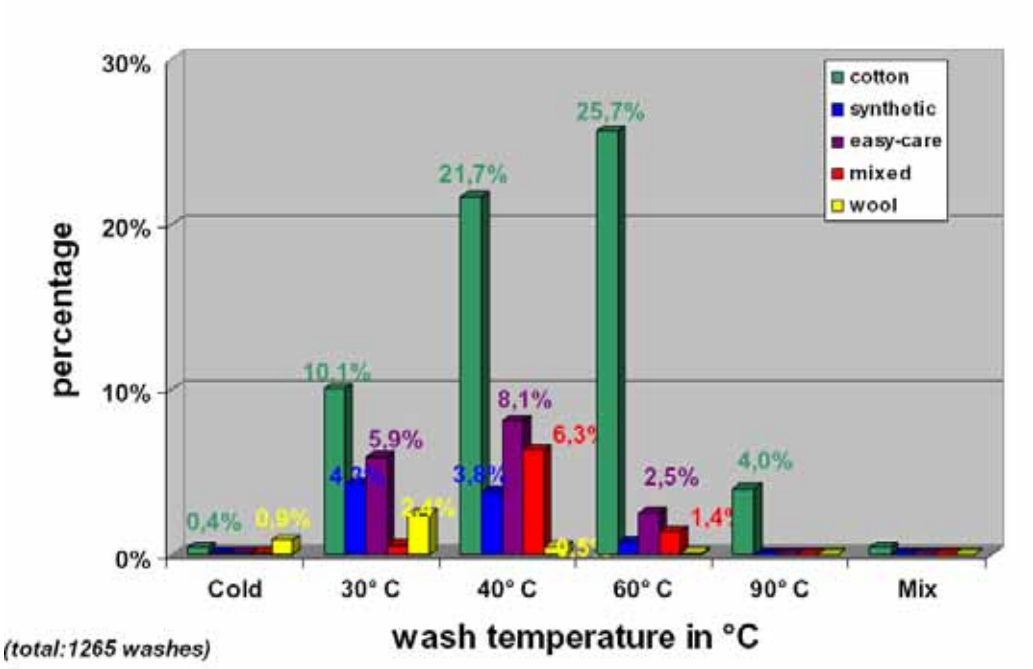
Table 23: Annual water consumption (in L/cycle) of new appliances by year and policy option.

L/cycle	2005	2010	2013	2015	2020 and beyond
BAU	46.3	44.9		44.9	% saving similar to energy
Proposal A	46.3	44.9		42.5	% saving similar to energy
Proposal B	46.3	44.9	42.5		% saving similar to energy

Real user behaviour

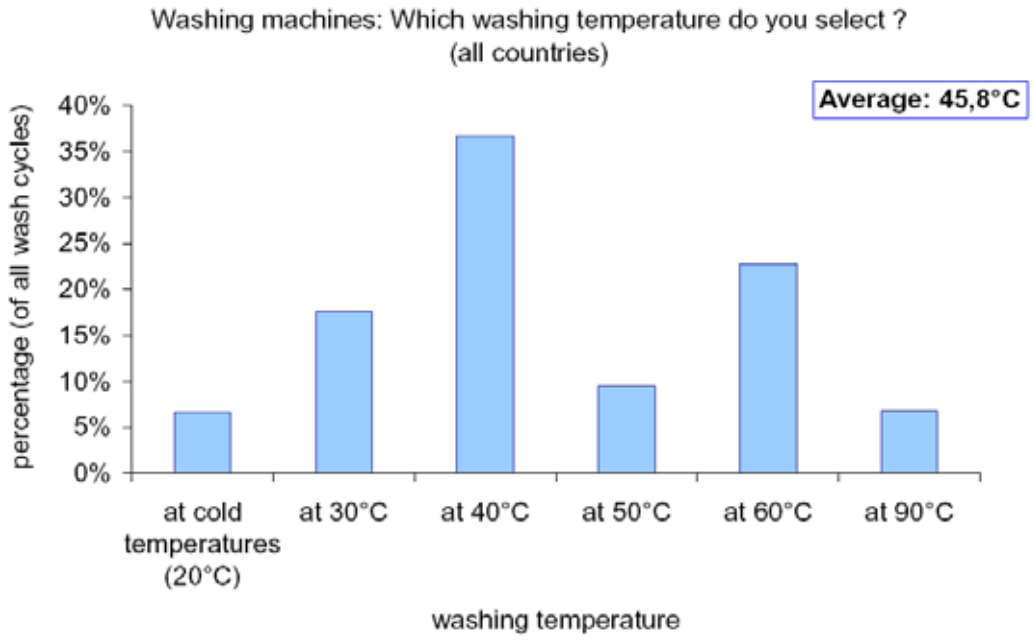
The figures below present some of the characteristics of most used washing programs in Europe (figures from Task 3 of the preparatory study).

Figure 18: Occurrence of washing cycles by temperature and load type



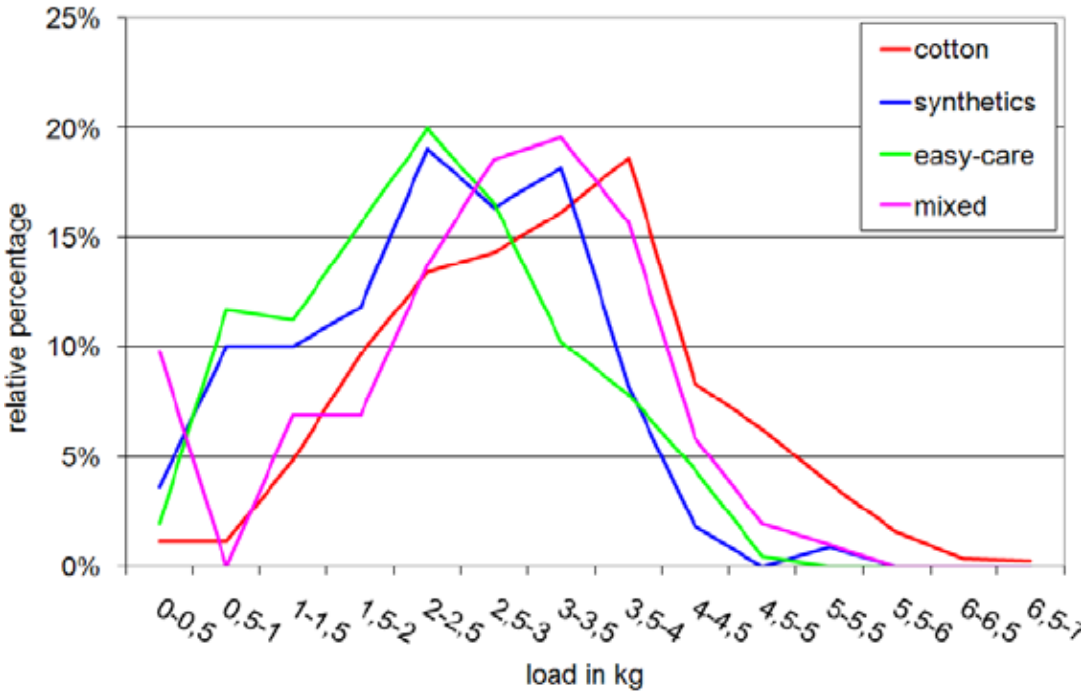
Source: Preparatory study, task 3, p.40

Figure 19: Average washing temperature



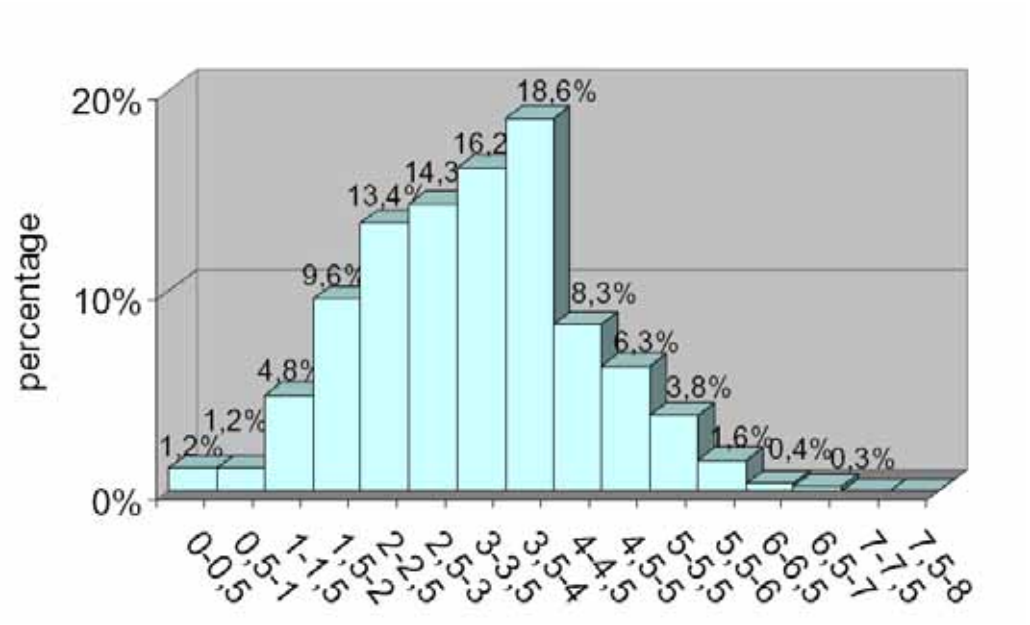
Source: Preparatory study, task 3, p.49

Figure 20: Occurrence of load per type of cycle



Source: Preparatory study, task 3, p.40

Figure 21: Distribution of load (in kg/cycle)



Source: Preparatory study, task 3, p.41

The effects of reducing the washing temperature and load however vary greatly depending on the rated capacity of the appliance, the year of built (status of technology applied) and many other factors.

From Task 3 and Task 6 of the Preparatory Study it is known from a mathematical model what the indicative energy savings are when lowering the washing temperature and reducing the wash load. If a 6 kg machine is loaded with only 3 kg wash the energy consumption reduces by 80% (factor 0,80 from 60ºC full load to 60ºC part load). If the temperature is also lowered to 40ºC the cycle energy decreases with a factor 0,64. (Task 3, figure 3.54, p. 46 and Task 6, par. 6.5.3.2, p. 137 and further)

The Proposal therefore uses the following conversion factors (to convert a 60ºC full load to wash cycles with part load/40ºC):

Table 22: Proposed conversion factors

	60ºC cycle	40ºC cycle
full load	1.00	(not described)
part load	0.80	0.64

The proposal presented at the Consultation Forum 04.12.2008 was based upon a mix of 3 cycles at 60ºC full load, 2 cycles at 60ºC half load and 2 cycles at 40ºC half load (total 7 cycles and 3 different programs). This so-called "3+2+2" cycle results in an average temperature of 54,3ºC and an average load of 3,6 kg (see table below). The overall conversion factor (from 60ºC full load to the 3+2+2 cycle) is 0,84.

Annex III
Draft Minutes of Consultation Forum Washing Machine with regard to ecodesign and labelling for washing machines- 04.12.2008

Centre Albert Borschette (CCAB), Brussels

Participants: see Table A

The Chairman opened the meeting by recalling the aim of the proposed two implementing measures for washing machines which is to improve the energy efficiency of washing machines (WM), hence contribute to the 20% energy efficiency target set for 2020. The *working document on a possible Commission Regulation implementing Directive 2009/125/EC with regard to household washing machines* (Annex 2) proposes to set new minimum requirements phasing out the less efficient models from the market, while the proposed *working document on a possible Commission Directive implementing Directive 1992/75/EC with regard to household washing machines* (Annex 3) is foreseeing the revision of the labelling scheme in order to drive the market towards more energy efficient models.

The Chairman highlighted that the two working documents tabled for discussion were presented exceptionally in the format of a draft legislative proposal so as to give a clear view of those provisions meant to be included respectively in the Eco-design or in the Labelling measure. Although the labelling does not fall under the competence of the Consultation Forum, it was considered appropriate to cover both measures to ensure coherence.

The layout of the label was not addressed during the meeting, since it is the object of a specific discussion and decision within the EELEP in its labelling formation.

In general, there was a consensus among stakeholders that the combined approach between the two proposals (ecodesign and labelling) setting common definitions, measurement methods and algorithm for the calculation of the Energy Efficiency Index is a very positive approach which will simplify and facilitate the implementation of both measures.

The debate was mainly concentrated on 3 major issues: the level of ambition of the specific requirements together with the low power mode issue, the possibility of additional generic requirements mainly regarding hot-fill water and cold-wash programmes and the proposed revision of the energy efficiency classes in the labelling scheme.

Specific requirements on energy efficiency

The working document considers the following minimum energy efficiency requirements (hereafter also referred to as thresholds):

- First stage, one year after entry into force of the implementing measure: EEI<68
- Second stage, six years after entry into force of the implementing measure: EEI<59 for WM ≥4 kg

TREN introduced the discussion by underlying that these thresholds cannot be compared with the current levels of the energy efficiency classes because of the new formulae which is

proposed for the calculation of the EEI[44]: the combined inclusion of the low power mode consumption into the calculation and the reduction of measurement uncertainty (from 15% to 10% for the energy consumption) will have the effect to increase the EEI (i.e. decrease it efficiency) for a given WM compared to the level achieved with the current formulae. Depending on the assumed annual consumption of low power modes (which can only be estimated since no database is currently available including this new parameter) the new energy efficiency requirements will have the effect of removing at the first stage between 16 and 62% of the models, while at the second stage it is likely to remove between 85 to 100% of the models from the market[45]. When very efficient (i.e. low power consuming) low power modes are hypothesised less WM models are phase-out (in that case 16% of the models would be phased out at the first stage), when on the contrary more power consuming low power modes are considered, a higher number of WMs are removed (in that case 62% of the models would be phased out at the first stage). CECED confirmed these figures and underlined that they show how ambitious the second stage of the energy efficiency requirements is: it will have the effect to remove 99% of today's product placed on the market.

ECOS (European Environmental Citizens' Organisation for Standardisation), speaking in the name of environmental NGO's[46], expressed disagreement with these assumptions. Current available technology will allow to rapidly decrease the low power mode consumption of WM, so that the impact of the energy efficiency requirements was overestimated. In any case, if higher energy efficiency thresholds are to be set because of the inclusion of low power modes into the EEI formulae, more data are needed to demonstrate the real share of low power modes into annual energy consumption of WM.

TREN replied that in the presented calculations “efficient” low power modes are 1W for off-mode and 2W for left-on mode, while “inefficient” low power modes are 2W for off-mode and 3W for left-on mode. These values are in line with those analysed in the EuP preparatory study for stand-by.

AT, NL, UK, ECOS, ANEC/BEUC asked for more ambitious energy efficiency requirements. The UK underlined that already 98% of WM were in energy efficiency class A on the British market so that it would be feasible to shift the second stage from six years down to three years. Low power modes are however not included in their evaluation. A "front runner approach" was advocated setting the most efficient model as the mandatory target within 6 years implementation time (NL).

Low power mode

The EC regulation on stand-by exempts appliances (such as WM and dishwashers) equipped with sensor based protection function(s) on the ground that they are justified from a safety

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44 See working document on ecodesign, annex IV:

$$EEI = \frac{AE_C}{SAE_C} \times 100$$

$$AE_C = E_t \times 220 + \frac{\left[P_o \times \frac{525.600 - (T_t \times 220)}{2} + P_l \times \frac{525.600 - (T_t \times 220)}{2} \right]}{60 \times 1.000}$$

45 See power point presentation discussed during the meeting and available on CIRCA, slides 27 to 31.

46 Including INFORSE (International Network for Sustainable Energy), EEB (European Environmental Bureau), CAN (Climate Action Network Europe), Greenpeace European Unit, WWF-Europe.

point of view (for example avoid water leakage) but need some more power in order to allow the basic electronics to work. The proposal described in the Working Document is built on the mentioned Regulation and proposes that the low power modes consumption is always (i.e. with or without sensor based protection functions) accounted for in the calculation of the overall WM annual energy consumption while appliances with no sensor based protection function(s) should comply with the thresholds of the stand-by Regulation. If the low power modes consumption is indeed included into the formulae of the EEI, pressure will be put on manufacturers to further optimize this parameter in order to comply with the ecodesign specific requirements and to achieve a better energy efficiency rating.

AT contested the technological ground for exempting WM from the provisions of the stand-by regulation. Some WM were indeed already placed on the market with security systems avoiding water leakage with no power consumption in the off-mode (NL). The Lot 6 – standby preparatory study on the contrary showed that WM with a sensor based option were not able to comply with the thresholds for the low power modes (TREN, CECED). For this reason, the Regulation on stand-by does not apply to models with such sensors protection. The overall EEI formula proposed for WM should solve the issue since the energy consumption of low power modes would always be taken into consideration in the calculation of the EEI.

Since the preparatory study showed that consumers often forget to switch their machines off (left-on mode activated sometimes for several hours), a question was raised as to the possibility to have automatic power down function after completion of a washing cycle (AT, ANEC/BEUC, NL).

Other proposals for mandatory requirements

Life-duration of WM: ANEC/BEUC stressed that it would be important to work on the possibility to repair WM for example by setting mandatory requirements on the availability of spare parts in order to extend their life duration. TREN replied that such parameters can indeed help evaluating the potential for improving the expected generation of waste material, recycling and possibilities for reuse and recovery of materials. However, they cannot be translated into legally binding provisions and are almost impossible to verify or enforce.

Cold wash option: Some stakeholders (DK, ECOS) asked for the inclusion of a generic provision requesting all WM to be able to wash at cold temperature (20°C or 0°C) which would result in a 50% decrease in energy consumption compared to a wash cycle at 40°C. According to a recent briefing note published by the UK Market Transformation Programme (also available on circa), cold wash may have some draw backs, namely: it will not allow to achieve a cleaning performance class A (including associated health issues), the impact on the environment of the detergent making it possible to wash at cold temperature is not well known, cold washes may be found to be more effective in summer than in winter because of the difference in the temperature of the incoming cold water (TREN).

Hot fill: Several stakeholders (ANEC/BEUC, ECOS) asked to support the up-take of hot fill-ready machines by simply indicating on the label if the WM model accepts hot-fill water or not. This option is mainly relevant in Southern countries where some households use solar energy. However, the energy savings potential from hot fill water prove to be marginal mainly because the quantity of hot water necessary for a typical 6 kg WM consuming about 17 litres is only 3 litres (TREN). A problem with hot fill lies also with the fact that since only few litres of hot water are required for the washing cycle, the water arriving in the machine from

the pipes will be cold: unless the distance between the heating source and the WM is very low the water arriving in the WM will be the colder water stocked in the pipes (CECED). In addition, the filling of warm water which will then remain in the pipes will cool down, which will increase the heat losses of the hot-fill system.

Spin drying efficiency: DK underlined that the display of the spin speed, as is the case on the current label, does not give valuable information to consumers; the residual moisture may be more informative. TREN replied that it is indeed proposed to take out the reference to the spin speed on the revised label and to maintain it only in the technical fiche of the energy labelling since it is one of the relevant technical parameter of the specific machine.

Load indicator: NL suggested adding a generic requirement for the fitting of load indicators at the second stage of the implementing measure (6 years after entry into force) which would indicate to consumers when they have reached the full load capacity of their WM.

Rinsing performance: There was a consensus among stakeholders that the rinsing performance of WM should be included in the IM once the measurement standard, currently under development, will be available (SE). The rinsing performance is also directly related with mandatory requirements on water consumption: there is a need to avoid that lower water consumption is achieved at cost of less good rinsing performance (with potential negative impact on health) (TREN/CECED). TREN also explained that unfortunately despite major efforts and research projects developed worldwide in the major washing machine markets (EU, USA, AU) the issue of the rinsing performance/efficiency is far from being solved due to the low reproducibility (very high measurement uncertainty) of the measurement methods under study. A too high measurement uncertainty makes the measurement method unsuitable for legislative applications since the verification of the declared values will be in practice impossible.

Scale in the detergent dispenser: In order to reduce the negative environmental impact of detergent, the introduction of a scale in the detergent dispenser was considered in the WD so as to help consumers in defining the right amount of detergent they need for good washing performance. Serious concerns were raised however as to the practicality of this measure. The wide range of detergent type on the market makes it impossible to draw a scale that will be accurate and still understandable by consumers. In addition, WM last for 10 years on average, so that the scale is likely to become outdated after several years. The most reliable way to communicate on detergent is to indicate the right dosage on the package of the detergent itself (DE, CECED).

Labelling scheme

In 2005, the reference year of the preparatory study, 90% of washing machines were in class A or above (the so called A+ class, which has been established via a commercial agreement among CECED's manufacturers but has no legal basis within the EU). There is therefore a need to revise the directive if innovation has to be further encouraged. CECED strongly advocated a quick revision of the labelling scheme. Despite the latest reduction in WM sales due to the economic downturn, energy efficiency remains a good selling point. Industry needs visibility to maintain the sustainability of its investments.

Several stakeholders (DK, ECOS, ANEC/BEUC) stressed that differentiation between product was indeed key for the success of a labelling scheme in driving innovation towards better energy efficiency products. On the other hand, it is obvious, that the higher the energy

efficiency requirements will be set at the second stage of the proposed ecodesign Regulation, the lower the possible differentiation between products will be. The second stage may indeed have the effect of leaving the choice to consumers between only two classes. The preparatory study showed that there is a room for improvement up to EEI ≤40 using the Best Non Available Technology (BNAT) which are currently known (TREN)[47]. CECED confirmed that the industry is already working on populating the three upper empty classes (between 52 and 40) provided a new labelling scheme is adopted rapidly: if there is no possibility for the industry to communicate towards consumers on better energy efficiency performance of models, there will be no energy efficiency improvements.

Taking into account the proposed mandatory requirement to ban all WM below class A as regards washing performance, it is suggested to take out the ranking of the washing performance of the labelling scheme; there is little room for improvement above class A (TREN). The only issue is about the less stringent threshold for WM with a load capacity below 3 kg which will imply that these smaller WM may have a washing performance in current classes A or B (ANEC/BEUC). A way to convey information towards consumers on this niche market should however be found without keeping the ranking of washing performance for all other WM. A possibility could also be to ban WM with a washing performance at class B after a certain period of time (TREN).

Consumer information

In addition to the energy efficiency improvements above the current levels which should be fostered by the revision of the labelling scheme and the ecodesign requirements, it would be probably more cost-effective to look for further energy savings by improving the communication addressed to consumers on how to best use their machines, eg. by choosing the less consuming programme or using the machine at full load capacity (TREN). Such advice could be developed in the user manuals showing the actual consumption of electricity and water for every washing cycle available.

Calculation of the energy consumption (3+2+2)

It is proposed to calculate the energy consumption of a WM (E_t) across several washing cycles according to the following formulae:

$$E_t = (3 \times E_{t,60} + 2 \times E_{t,60½} + 2 \times E_{t,40½})/7$$

Some proposals were made in the written replies for a different weighted average but a more detailed scrutiny show that they have the outcome to systematically underestimate the real energy consumption of washing machines measured in real life conditions (TREN)[48]. Although the alternative weighing formulae proposed by stakeholders are probably more in line with the actual consumer behaviour in term of frequency of the washing cycles' temperature, the initial formula proposed by TREN in the working document better reflects the real life energy consumption of such cycles. It puts thereby consumers on the safe side by slightly overestimating the declared overall annual energy consumption of the washing machines. CECED highlighted that the move towards the 3+2+2 cycles was a positive step forward since it will oblige manufacturer to optimize WM across several cycles.

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47 The analysis of the preparatory study on BNAT did not take into account though the impact of the low power mode on energy consumption.

48 See power point presentation discussed during the meeting and available on CIRCA, slides 14 to 16.

DE also asked to use the same weighted average (3+3+2) to calculate the water consumption.

Other issues

Washer-dryers: A possible problem was highlighted concerning the potential overlap of two different labelling schemes: the newest one on washing machines and the oldest scheme still applicable for washer-dryer. This would mislead consumers (a A graded washer-dryer would be less efficient than an A graded washing machine) and pave the way for unfair competition between the two markets (DE, UK). TREN will address the issue by working in parallel for the definition of ecodesign specific requirements and energy labelling scheme also for this products, taking into consideration the results of the preparatory study for the dryers so as to have the most recent information about the drying part of the cycle of a washer-dryer.

Standardisation: Since a new revision of the International Standard EN 60456 on washing machines is expected in a short term, a statement was added by CECED to urge the Commission to incorporate it in the legal text at the earliest possible time. The chairman confirmed that the IM has to clarify which are the measurement methods applicable as long as the newest standard is not available, but includes a clear provision stating that when a new suitable standard is ready and published in the official journal, it will supersede the relevant measurement method defined in the IM.

Table A: List of participants

Member States or company/organisation's name
Norway
Austria
Belgium
Bulgaria
Czech Republic
Denmark
Estonia
France
Germany
Hungary
Ireland
Italy
Latvia
Lithuania
Luxemburg
Malta
Netherlands
Portugal
Romania
Slovakia
Spain
Sweden
United Kingdom
ANEC/BEUC
CECED
CENELEC
ECOS
EEB
Grayling Global

Annex IV
Minutes of the Consultation Forum – 26/03/2010

Centre Albert Borschette (CCAB), Brussels
Participants: see Annex A

The Chairman opened the meeting by recalling the agenda addressing draft regulations on labelling for fans and draft regulations on ecodesign and labelling for household washing machines (WM) and dishwashers (DW) circulated to the members of the Consultation Forum (CF) prior to the meeting. Furthermore, a draft document on Voluntary agreements (VA) has been transmitted for discussion.

(…)

Energy labelling: Horizontal issues relevant for household refrigerating appliances (RF), televisions (TVs), household washing machines (WM) and dishwashers (DW)

Timing of the requirements applicable to advertisement (Articles 3 and 4)

On the timing of advertisement, the **Commission Staff** stated that 16 months after publication in the Official Journal is a necessary transitory period for suppliers and distributors to adapt their technical promotional material such as printed catalogues. That transitory period is especially important for distributors as they will only get the information on the classification of appliances 12 months after publication in the OJ; it would leave them only 4 months to adapt their promotional material for publication including printing.

BE questioned the necessity to display the energy efficiency class of the appliance only in those advertisements disclosing energy-related or price information. **The Chairman** explained that this was the agreement which was reached in the recast (Article 4 (2a)).

Timing of the display of the label in shops (Article 4)

The **Commission Staff** explained the rationale of the proposal to display the new label 16 months after publication in the OJ of the delegated regulation for every appliance independent of their date of placing on the market. The intention was to avoid that the new label is displayed close to the old label at the point of sale, and that distributors continue to display the old label for appliances below A+++ so as to benefit from a more advantageous label format.

This proposal met strong opposition by some MS and stakeholders (**DE , IT, PT, RO, CECED, EUROCOMMERCE, ORGALIME**) arguing that requesting the display of the new label on products placed on the market at the time of application of the current labelling Directives would lead to a retroactive effect of the new labelling delegated Regulations. They advocated instead that the new labelling requirements apply only to those appliances placed on the market 12 months after publication in the OJ of the related delegated Regulations and that appliances placed on the market before that date may continue to be displayed with the old label.

IE and **ANEC/BEUC** asked for a shorter transitory period.

Energy efficiency classes (Annex I)

On the energy efficiency classes, the **Commission Staff** proposed that the classifications for RF, DW and WM remain unchanged compared to the drafts agreed at the last Regulatory committee in March 2009. However the class A+++ would be introduced for RF, DW and WM from the start since market data shows that class A+++ could be populated and that this would provide a similar layout for the label across white goods at point of sale.

(…)

The Label (Annex V)

The Commission Staff pointed out that the reference period will be taken out from the label of WM, DW as well as RF as the full scale up to A+++ will be shown from the very start.

(…)

Horizontal issues relevant for household washing machines and dishwashers (ecodesign and energy labelling)

Timing of the ecodesign requirements (Annex 1)

On the timing of the ecodesign requirements, the **Commission Staff** explained that the 1st step for both WM and DW is set one year after publication in the OJ so as to leave suppliers sufficient time to test their products. The one year time line of the 1st step could not be reduced taking into account in particular that the ecodesign and labelling Regulations on WM introduce a new test method and formulas (the 3+2+2 approach) which will require from suppliers to test all washing machines for the 60°C half load and 40°C half load standard cotton programs in addition to the 60°C full load standard cotton program currently tested under the labelling Directive 95/12/EC.

The date of the application of the 2nd step is set three years and four years after entry into force for WM and DW respectively. On WM, the **Commission Staff** explained that market data show that it is possible to keep the date of application of the 2nd step unchanged compared to the dates of application agreed at the Regulatory Committee in March 2009, i.e. around October 2013. On DW, the **Commission Staff** explained that a transitory period is given for DW with 10 place settings of 45 width, as they are compared to 9 place settings and below, whereas larger 10 place settings DW are compared to other DW of the same size.

CECED and **IT** informed that small DW between 7 and 10 place settings do not have the same potential of improvement as larger 12 to 16 place settings DW. They requested on this ground an exemption for 7 to 10 place settings DW from the second step of the energy efficiency requirements (EEI<63). **The Commission Staff** stated that 9 place settings DW represent 12% of market share so that an exemption of these appliances from the second step should be substantiated. It asked CECED to provide for more evidence to demonstrate the need to exempt those appliances from the second step.

ECOS requested that the level of the energy efficiency requirements be strengthened.

The Label and the Fiche (Annex V, Annex III)

ECOS supported by **ANEC/BEUC** requested that washing and cleaning efficiency of WM and DW are declared, on the label and the fiche. ANEC/BEUC emphasized the need to reward improvements on this parameter wherever possible.

The Commission Staff stressed that due to minimum requirements for washing and cleaning efficiency, all machines would be in class A (except for a very small market share of small machines where class B is required due to technology constrains arising from their size). There will be no more scope for differentiation among appliances on that specific parameter, so that it will not be anymore relevant for consumers to get information on this regard.

ANEC/BEUC expected the electricity and water consumption to be given in the fiche for all programmes available to the machine, not only for the 'main washing programmes' (point c of Annex I, point 1 (2)).

The Commission Staff underlined the importance of being proportionate on what to request from the suppliers, as some machines may have up to 100 programs combinations.

Rinsing efficiency

On rinsing efficiency, the **Commission Staff** confirmed that the draft mandate for standardization includes the request to develop a test method for rinsing efficiency within 30 months. This will allow consideration of new requirements on rinsing efficiency and water consumption by the time of revision of the ecodesign and labelling Regulations.

Revision Clause (Article 7)

On the revision clause, the **UK** called on the revision to start within three or maximum four years after entry into force, and not five as stated today.

On DW, the **UK** requested that requirements on water consumption be added in the revision clause.

Test methods (Annex VII labelling, Annex III ecodesign)

On test methods, **CECED** asked the Commission to publish the new test methods as early as possible for the industry to be ready by the first dates of application of the ecodesign and labelling Regulations. **CECED** emphasized that the early implementation of the label is dependent on the availability of the test methods.

The Commission Staff confirmed its commitment to speed up the adoption process of the test methods as much as possible including by considering ways to publish a transitory test standard in the OJC. The chairman emphasized however that the publication of a 100 pages full test method in the OJC is not possible due to translation constrains (any publication in the OJ must be translated in all EU official languages).

Verification tolerances (Annex VII labelling, Annex III ecodesign)

On the verification tolerances, **RO** suggested that the 2nd round for the verification procedure for energy consumption of WM should have the same tolerance level as the first round.

The Commission Staff explained that this had already been debated and voted for by a qualified majority at the last Regulatory Committee in March 2009. A new discussion on this topic should therefore preferably be avoided.

(…)

The Chairman closed the meeting.

Annex A: List of participants

MEMBER STATES OR COMPANY/ORGANIZATION'S NAME
AUSTRIAN ENERGY AGENCY (AT)
CECED
CEN/CENELEC
DANISH ENERGY AUTHORITY (DK)
DEFRA (UK)
DELEGATION FRANCAISE (FR)
DIGITALEUROPE
ECEEE
ECOS
EFTA
EGMF
ENEA (IT)
ENTRERPRISE IRELAND (IE)
EPEE
EUNITED CLEANING
EUROCOMMERCE
EUROPUMP
EUROVENT
FEDERACION ESPANOLA COMERCIANTES DE ELECTRODOMESTICOS
FEDERAL ENVIRONMENT AGENCY (DE)
FEDERAL INSTITUTE FOR MATERIALS RESEARCH AND TESTING (DE)
FEDERAL MINISTRY FOR ECONOMICS & TECHNOLOGY (DE)
FEDERAL MINISTRY OF THE ENVIRONMENT (DE)
FEDERAL PUBLI SERVICE HEALTH 1 ENVIRONMENT (BE)
FEDERAL PUBLIC SERVICE ECONOMY (BE)
GERMAN ENERGY AGENCY (DE)

IKEA, EUROCOMMERCE
ILNAS (LU)
MALTA STANDARDS AUTHORITY (MT)
MINISTERO DELLO SVILUPPO ECONOMICO (IT)
MINISTRY OF ECONOMICS AFFAIRS & COMMUNICATION (EE)
MINISTRY OF ECONOMY (PL)
MINISTRY OF ECONOMY (SI)
MINISTRY OF ECONOMY ENERGY & TOURISM (BG)
MINISTRY OF ECONOMY TRADE & BUSIN ESS ENVIRONMENT (RO)
MINISTRY OF EMPLOYMENT AND THE ECONOMY (FI)
MINISTRY OF THE ECONOMY (SK)
MITYC (ES)
NORWEGIAN WATER RESSOURCES AND ENERGY DIRECTORATE (N)
ORGALIME
SENTERNOVEM
STATE ENERGY INSPECTION (CZ)
SWEDISH ENERGY AGENCY (SE)
WWF

Annex V
Calculation methodology for the Energy Efficiency Index

General methodology

The methodology for calculating the energy efficiency of washing machines is based on the identification of an energy efficiency index (EEI) on which target levels (for stage 1 and stage 2) are based. As for other appliances, the aim of the EEI is to compensate for the differences in sizes of washing machines so as to allow a fair comparison between products.

Three major changes are foreseen compared to the current formula of Directive 95/12/EC.

– It is proposed to include the energy consumption of low power modes into the calculation of the energy consumption so as to give manufacturers incentives to improve this criterion in addition to the energy consumption of washing cycles. The inclusion of low power modes into the EEI (on which the energy efficiency classes are based) will also convey more transparent information to end-users on real energy performances of washing machines.

– The inclusion of low power modes into the formula obliges to shift from the current calculation of the efficiency class which is based on the energy consumption per kg per cycle, to a ratio based on the annual energy consumption. Thus, it is proposed to base the annual energy consumption of washing machines on a predefined number of cleaning cycles per year which reflects real use of consumers.

– In order to address the problem with regard to lower temperatures and partial loads found in real life washing behaviour, it is proposed to change the current basis of the 60ºC test standard towards a basis that contains lower wash temperatures and partial loads.

The energy efficiency index is calculated as:

$$EEI = (AEc/SAEc) * 100$$

where:

AEc = annual energy consumption of a washing machine, based on measurements

SAEc = standard annual energy consumption of a washing machine (the reference consumption for machines of that capacity)

The annual energy consumption AEc of a washing machine, in kWh/year rounded to two decimal places, shall be calculated as:

$$AEc = Et * cycles + \frac{\left[Poff * \frac{525600 - (Tt*cycles)}{2} \quad Plefton * \frac{525600 - (Tt*cycles)}{2} \right]}{60 * 1000}$$

where:

Et = energy consumption for the standard cycle in kWh and recorded to three decimal places

Poff = is the power in 'off' mode for the standard cycle, in W and recorderd in two decimal places

Plefton = is the power in 'left-on' mode for the standard cycle, in W and recorderd in two decimal places

Tt = is the programme time for the standard cycle, in minutes and recorded in whole minutes

cycles = is the number of cycles per year and is for both proposals set at 220 [cycles/year].

(The number 525600 is the number of minutes in one year)

If power management is active the average time spent in 'left-on' mode shall be measured as well. The minutes spent in off-mode then become the total annual minutes minus the minutes allocated to the cleaning cycles and the minutes spent in left-on mode (all using the same basis of cycles per year).

Chosen program cycle (for Et, Poff, Plefton and Tt)

The values of Et, Poff, Plefton and Tt depend on what program cycle has been chosen. For Directive 95/12/EC all data were based on the standard 60ºC cotton cycle at full load capacity. However, since most consumers use lower washing temperatures and only partially load the machine, this 60ºC cycle is not representative for the average user behaviour.

In the Working Document the Commission presented an alternative approach, as developed in the Preparatory Study. In this proposal the energy consumption Et is the average of three washing cycles with the following ratios.

Et = (3 * Et,60 + 2 * Et,60½ + Et,40½) / 7

Where:

Et,60 is the energy consumption for the standard 60ºC cotton program at full load, in kWh recorded to three decimal places;

Et,60½ is the energy consumption for the standard 60ºC cotton program at half load, in kWh recorded to three decimal places;

Et,40½ is the energy consumption for the standard 40ºC cotton program at half load, in kWh recorded to three decimal places;

For Poff, Plefton and Tt a similar equation applies, where "60", "60½" and "40½" stands for the programs described above

Poff = (3 * Poff,60 + 2 * Poff,60½ + Poff,40½) / 7

Plefton = (3 * Plefton,60 + 2 * Plefton,60½ + Plefton,40½) / 7

Tt = (3 * Tt,60 + 2 * Tt,60½ + Tt,40½) / 7

Transitional period

The proposal recognises that the current test standard EN 60456:2005 does not decribe testing at 40ºC and at partial loads. The proposal therefore allows manufacturers - during a transitional period - to continue testing at 60ºC full load and requires them to convert these values using the following correction values:

– Et60 to Et60½: 0,80

– Et60 to Et40½: 0,64

The calculation of the transitional energy consumption Et is therefore:

Et,transitional = (3 * Et60 + 2 * (0,80 * Et60) + 2 * (0,64 * Et60) / 7

The formula above can be further condensed to Et,transitional = 0,84 Et60. The same conversion factors apply for the calculation of Plefton, Poff and Tt (and Tl if power management is active). Once the reference to the harmonised standard is published in the Official Journal the testing (and the calculation of Et etc.) should be performed on the basis of the described test programs.

Reference Consumption SAEc

In Directive 95/12/EC the reference consumption values (to calculate energy efficiency class) were expressed in kWh/kg. In the current proposal 1 the reference consumption is based upon the following elements:

– the reference consumption is an annual consumption, based upon 220 washing cycles per year;

– the reference consumption is based upon the mix of washing programs (temperature and load) used to calculate the annual energy consumption;

– the actual energy consumption now includes the calculation of energy consumption in low power modes.

The standard annual energy consumption SAEc of a washing machine shall be calculated in kWh/year and rounded to two decimal places as (Task 7, p. 127):

– SAEc = 47,0 * c + 51,7

Where 'c' is the rated capacity of the machine (rounded to 0,5 kg) for the standard 60ºC cotton program at full load or the standard 40ºC cotton program at full load, whichever is the lowest.

This standard annual energy consumption takes into account the contribution of low power modes to overall energy consumption and the conversion from 60ºC standard cotton cycle to the '3+2+2' mix of cycles (task 7, p.127).

Verification procedure for market surveillances purposes

This proposal includes, in line with the preparatory study (task 7, p. 142), a reduction of the tolerance of the first step of the verification test (for a single appliance) from 15% to 10%. This value of 10% has been selected taking into account that a revised washing machine test standard is in preparation and the reproducibility of this test revised standard has not been verified yet (a mandate to CENELEC for a round robin test to define the standard deviation of the results from the revised test standard is in preparation). A further reduction in the allowed tolerance is deemed not appropriate without knowing the standard deviation of the revised test.