Mapping Document

Country:	Switzerland
Technology:	Washing Machines
Sub Category:	Domestic top and front loaders

Introduction

The first stage in the Mapping and Benchmarking process is the definition of the products, i.e. clearly setting the boundaries that define the products for use in data collection and analysis. Doing this ensures that comparison between the participating countries is done against a specific and consistent set of products.

The summary definition for this product is:

Washing machines, defined as:
'An appliance for cleaning and rinsing of textiles using water which is principally designed for use within a domestic environment. The appliance may draw water from a cold and/or hot water supply and may also have a means of extracting excess water from the textiles.'

Data will be analysed for the following types of washing machine :

|		
Technology	User intervention	All Types - Automatic, semi-automatic and manual
	Orientation	All Types - Horizontal (front loaders) and Vertical Plane (top loader)
	Configuration	All Types - Drum, Impeller, Agitator, Nutators Exclude all types of Washer/Dryer
	Coin/Card Operation	All Types
	Water intake	All Types - Hot fill/cold fill
	Spin Speed	All Speeds
Other variables	Capacity	Consider only units between 1Kg - 13kg (Use kWh/Kg as metric)

The detailed product definitions can be found at the Annex website:
http://mappingandbenchmarking.iea-4e.org/matrix

Energy Efficiency of New Washing Machines Switzerland

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Worst Product (kWh/kg)														
Product Weighted Average (kWh/kg)														
Sales Weighted Average (kWh/kg)								0.186	0.181	0.179	0.182	0.185	0.178	
Best Product (kWh/kg)														
Wash Quality (100 index)														
Spin Efficiency (%)														
Rinse Efficiency														
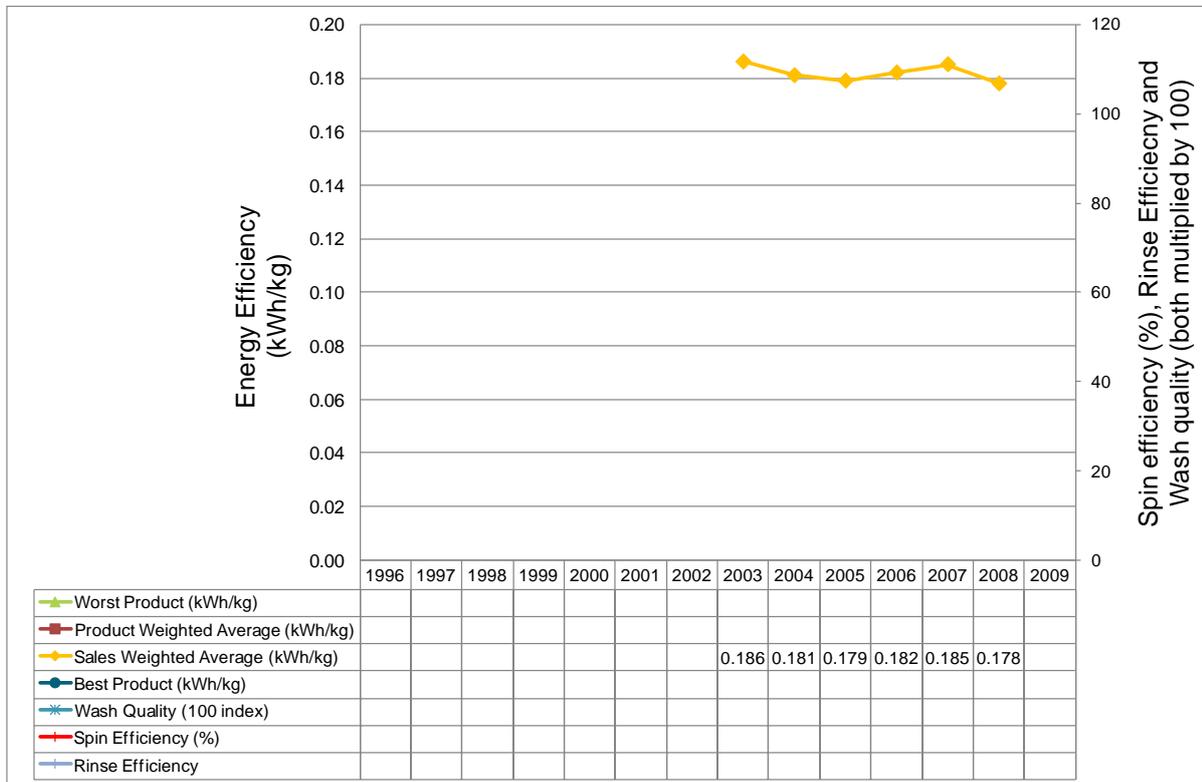
Key notes on Graph (see notes section 1)

- This graph is based on the weighted average of all sold Swiss Washing Machines: the total market consists of 7% top loaders (5 kg medium capacity in 2008) and 93% front loaders (6.5 kg medium capacity in 2008), without any differences in specific energy consumption between top and front loaders, if medium capacity is the same with both machine types. At the same time, the total market for washing machines is parted in machines just for one household or family (about 90% of the sales) and washing machines for apartment buildings (semi-professional machines, about 10% of the sales). A semi-professional washing machine is used by 5 household on an average, i.e. the medium load of a single household machine has to be multiplied by five in order to get to real use/intensity in washed kg/year.

- No wash quality, rinse efficiency or spin efficiency data was available to the Annex at the time of publication.

Energy Efficiency of New Top Loader Washing Machines Switzerland

No data on top loader models was available to the Annex at the time of publication.

Top loader washing machines are not used to any extent in Switzerland. Approximately 7 % off all washing machines sold are top loaders. This machine type is a little bit smaller than the average front loader (5 kg vs. 6.5 kg capacity). Top loaders are typically washing machines used in single households, rather than used in apartment buildings by more than one family.
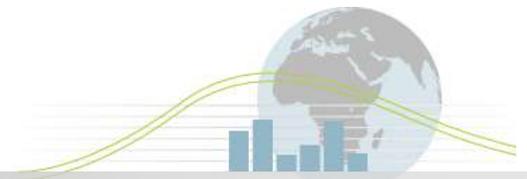
Energy Efficiency of New Front Loader Washing Machines Switzerland

Front loader washing machines account for the vast majority of the Swiss market – please refer to the all washing machines energy efficiency data.
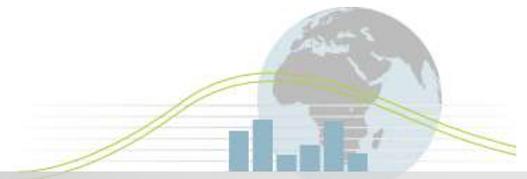
Energy Consumption of New Washing Machines Switzerland

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Worst Product (kWh)														
Product Weighted Average (kWh)														
Sales Weighted Average (kWh)								1.054	1.027	1.035	1.059	1.089	1.058	
Best Product (kWh)														
Load capacity (kg)								5.6	5.6	5.7	5.8	5.9	6.0	
Water Consumption (decalitres)														
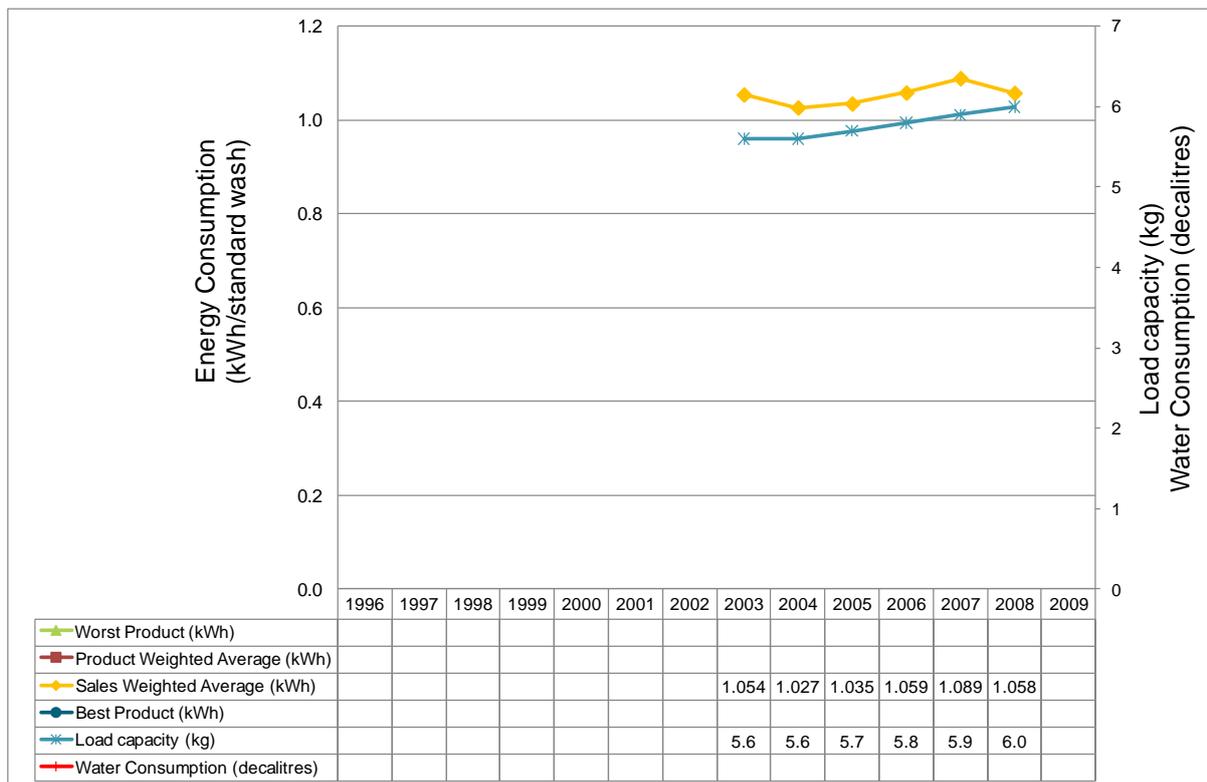
Key notes on Graph (See notes section 2)

- This graph is based on total washing machine sales by type (front loader just for one family, top loaders just for one family or for use in apartment buildings - on an average used by 5 families per washing machine, and parted in different capacity classes). The published data are the weighted averages for the average washing machine. In 2008 there were 175,300 washing machines sold.

- No water consumption data was available to the Annex at the time of publication.

Energy Consumption of New top loader Washing Machines Switzerland

No data on top loader models was available to the Annex at the time of publication.

The specific energy consumption (kWh/kg) decreases slightly with the washing machine size in general, but there is no difference between front and top loaders for both machines, if the washing capacity is the same.

Energy Consumption of New front loader Washing Machines Switzerland

Front loader washing machines account for the vast majority of the Swiss market – please refer to the all washing machines energy consumption data.

Unit Energy Efficiency of Washing Machines Installed in the Stock – Switzerland

No data on Unit Energy Efficiency of Washing Machines installed in the stock was available to the Annex at the time of publication.

Unit Energy Consumption of Washing Machines Installed in the Stock - Switzerland

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Average Unit Energy Consumption (kWh)	1.29	1.26	1.23	1.21	1.19	1.17	1.17	1.16	1.16	1.16	1.15	1.15	1.15	
Load capacity of average installed model (kg)														
Water Consumption (decalitres)														
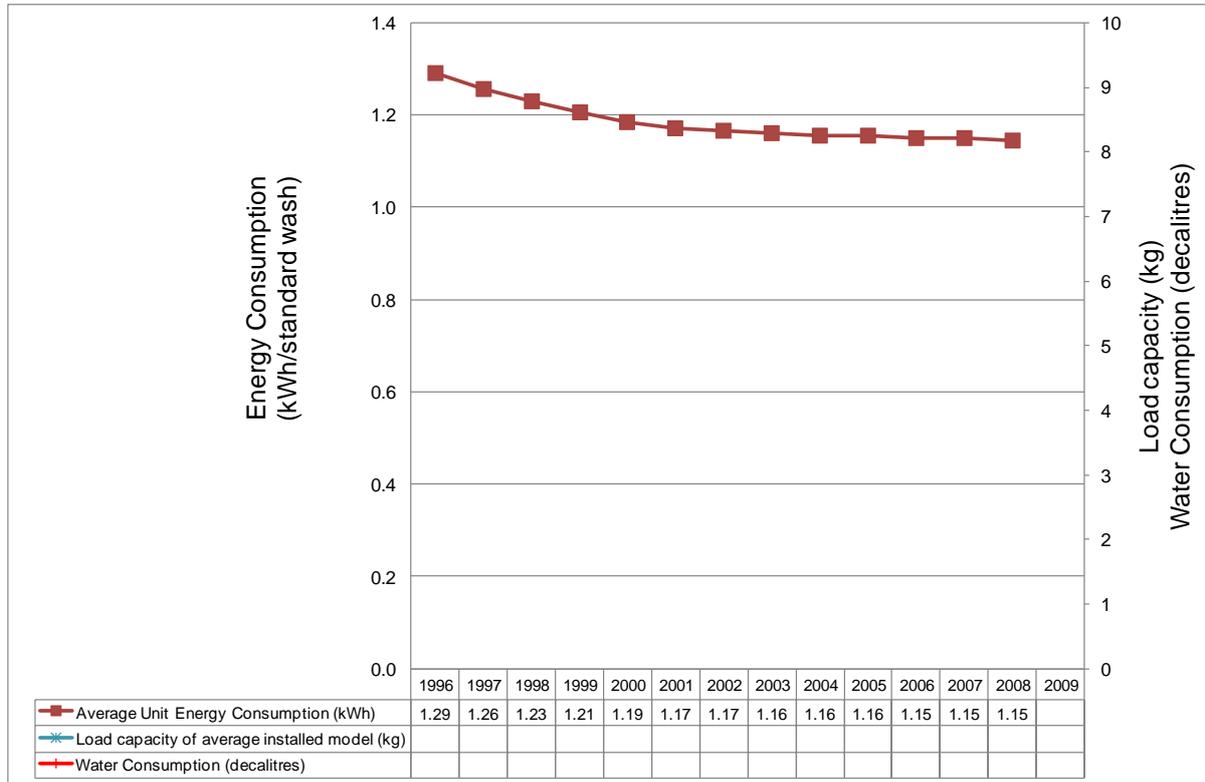
Key notes on Graph (See notes section 3)

- Data is taken from "*prognos report electrical appliances in Households and offices*" for *eae, Zürich. Medium specific consumption is calculated on medium consumption per unit (2008: 229 kWh/washing machine, divided by 200 programs/year)*

Energy Consumption of the total stock of Installed Washing Machines - Switzerland

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total Consumption ('00 GWh/yr)	7.37	7.25	7.17	7.13	7.08	7.09	7.14	7.23	7.30	7.39	7.48	7.59	7.72	
Number of units in stock (millions)	2.86	2.88	2.91	2.96	2.99	3.03	3.07	3.12	3.16	3.21	3.26	3.30	3.37	
Number of washes per year	200	200	200	200	200	200	200	200	200	200	200	200	200	
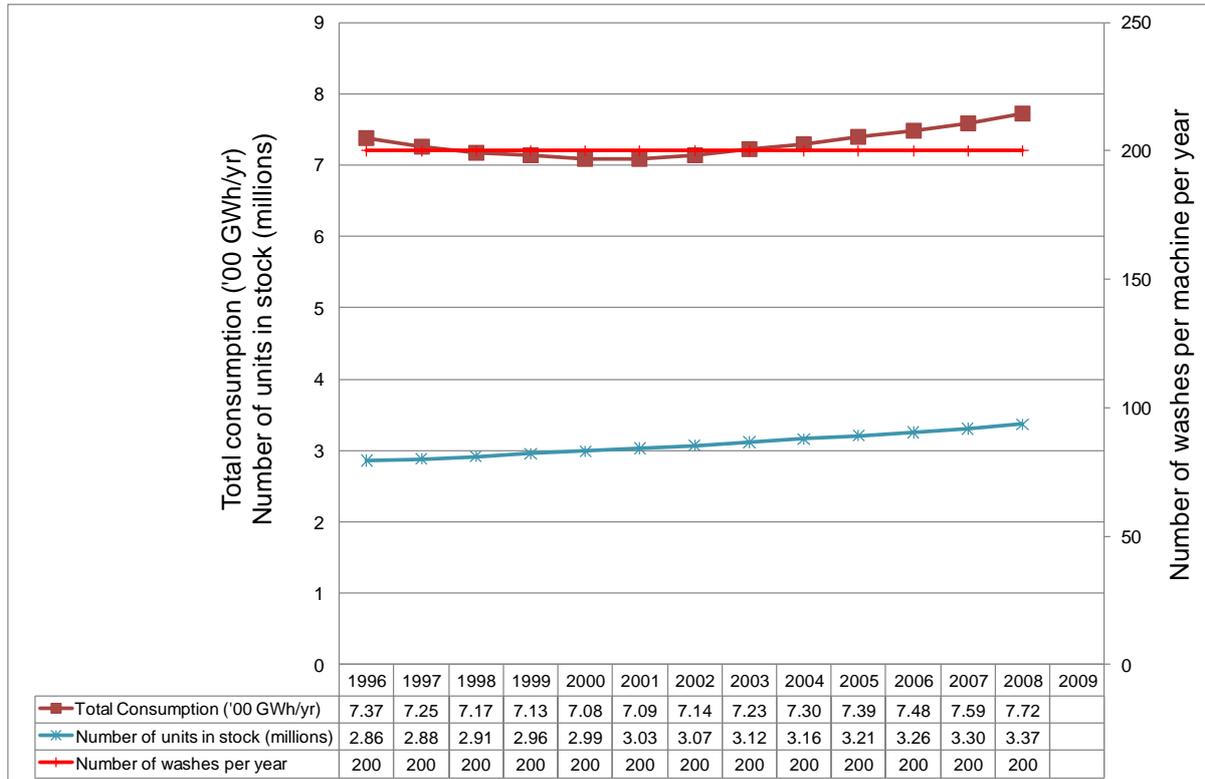
Key notes on Graph (See notes section 4)

- Data is taken from *prognos report "electrical appliances in Households and offices" for eae, Zürich.*

- Number of washes per year: 200. For the newer greater washing machines with more than 5.5 kg capacity, number of washes per year will slightly be lower. For total stock of the medium number of washes per year will be approximately 200. Number washes per year for the washing machines in apartment buildings, used by more than one family/household, are assumed to be 1000, because on an average there are five families/households per washing machine in apartment buildings.

Major Policy Interventions (See notes Section 5)

Primary policy interventions related to washing machines can broadly be divided into two groups, those developed and implemented at a pan-European level (although often through national legislation mandated through the EU), and those developed and implemented at the national level only.

Pan-EU Policy

Policy name	Period in force	Description
EU Energy Label[1]	1996 - 2010	Required labelling of all new washing machines. Defines A to G classes for energy efficiency, wash performance and spin performance. Gives maximum spin speed information and water consumption.
EC Ecolabel	1999 - ongoing	Voluntary declaration for resource efficiency. For the standard 60°C cotton programme: energy consumption equal to or lower than 0.17 kWh/kg, water consumption equal to or lower than 12 litres/kg.
Industry voluntary commitments	1996 – 2002 and 2002 – 2010	Removed EU Energy Label energy classes E, F and G by 1999. Removed class D by 2003. New Labelling category introduce A+ (EEI > 0.17) introduced at the end of 2002 Set target for efficiency of sales weighted ("fleet") average efficiency of 0.2 kWh/kg by 2008. Promotes models with 0.17 kWh/kg and A rated wash performance.
Early replacement	2007 - ongoing	Industry promotion to consumers to encourage consumers to replace older appliances with more efficient new ones.

National Level Policy

No data on national level policies was available to the Annex at the time of publication.

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[1] See notes section 1.1.2

Cultural Issues (See Notes Section 6)

- In Switzerland totally (full) automatic washing machine market is parted in round about 7% front loaders (medium capacity 5 kg in 2008) and 93 % front loaders (medium capacity 6.5 kg in 2008).

- Specific energy consumption does not differ between front and toploaders, if washing capacity is the same in both cases.

- The total market consists of washing machines for just one household or family (about 90% of the sales) and washing machines for apartment buildings (semi-professional machines, 10% sales share).

- A semi professional washing machine is used by 5 household on an average, i.e. the medium load of a single household machine has to be multiplied by five in order to get to real use/intensity in washed kg/year.

Notes on data

Section 1: Notes on Product Efficiency

1.1   Test methodologies and Performance Standards

1.1.1 Test methodology

From 1 Jan 2007 EN 60456: 2005 (derivative IEC 60456:2003)

Previously EN 60456: 1999 + A11:2001 + A12:2001 + A13:2001. Primary difference with preceding method is the allowance of 3 methods to condition the load prior to test.

1.1.2 Key Testing Parameters and Regulatory Requirements

Overview of test method

The test standard EN 60456 contains a number of methods for measuring the various performance characteristics of washing machines. The key relevant tests are: cleaning performance, energy consumption, water consumption, spin extraction performance and spin speed. All these tests are performed using the rated capacity cotton load and a 60°C cotton programme nominated by the manufacturer. The cleaning performance of a washing machine is measured by using it to wash a set of standard soiled test strips together with a base laundry load. Each soiled test strip consists of five fabric squares, soiled with carbon black / mineral oil, blood, chocolate and milk, red wine, with the fifth square left unsoiled. The different soils challenge the various cleaning characteristics of the washing machine such as mechanical action, mixing and distributing the wash liquor, and wash temperature control. After washing, drying, and ironing, soil removal is assessed by measuring the reflectance of the test strips. Cleaning performance is calculated from the reflectance values.

The energy and water consumption are measured during the cleaning performance test. If the machine draws hot water rather than cold, the energy associated with the hot water is added to the electrical energy used to give the total energy consumption. The spin extraction performance is assessed after the cleaning performance test by weighing the base load. Comparing the wet load weight with the dry load weight[2]

Specific Test Details

Voltage	230V +/- 1V, 50Hz +/- 1Hz
Test Cycle	60°C Cotton Cycle (without pre-wash) in accordance with the manufacturer's instructions. At least 5 complete cycles should be completed with new soil strips added before each new cycle commences.
Ambient Temperature	23°C +/-2°C
Load	Rated Kg
Detergent	Type A* as defined in Annex F of IEC 60456.

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[2] UK MTP Briefing Notes: See www.mtprog.com

Water Supply	*Cold Water: 15^oC +/-2^oC* *Hot Water (for use in units without heating elements): 60^oC +/-2^oC (or as directed by manufacturer)*
Reference Unit	*As defined in Annex A of EN60456*
Water Test Temperature	*60^oC*
Energy Consumption	*Consumption of unit under test corrected for energy in water as follows:* *Total Energy = Tested Energy + Cold Water Correction + Hot Water Correction,* *where:* *Cold Water Correction = (volume of cold water x (cold water inlet temp - 15))/860* *and* *Hot Water Correction = (volume of hot water x (hot water inlet temp - 15))/860* *Average of 5 cycles* *TOLERANCE: Not greater than 15% greater than manufacturer claim (for one unit) or 10% greater than manufacturer claim (if average of 3 units)*
Cycle Efficiency	*TOTAL Energy of Model under test divided by rated load (kWh/cycle/kg).*
Measurement of Water Volume	*Complete volume of water used during energy consumption test (litres). Average of 5 cycles* *TOLERANCE: Not greater than 15% greater than manufacturer claim (for one unit) or 10% greater than manufacturer claim (if average of 3 units)*
Spin Extraction Ratio	*Section 9: EN60456 - Moisture remaining in base load after spinning relative to the conditioned mass of the same load.* *(Mass of Base Load after Spin - Mass of conditioned base load)/Mass of conditioned base load.* *Average of at least 5 cycles* *TOLERANCE: Not greater than 15% greater than manufacturer claim (for one unit) or 10% greater than manufacturer claim (if average of 3 units)*
Rinsing Index	*Section 9: EN60456 - Based on alkinity of of detergent in base load following normal cycle. Value of 2-5 cycles (1st cycle after normalising not to be used)*
Wash Quality Index	*Section 9: EN60456 - As a ratio of average reflectance measured (compared with reference unit). At least 5 cycles from series.*
Spin Speed	*The lowest speed achieved during highest spin speed variation which runs continuosly for 60 seconds.* *TOLERANCE: Not greater than 10% or 100 rpm greater than manufacturer claim (if average of 1 or 3 units)*

Regulatory Requirements based on:

1995 95/12/EC implementing directive[3] implementing 92/75/EEC with regard to energy labelling of washing machines. (see also policy in Notes Section 5)

1.2   Product Efficiency Graphics

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[3] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:1995L0012:20070101:EN:PDF

None

1.2.1 Data Source:

Swiss Federal Office of Energy: Data extracted and enriched from the SFOE-Report Efficiency statistic for electrical appliances in households and offices

1.2.2 Data Clarifications

Additional Specific Data Cautions

As the data for this analysis has been provided from a third-party report the limitations of the data set are unknown.

1.2.3 Key calculations undertaken:

Declared Unit Load Capacity: Unit load capacity in kg is defined by local regulations and declared by manufacturers Unit kg).

(Note: This capacity is defined using the mixture of materials defined in the local regulations which is not necessarily in line with the mixture of material used elsewhere (for local load mix, refer to Section 1.1 on "Notes on Data")).

Model Energy Consumption: Model Energy Consumption is the energy consumed by the unit to complete one wash cycle as defined by local test conditions (Unit: kWh/wash).

Sales Weighted Energy Consumption of New Models: Value calculated by [Sum of (Model Energy Consumption multiplied by sales volume of Model in year) for all Models] divided by [Sum of (sales volume of all Models in year)]. Unit kWh/wash.

Model Weighted Consumption of New Models: Value calculated by [Sum of (Model Energy Consumption for all models sold in year)] divided by [Sum of (Number of Models sold in year)]. Unit kWh/wash.

Model Energy Efficiency: Value calculated by dividing Model Energy Consumption by Declared Unit Load Capacity (kWh/Kg/Wash).

Sales Weighted Energy Efficiency of New Models: Value calculated by [Sum of (Derived Model Energy Efficiency multiplied by sales volume of Model in year) for all Models] divided by [Sum of sales volume of all Models in year]. Unit kWh/kg/Wash.

Model Weighted Energy Efficiency of New Models: Value calculated by [Sum of Model Energy Efficiency for all models sold in year] divided by [Number of Models sold in year]. Unit kWh/Kg/Wash.

Spin Efficiency: The efficiency of removal of water from the test load as defined in local test conditions (refer to Section 1.1 on "Notes on Data").

Wash Quality: The efficiency of cleansing of test load as defined in local test conditions (refer to Section 1.1 on "Notes on Data").

Rinse Efficiency: The efficiency of removal of detergent, softener or other additive from the test load as defined in local test conditions (Unit: comparative percentage).

Spin Speed: The highest spin speed attainable by the unit (Unit: revolutions per minute – rpm).

Section 2: Notes on Product Consumption

2.1 Test methodologies and Performance Standards

Refer to section 1.1

2.2 Product Consumption Graphic

Refer to section 1.2

Section 3: Notes on the Efficiency and Consumption of units in the installed Stock

3.1 Unit Stock Efficiency Graphic

None.

3.1.1 Data Source

None.

3.1.2 Data Clarifications

None.

3.2 Unit Stock Consumption Graphic

None.

3.2.1 Data Source

Refer to section 1.2.1

3.2.2 Data Clarifications
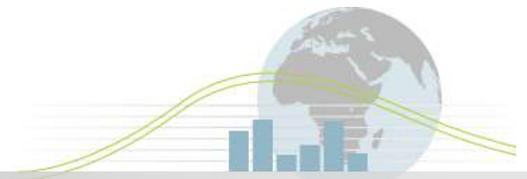
None.

Section 4: Notes on Consumption of Stock

4.1   Stock Consumption Graphic

None.

4.1.1 Data Source

Refer to section 1.2.1

4.1.2 Data Clarifications

None.

Section 5: Notes on Policy Interventions

5.1.1 Data Source

1995 95/12/EC implementing directive[4] implementing 92/75/EEC with regard to energy labelling of washing machines

5.1.2 Requirements of 1995 95/12/EC implementing directive implementing 92/75/EEC with regard to energy labelling of washing machines.

Limits for various labelling criteria are defined in the directive as follows (refer to policy table for criteria that are now no longer applicable due to the introduction of minimum standards or voluntary agreements):

ANNEX IV

ENERGY EFFICIENCY CLASS

1. The energy efficiency class of an appliance shall be determined in accordance with the following table 1:

Table 1

Energy efficiency class	Energy consumption 'C' in kWh per kg washed for standard 60 °C cotton cycle using test procedures of the harmonized standards referred to in Article 1 (2)
A	$C \leq 0,19$
B	$0,19 < C \leq 0,23$
C	$0,23 < C \leq 0,27$
D	$0,27 < C \leq 0,31$
E	$0,31 < C \leq 0,35$
F	$0,35 < C \leq 0,39$
G	$0,39 < C$

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[4] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:1995L0012:20070101:EN:PDF

2. The washing performance class of an appliance shall be determined by the following table 2:

Table 2

Washing performance class	Washing performance index P as defined in the harmonized standards referred to in Article 1 (2), using a standard 60 °C cycle
A	$P > 1{,}03$
B	$1{,}03 \geq P > 1{,}00$
C	$1{,}00 \geq P > 0{,}97$
D	$0{,}97 \geq P > 0{,}94$
E	$0{,}94 \geq P > 0{,}91$
F	$0{,}91 \geq P > 0{,}88$
G	$0{,}88 \geq P$

3. The drying efficiency class of an appliance shall be determined by the following table 3:

Table 3

Spin drying efficiency class	Water extraction efficiency D as defined in the harmonized standards referred to in Article 1 (2), using a standard 60 °C cycle
A	$D < 45\ \%$
B	$45\ \% \leq D < 54\ \%$
C	$54\ \% \leq D < 63\ \%$
D	$63\ \% \leq D < 72\ \%$

Spin drying efficiency class	Water extraction efficiency D as defined in the harmonized standards referred to in Article 1 (2), using a standard 60 °C cycle
E	$72 \% \leq D < 81 \%$
F	$81 \% \leq D < 90 \%$
G	$90 \% \leq D$

The label itself is shown below[5]

_____
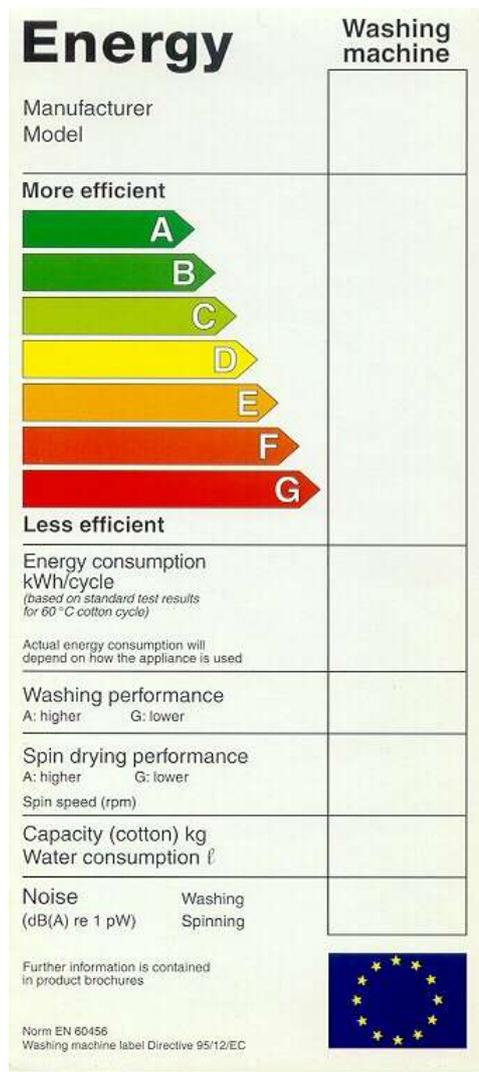
[5] Source from: http://www.ceced.org/energy/Washer_energy_label.jpg

5.1.3 CECED Voluntary Agreements

There have been two voluntary agreements have been negotiated between the EU and CECED (the European Committee of Manufacturers of Domestic Equipment). The following description of the first agreement and outcome and detailing of the second agreement is drawn from: "*SECOND VOLUNTARY COMMITMENT ON REDUCING ENERGY CONSUMPTION OF DOMESTIC WASHING MACHINES (2002 - 2008)*[6]"

"The European Committee of Manufacturers of Domestic Equipment (CECED) represents the interestsof domestic washing machines manufacturers in Europe. Its members are domestic appliances manufacturers and a number of national trade associations.

In April 1996 the European Committee of Manufacturers of Domestic Equipment (CECED) presented a first Commitment about energy saving to the European Commission. This Commitment was made on behalf of the European manufacturers of domestic washing machines and was aimed at a considerable reduction of energy consumption of washing machines. The proposal was negotiated with the EU Authorities and notified, in October 1997, to EC DG IV. The final approval followed on 9. December 1998, when the Commitment was published in the Official Journal. Exemption according to Art. 81 of the EU Treaty was granted by decision of the Commission for the period up to end of year 2001.

The overall saving target of this Commitment was to reduce the specific energy consumption of domestic washing machines by 20% in the period 1994 - 2000. Practically, this targeted at bringing the average consumption value of 0.30 kWh/kg1 down to 0.24 kWh/kg within 6 years. To achieve this goal, a catalogue of different technical and marketing related measures was set up, specifying socalled "hard targets" and also "soft targets".

In addition, CECED committed itself to monitor the progress and to report regularly - every year – to the European Commission on the basis of a notary report and the technical database of washing machines of CECED. The targets of the Commitment were achieved at the end of 1999. The specific energy consumption was then calculated and reported with 0,228 kWh/kg. That way a saving of 24% had been achieved - without regulative measures and without adverse market distortion.

A recently completed study2 came to the conclusion that in terms of energy efficiency of washing machines there is no real reason for a change in the present energy label. Other conclusions of this study have been taken on board in this proposal if considered as a support to contribute to energy savings in the future.

The successful fulfilment of this first Commitment prompted manufacturers to elaborate the possibility of a new - second - Voluntary Commitment, covering the

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[6] http://ec.europa.eu/energy/efficiency/doc/agreements/2002_ceced_washing_machines.pdf

period from 2002 to 2008. The proposal of this new Commitment is described thereafter.

This Industry Commitment is developed at Community level as it aims to ensure that free circulation of goods is not hampered by diverging practices at national level. Its logical reference could be ECTreaty article 95.

….

[In the second voluntary commitment, CECED members] commit to:

"Hard targets":

• By 31.12.20034 participants will have stopped producing for and importing in the CommunityMarket domestic washing machines which belong to energy efficiency class D

"Fleet target":

• Each participant will commit himself to contribute to the Commitment overall objective ofachieving a European production weighted average of 0.20 KWh/Kg for the year 2008. Eachparticipant will provide to the CECED notary consultant, as specified in part B of this clause, andaccording to the procedure specified in annex 2; production weighted energy consumption data forthe previous calendar year.

"Soft targets":

In addition to the above commitments, all participants commit themselves to strengthen their overall activities to achieve further energy savings and to educate consumer on the way to save energy, in particular, they commit to:

• Support the introduction of a new 'quality mark' on the present energy label, identifying and promoting super efficient machines at a level of 0,17 kWh/kg by giving additional public awareness.

• Support at EU or national level, rebates schemes aiming at fostering the introduction of efficient washing machines, e.g. by replacing old and inefficient machines as long as the balance between energy and washing performance in maintained (minimum class B for washing performance)

• Co-operate preferably at national level in setting up targets and measures for achieving a high level of spinning efficiency for markets where tumble drying is relevant

• Inform in their brochures about the advantages of a high spin speed washing machine when tumble drying is preferred

• Promote the energy efficient use of washing machines by giving information in the user manual

• *Co-operate with detergent industry on new energy saving detergents and promotion of an energy saving consumer behaviour*

• *Push the development of a new standard for testing washing machines taking into account the change of consumer behaviour towards lower wash temperatures and not using always full load. This development will be done in close co-operation with CENELEC and consumer organisations and testing institutes if actively supported by member states and/or the European Commission and is targeting to be used as a basis for a revised label in 2008. 4 Models of classes E,F and G were already eliminated by the first negotiated agreement Voluntary Commitment II - Washing Machines - 31.08.2002 7"*

5.1.4 National Policies

None.
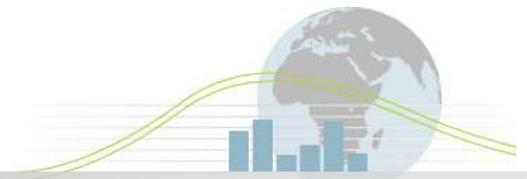
Section 6: Notes on Cultural Issues

6.1.1 Data Source

None.