Nordic Ecolabelling of White Goods

Background document

Version 5.0

4 October 2012

Nordic Ecolabelling

Criteria for White Goods
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1 Summary

Nordic Ecolabelled white goods refers to different types of white good and, for the consultation draft, Nordic Ecolabelling has chosen to tighten the requirements for different types of product in the following main groups: refrigerators and freezers, dishwashers, washing machines and tumble dryers. Nordic Ecolabelling has not previously had criteria for tumble dryers. It is also proposed that the Nordic Ecolabelling criteria for white goods are merged into a single criteria document.

This revision contains a proposal to tighten the requirements primarily for energy efficiency and for specific product parameters such as water consumption. The Ecodesign Regulations set out minimum requirements for a product that is to be placed on the market in the EU. The Regulations have identified key environmental parameters for each product group and the Nordic Ecolabel has decided to use the same parameters as a basis for setting stricter requirements than the minimum contained in the Regulations. The Energy Labelling Directive provides guidelines for calculating efficiency that all producers must adhere to, and that make it easy to compare different products.

Requirements concerning manufacture of white goods, input materials and chemicals and surface treatments have also been added.

Quality requirements for credibility have been considered. This relates to the correct use of energy labelling. Requirements regarding test methods and laboratories have also been reviewed.

Installation and user instructions have been clarified.

2 Basic facts about the criteria

2.1 *Products eligible for labelling*

The product group comprises the following white goods: washing machines, dishwashers, tumble dryers, refrigerators and freezers.

Proposed product group definition:
The following household white goods may carry the Nordic Ecolabel:

- Refrigerators and freezers
- Washing machines
- Dishwashers
- Tumble dryers

Gas-powered appliances, washer/dryers, drying cupboards, coffee machines, extractor fans, ovens for household and commercial use, hobs/grills for household and commercial use, microwave ovens, food processors, kitchen appliances and battery-powered and absorption-type refrigerators and freezers cannot be given the Nordic Ecolabel under these criteria.

The delimitation of the product group is the same as in the related Ecodesign Regulations and Energy Labelling Regulations as stated in Table 1. It will also be possible for hot water converter (HWC) machines to be given the Nordic Ecolabel.

Table 1 Overview of current Ecodesign and Energy Labelling Regulations

	Ecodesign Regulation	*Energy Labelling Regulation*
Refrigerators and freezers	*643/2009/EC*	*1060/2010/EU*
Household washing machines	*1015/2010/EU*	*1061/2010/EU*
Household dishwashers	*1016/2010/EU*	*1059/2010/EU*
Household tumble dryers	*Publication expected autumn 2012*	*392/2012/EU*

2.2 *Justification for Nordic Ecolabelling*

A consumer survey was conducted as part of the development of new Ecodesign criteria for dishwashers and washing machines (LOT 14: Household Washing machines & Dishwashers)[1]. The survey shows that washing machines are present in almost 100% of all European households, while the figure is over 60% for dishwashers. The lifetime of the white goods in the possession of the consumer averages 10 years, which means that production technology improvements (e.g. energy and water consumption) take over 10 years to be fully established across the

[1] http://www.ebpg.bam.de/de/ebpg_medien/014_studyf_08-12_part3-5.pdf

market. The trend concerning energy consumption for dishwashers has gone from an average of 3 kWh in 1970 to 1.2 kWh in 2005, while the corresponding water consumption has shrunk from an average of 75 litres in 1970 to 15 litres in 2005. A switch from old to new technology leads to major environmental improvements. The conclusion drawn from the survey is that educating the consumer is crucial for further reducing consumption of energy, water and chemicals.

In the autumn 2011 edition of their magazine *Tænk*, the Danish Consumer Council tested washing machines, dishwashers and tumble dryers[2]. The results of the test show major differences in energy consumption, and in functional performance (e.g. spinning performance, washing performance, noise, and how easy the white good is to use).

LCA

There are many LCA studies for the white goods refrigerators, freezers, washing machines, dishwashers and tumble dryers. The preparatory studies arising from the Ecodesign Directive (Lot 13, Lot 14 and ongoing Lot 16) refer in the background reports to specific LCA studies and consumer surveys. An LCA study from 2005[3] and 2010[4] for washing machines shows that the vast majority of the environmental impact arises during the time that the machine is in use, i.e. energy consumption has the greatest impact. The same is true for refrigerators, freezers, dishwashers and tumble dryers, according to the Ecodesign Directive studies above. Requirements regarding energy consumption are therefore also the lead requirements in the draft version of the criteria for Nordic Ecolabelled white goods.

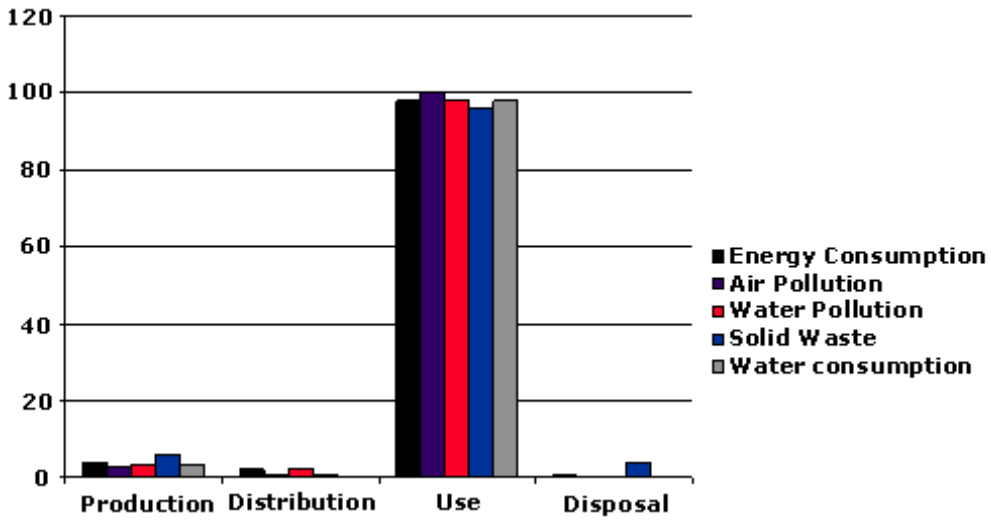


Figure 1 LCA for a washing machine, background report LOT 14: Domestic Washing machines & Dishwashers see footnote 6

A life cycle screening can identify the phases in the life cycle where the greatest environmental impact occurs for a given product. Based on this, Nordic Ecolabelling has assessed the individual environmental factors in terms of their relevance, potential

[2] www.taenk.dk
[3] Rüdenauer I et al. "Eco-efficiency analysis of washing machines" (2005), Öko-Institut e.V.Geschäftsstelle Freiburg
[4] http://labspace.open.ac.uk/mod/resource/view.php?id=360431

for improvement and controllability. The life cycle phases for white goods are as follows:

- Production (raw material extraction, production of parts and final assembly)
- Distribution (distance, mode of transport)
- Use phase (specific consumption, product lifetime, repairs)
- Packaging (type and weight)
- Disposal (recycling, landfill)

Production
White goods comprise various materials. The material list in the background report on the Ecodesign Requirements for dishwashers and washing machines (LOT 14: Domestic Washing Machines & Dishwashers)[5] shows that the majority of the materials are metals. Other materials used include concrete, plastic, insulation (polystyrene), glass, electronic components and cardboard (during distribution). The material list in the background report on the Ecodesign Requirements for refrigerators and freezers (LOT 13)[6] and for tumble dryers (LOT 16)[7] have lists similar to that in LOT 14. Concrete is only used in washing machines (weight for the drum) and glass is used primarily in washing machines and refrigerators.

In light of the above, there are many materials for which it is appropriate to set ecolabelling requirements, there is potential for improvements in the choice of materials and there is good scope for control over many of the materials. As far as Nordic Ecolabelling is concerned, it is important to set requirements that limit or prevent the use of materials that contain, or production processes that generate, environmentally harmful substances. It is currently difficult to set relevant requirements for the production and extraction of raw materials, but this is an area in which Nordic Ecolabelling hopes to be able to set more requirements in the future.

The production phase (including material extraction and production) also uses energy, but this is marginal compared with what is consumed during the use of the product (see also *Use phase*). The final assembly also uses various chemicals such as paints, lacquers, sealants, adhesives and cleaning products. It is thus appropriate to set requirements relating to these in terms of environmental and health and safety considerations. There is also potential for improvements in the choice of chemicals and good scope for control over the types of chemicals.

Distribution
This phase is relevant and has great potential for environmental improvements, but it is a difficult area over which to maintain any control. As a consequence of this lack of scope for control, there are no distribution-related requirements in this version of the Nordic Ecolabel criteria. It is, however, possible to set requirements regarding the materials (cardboard, plastics and wood) used during distribution.

Use phase
As mentioned above, energy consumption during use creates the greatest environmental impact, as viewed from a life cycle perspective in the Ecodesign

[5] http://www.ebpg.bam.de/de/ebpg_medien/014_studyf_08-12_part3-5.pdf
[6] Lot 13 Final Report tasks 3-5
[7] Lot 16 Final Report tasks 3-5

report. The effect can vary enormously depending on the behaviour of the consumer (e.g. with washing machines: type of laundry detergent, temperature and size of load). The same relation to consumer behaviour is considered to apply for dishwashers, tumble dryers and, to some extent, refrigerators and freezers. Energy consumption is linked to a number of different functions that guide the consumer's choice of white goods (such as washing, spinning, rinsing, cleaning and drying performance, water consumption and noise). The environmental impact of electricity consumption should be related to the way the electricity is produced[8]. This is illustrated, not least, in an article in the climate magazine Klima no. 5/11[9], which shows that when the EU's energy mix is used as the basis for calculations, carbon emissions from the use phase account for 60% of the total emissions in the life cycle, while taking the Norwegian energy mix as the basis, it is the production phase that accounts for 76% of the emissions.

Nordic Ecolabelling finds it appropriate to set requirements for low energy consumption and efficient energy use during the use phase, but Nordic Ecolabelling will also be setting requirements relating to the production phase. It is also relevant to inform consumers about the correct operation and maintenance of the white goods during the use phase.

White goods mainly comprise metals that can be recycled. Other materials used include concrete, plastic, insulation (polystyrene), glass, electronics, cardboard (packaging) and wood (during transport). It is therefore appropriate to set requirements for the disposal of white goods. There is potential in the correct recycling of the various materials and the safe disposal of substances such as refrigerants. There is relatively little scope for control over waste management, but it is possible to influence the waste route that the products take by setting requirements regarding the content of the installation/user handbook, which includes instructions on how the product should be disposed of.

2.3 *Version and validity of the criteria*

The history of the criteria is as follows

Refrigerators and freezers
Have had the following versions adopted:

1. October 1904
2. September 1996
3. June 2001
4. October 2004
5. May 2008

The difference between versions 4 and 5 relates to minor changes regarding documentary requirements for flame retardants, plus a new requirement for nanomaterials and antibacterial substances. The change in version 5.3 is that energy efficiency has been brought in line with Regulation (EU) No 1060/2010.

[8] Anatol Krozer et.al: SWACH_final report, 2011
[9] O. Michelsen and Edgar Hertwich: "Større fotspor fra produksjonsfasen", Klima 5-2011, page 16-16.

Dishwashers
Have had the following versions adopted:

1. 1995
2. June 1997
3. March 2007

In version 3.3, the requirements regarding energy efficiency, cleaning performance and drying performance were brought in line with Regulation (EU) No 1059/2010.

Washing machines
Have had the following versions adopted:

1. April 1994
2. June 1995
3. September 1996
4. March 2004

The criteria were reviewed in 2008, and a supplementary review of the Nordic Ecolabelling Criteria for White Goods (Refrigerators, freezers, dishwashers and washing machines) was conducted in autumn 2010 with a view to revising the criteria and making a single document for white goods.

3 The Nordic Market

A review in 2001 showed that in Sweden around 97-98% of white goods manufacturers are members of the Swedish association of electrical household appliance suppliers EHL, and 90% of the Swedish white goods market is covered by five players (Bosch, Siemens, Cylinda, ElektroHelios and Electrolux). Table 2 shows the share held by the different brands in the Norwegian white goods market.

Table 2 Market share by manufacturer 2005[10]

Electrolux	27%
Bosch Siemens	20%
Whirlpool	20%
Miele	10%
AM Vitvaror (Asko, Upo, Elto)	7%
Other	16%

As part of newbuilds and extensive renovations, a whole series of white goods is usually purchased and there is a desire for a broad approach to white goods, including extractor fans, hobs, ovens, drying cupboards and tumble dryers, together with the existing product groups of washing machines, dishwashers, refrigerators and freezers.

Table 3 gives an overview of the distribution between different energy classes in the Danish white goods market[11].

[10] Aftenposten "Hett marked for kjølig luksus" 7 March 2006
http://www.aftenposten.no/forbruker/article1241779.ece

Table 3 Overview of energy labelled white goods Denmark 2010

White good	No. of labelled models	Of which A++	Of which A+	Of which A
Refrigerator (standalone)	238	15	144	
Refrigerator (built-in)	85	6	52	
Upright freezer	232	16	139	
Chest freezer	81	8	72	
Washing machine	332			None higher than A
Dishwasher (standalone and built-in)				None higher than A

In 2007, sales of white goods totalled NOK 16 billion across the Nordic region. In 2009, NOK 7.8 billion worth of household appliances (which includes small electricals with white goods) were sold to Norwegian end users. Household appliances thus accounted for around 30% of sales of electronics to end users (including games consoles, software, parts, accessories, services and so on)[12].

Over the past five years, the market for white goods has seen a slight downturn (certain types have been hit hard by the reduction in the number of construction projects), but the market appears to be stabilising. The early 2000s saw a period of strong growth for certain products, such as American-style refrigerators with water and ice dispensers, which grew by 36% from 2004 to 2005.

Table 4 shows the total volume of white goods sold per product group in Norway in 2009.

Table 4 Total figures 2009 (sales in 1000s STC)[13]

Chest freezers	47
Upright freezers	34
Fridge/freezers	141
Of which American-style	8
Fridge/freezers total	149
Refrigerators	77
Washing machines, top-loading	17
Washing machines, front-loading	201
Washing machines total	218
Tumble dryers	70
Dishwashers	146
Hobs	79
Hobs, built-in	147
Countertop ovens	20

[11] www.energisparefonden.dk 6 September 2010
[12] The Norwegian Consumer Electronics Trade Foundation, "Presentasjon bransjetall 2009" http://www.elektronikkbransjen.no/file/8a0bf5de6cf1f1d477545e8b625ea134/elektronikk-2009-2010-fullPP.pdf
[13] Consumer Electronics Trade Magazine, "Hvitevarer totalomsetning 2009" http://www.elektronikkbransjen.no/file/66751d3e2d80219544c369d89635af23/Elektronikkbransjen%20-%20HvitevarerTotalomsetning%202009.xls

Extractor fans	112
Mini kitchens	3
Microwave ovens	133
Total large electrical appliances	1235

Resellers to the end consumer are dominated by the consumer electronics chains in Norway. Elkjøp is the largest, with a market share of around 40% for white goods in Norway[14]. Expert is the second largest, with other electronics chains including Lefdal, Siba, Elprice and Euronics. There are also several online stores that sell white goods.

There are two Nordic Ecolabel licensees, for both dishwashers and washing machines, and both these players extended their licences to include new Nordic Ecolabelled products in 2009 and 2010There is a strong desire to expand the white goods group of products to include tumble dryers. This is because consumers are looking for the combination of a washing machine and a tumble dryer when facing a purchase and, there is a major risk that they will choose a non-ecolabelled option for this reason. Technical advances in the development of tumble dryers have made and therefor expanding the white goods product group.

The figure below shows the proportion of EU households with the listed appliances. The Nordic market does not differ significantly from the EU countries, considering that households in Spain and Italy on average comprise more people and that countries with a poor economy have fewer dishwashers and tumble dryers per person than richer countries. This distribution they also be a result of cultural differences.

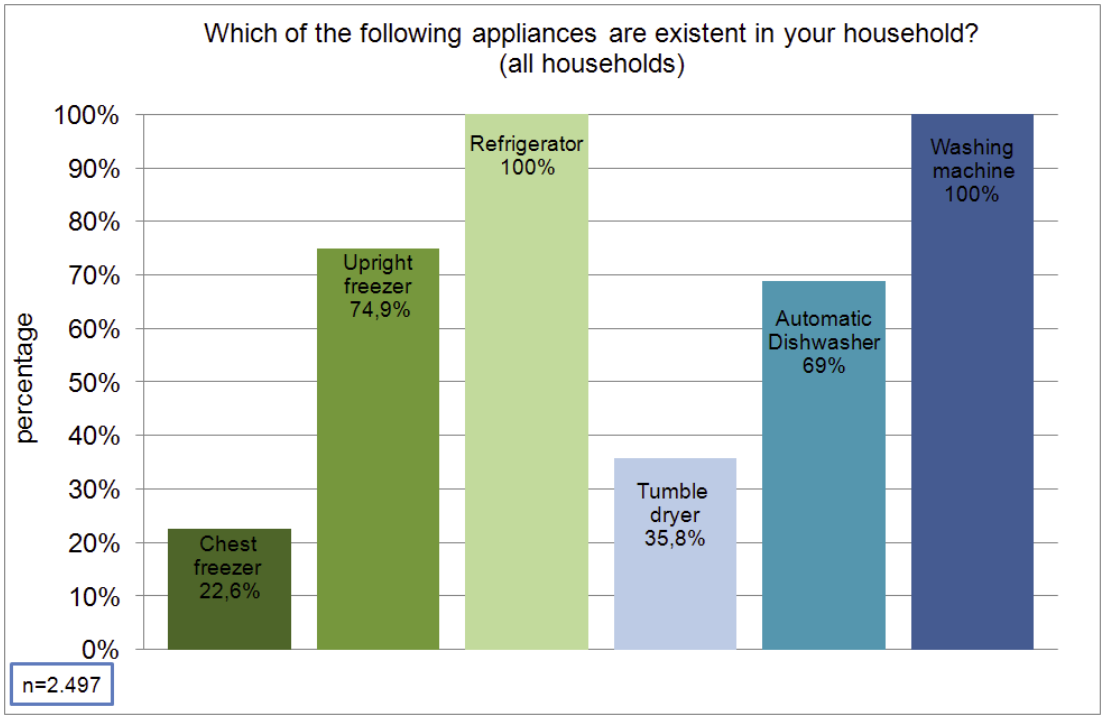


Figure 2 Percentage of 10,044 interviewed households in the EU that have these appliances installed. The chart is taken from Final Report tasks 3-4 in Lot 14, Ecodesign Programme[15].

[14] NVE www.energimerking.no
[15] Lot 14 Final Report tasks 3-5

4 Other labels

Environmental product declarations
Environmental product declarations give detailed environmental information without any particular requirements being placed on the products. There are thus no predetermined requirement levels. The usefulness of the declarations depends on the purchaser's knowledge of the environmental conditions surrounding the product to be bought in, and is not used directly for marketing to consumers of white goods. There is no international system for environmental product declarations, but work is underway in this area within ISO. In order to make an environmental product declaration, product category rules (PCRs) must be in place or created.

In Sweden there have been PCRs for washing machines, dishwashers and refrigerators, but these have expired. No PCRs have been developed for white goods in Denmark and Norway.

- Sweden: (PCRs for refrigerators as household appliances, expired 2004 and PCRs for washing machines and dishwashers for household use, expired 2004[16]):

Ecolabelling
In order for a product to be ecolabelled, it must be approved according to set environmental requirements that have been developed under ISO 14024. The products must meet specific environmental requirements in order to be approved. The system excludes products that do not meet the requirements and there is an independent third party that checks them. In addition to the Nordic Ecolabel, examples such as Hong Kong's Green Label scheme and the German Blaue Engel ecolabel have criteria for washing machines, dishwashers, refrigerators, freezers and tumble dryers. Hong Kong's Green Label scheme dates from 2010 and sets requirements in areas such as energy consumption, water consumption, noise, use of environmentally harmful chemicals and material recycling[17]. Blaue Engel's criteria also date from 2010 and set requirements regarding energy and water consumption, noise and function/efficiency. The EU Ecolabel previously had criteria for washing machines, dishwashers, refrigerators and freezers, but these expired in 2010. The EU Ecolabel is now developing criteria for Green Public Procurement (see section on GPP below). According to the EU Ecolabel's work plan[18] it was agreed in June 2011 that they would wait until the technical basis for GPP had been established before making a final decision on developing the EU Ecolabel criteria. The work plan gives no date for when the criteria will be completed.

Environmental management

[16] http://www.environdec.com/en/Product-Category-Rules/Detail/?Pcr=5656&show_login=true&new_user=true
http://www.environdec.com/en/Product-Category-Rules/Detail/?Pcr=5636

[17] http://www.greencouncil.org/eng/greenlabel/cert.asp
[18] http://ec.europa.eu/environment/ecolabel/about_ecolabel/pdf/work_plan.pdf

Environmental management systems bring order to a company's own operations and produce improvements based on the company's own targets in the environmental field. However, an environmental management system does not contain any specific requirement levels (threshold values) for the products or their production. The most important systems are EMAS, which was developed by the EU, and ISO 14001, which is an international standard.

Public procurement

Many countries have public bodies developing environmental requirements for public procurement. Such bodies include SEMCo in Sweden, DIFI in Norway[19] and SKI[20] in Denmark. Denmark[21] and Sweden[22] have systems/criteria for environmental assessment of white goods that can be applied to procurement. The Danish Environmental Protection Agency's environmental guidelines give recommendations on the best white goods in energy terms through energy labelling, while the Swedish Environmental Management Council (SEMCo) has criteria that set requirements for energy efficiency through energy labelling and ecodesign.

GGP (Green Public Procurement) is an instrument developed by the EU to increase public procurement of products and services with a reduced environmental impact throughout their lifetime, compared with similar products and services that might otherwise be purchased. GPP is a voluntary system, and a way for authorities to contribute to sustainable consumption and production.
There are currently 19 criteria[23] (developed or under development) for environmentally aware procurement in various product groups. The development of criteria for environmentally aware procurement of white goods (washing machines and freezers) is underway, but there is no plan for when the criteria will be completed.

ENERGY STAR

ENERGY STAR is a joint programme by the Environmental Protection Agency and the Department of Energy in the US to save the environment through energy efficient products and usage. The labelling system includes criteria for washing machines, dishwashers, refrigerators and freezers. The most important parameters in the labelling system are efficient energy and water consumption. ENERGY STAR does not have criteria for tumble dryers, since most tumble dryers use the same amount of energy[24].

Producers' own labels

Producers of white goods also have their own labels relating to environmental issues that are used only on their particular products. The criteria for these labels have been developed by the producers themselves. It is not possible to unify the requirements and parameters across the different labels.

Topten.eu Best Products of Europe

[19] DIFI = Agency for Public Management and eGovernment
[20] SKI = National Procurement Ltd
[21] http://www.miljoevejledninger.dk/vejledninger/haardehvidevarer
[22] http://www.msr.se/kriterier/vitvaror
[23] http://ec.europa.eu/environment/gpp/eu_gpp_criteria_en.htm
[24] http://www.energystar.gov/index.cfm?c=clotheswash.pr_clothes_dryers

Topten is a web portal that guides consumers towards the most energy efficient household appliances and cars in Europe. There are also national websites in the Nordic region: Norway http://www.besteprodukter.no/ Sweden http://www.toptensverige.se/ and Finland http://www.topten-suomi.fi/.

The Energy Labelling Regulations form the basis for Topten's assessment of which white goods are most energy efficient. The national portals also show which products are available on the household market. It has been noted that the Norwegian website is not regularly maintained. The Swedish website does not include washing machines, tumble dryers, dishwashers or combined fridge/freezers.

5 Statutory requirements

5.1 *Ecodesign Directive*

The Ecodesign of Energy-using Products Directive 2005/32/EC, or EuP as it is generally abbreviated, was replaced on 20 November 2009 with the Ecodesign of Energy-related Products Directive 2009/125/EC (commonly known as ErP). Work is currently underway within the EU to assess which products are to be covered by the Ecodesign Directive and which can be exempted because the market itself is such a strong driver of work on energy efficiency/reduced environmental impact that legislation is not required.

Various product groups/categories have been defined as main groups, which in this context are referred to as Lots, and these then have different numbers to identify them by. Work on the different groups (Lots) proceeds according to a model that begins with a feasibility study to establish the significant environmental factors and the potential for savings and the setting of requirements. Then a proposed Regulation is drawn up, and that is voted on by the relevant committee and the European Commission, which finally adopts the Regulation and publishes it in the Official Journal of the European Union, at which point it comes into force as legislation.

The Ecodesign Regulations set out minimum requirements (e.g. requirements for white goods covered by the Directive regarding energy consumption during use, i.e. in standby and off mode, minimum level of energy efficiency, measurements for verification, instruction book for users, etc) that must be met before a product can be placed on the market within the EU. Since the Regulations have identified key environmental parameters for each product group, Nordic Ecolabelling has decided to use the same parameters as a basis for setting stricter requirements than the minimum contained in the Regulations.

There are also a number of Regulations accompanying the Ecodesign Directive that are horizontal, which means that they are not product specific.

Table 5 Overview of horizontal Regulations

	Standby and off	**Electric motors 0.75-375 kW**	**Circulators**
Product group (Lot) **Regulation**	Lot 6 1275/2008/EC	Lot 11 640/2009/EC	Lot 11 641/2009/EC

Table 6 Overview of product specific Regulations

	Tumble dryers	**Dishwashers**	**Washing machines**	**Refrigerators / freezers**
Product group (Lot) **Regulation**	Lot 16 Publication expected autumn 2012	Lot 14 1016/2010/EU	Lot 14 1015/2010/EU	Lot 13 643/2009/EC

For more information about the Ecodesign Directive and the associated Regulations, see Appendix 1.

5.2 *Energy Labelling Directives*

The Energy Labelling Directive (2010/30/EU) is compulsory and ensures that manufacturers of white goods produce relevant and comparable data on the product's specific energy consumption. The Directive ensures that consumers can easily compare similar product types and, based on this, choose the best product in energy terms. The manufacturers are responsible for stating the correct energy consumption for their products.

Studies in Norway[25], Denmark and Sweden show that white goods are to a large extent incorrectly labelled or not labelled at all. By setting requirements regarding energy labelling, the Nordic Ecolabel can act as a third-party control to ensure that consumers receive this information.

Table 7 Overview of Energy Labelling Regulations

	Tumble dryers	**Dishwashers**	**Washing machines**	**Refrigerators / freezers**
Regulations	Regulation 392/2012/EU	Regulation 1059/2010/EU	Regulation 1061/2010/EU	Regulation 1060/2010/EU

For more information about the Energy Labelling Directive and the associated Regulations, see Appendix 2.

5.3 *WEEE (Waste Electrical and Electronic equipment)*

The purpose of the Directive is to prevent the occurrence of waste that comprises or contains electrical or electronic equipment (WEEE) and to ensure that there is reuse,

[25] NVE www.energimerking.no Consumer Electronics Trade Magazine, "Bedre energimerking av hvitevarer" http://www.elmag.no/Forside/fagbladet/?article_id=6052 and Dinside "Feil i energimerking" 16 February 2007 http://www.dinside.no/php/art.php?id=369685

material recovery and other forms of recycling of such waste in order to reduce the amount of waste disposed of.

The Directive applies to the electrical and electronic equipment covered by the categories listed in Annexes to the Directive: Category 1 according to Annex I A – Large household appliances, which for the product group of white goods means (under Annex I B)

- Large cooling appliances
- Refrigerators
- Freezers
- Washing machines
- Tumble dryers
- Dishwashers
- Electric stoves
- Microwave ovens

Design
The Member States are tasked with encouraging manufacturers to design and manufacture electrical and electronic equipment in a way that takes into account and facilitates disassembly and recovery, particularly reuse and material recovery of WEEE, their constituent parts and materials.

Recovery
The manufacturer (or a third party acting on behalf of the manufacturer) is to set up a system for recovery. Reuse of whole appliances is to be prioritised. The products covered by Category 1 (large household appliances) are subject to requirements for recovery as part of collection, under Article 7, Point 2 a):

- the rate of recovery shall be a minimum of 80% by an average weight per appliance

and

- component, material and substance reuse and recycling shall be a minimum of 75% by an average weight per appliance.

The Member States must keep a record of the quantities of WEEE and their components, materials or substances when they enter and when they leave the processing plant and/or when they come in to the recycling or material recovery plant.

The producer/manufacturer is responsible for ensuring that users of electrical and electronic equipment in private households have access to all the necessary information about the obligation to dispose of WEEE separately, what systems are in place for depositing and collection, the user's role in the system, the potential effects on health and the environment and the meaning of the symbol that the product carries. As a minimum, the following substances, preparations and components have to be removed from any separately collected WEEE (that is considered to be a large household appliance):

- Polychlorinated biphenyl (PCB) containing capacitors
- Mercury containing components, such as switches or backlighting lamps

- Batteries
- Printed circuit boards if the surface of the printed circuit board is greater than 10 cm^2
- Plastic containing brominated flame retardants
- Asbestos waste and components which contain asbestos
- Chlorofluorocarbons (CFC), hydrochlorofluorocarbons (HCFC) or hydrofluorocarbons (HFC), hydrocarbons (HC)
- External electric cables
- Components containing refractory ceramic fibres

A study[26] by the Norwegian Climate and Pollution Agency (Klif), shows that checks on compliance with the WEEE Directive are unsatisfactory, and that collection points for the processing of EE waste need to be improved.

5.4 *RoHS (Restriction of Hazardous Substances)*

The purpose of RoHS is to reduce levels of hazardous substances in waste from electrical and electronic equipment (EEE) by restricting the use of such substances in EEE, with a view to contributing to the protection of human health and the environment, including the environmentally sound recovery and disposal of waste EEE. RoHS covers the same products listed in the WEEE Directive, with white goods coming under Category 1: Large household appliances, as shown in the list above from the WEEE Directive.

Member States shall, from 1 July 2006, ensure that new electrical and electronic equipment released onto the market does not contain:

- Lead
- Mercury
- Cadmium
- Hexavalent chromium
- PBB or PBDE

Limits
The limits for the hazardous substances listed above are 0.1% by weight in homogenous material, with the exception of cadmium, whose limit is 0.01% by weight in homogenous material.

The Directive is continuously reviewed and revised to adapt to the demands of scientific and technical development, and to respond to consultations with manufacturers of electrical and electronic equipment, material recovery companies, processors, environmental organisations and consumer organisations. Exceptions regarding the use of the prohibited substances can be found in an Annex to the WEEE Directive. This applies particularly to applications where a replacement is not currently available, and this provision has been taken into account in drawing up the requirements for the Nordic Ecolabel.

[26] http://www.klif.no/no/Aktuelt/Nyheter/2010/Oktober-2010/Refser-handtering-av-EE-avfall/?cid=3292 28.10.2010

5.5 *The REACH Regulation*

The REACH Regulation *(Registration, Evaluation, Authorisation and Restriction of Chemicals)* (No 1907/2006) with reference to the ECHA (European Chemical Agency) Candidate List, Annex 1 (http://echa.europa.eu/chem_data/candidate_list_en.asp) carries a list of hazardous substances that are defined as Substances of Very High Concern (SVHC). The Candidate List is published by the ECHA and the substances on the list are covered by the official regulatory requirements once the European Commission has confirmed the substances on the list. Nordic Ecolabelling pays particular attention to the substances confirmed by the European Commission.

6 About the criteria review/revision

6.1 *Goals of the criteria review/revision*

Since the development of the criteria, they have focused primarily on consumption of energy, since life cycle analyses[27] and current statutory requirements indicate that energy consumption (and the associated climate problems) should be given priority over factors such as environmental impact from manufacturing. Due to improvements in energy efficiency in the use phase, the focus may shift towards environmental impact from the manufacturing phase.

Following a review of the current Nordic Ecolabel requirements concerning white goods (refrigerators, freezers, washing machines and dishwashers) (2010), it was proposed that the criteria should be revised and merged into a single criteria document. Many of the requirements currently set out in the Nordic Ecolabel criteria document for refrigerators and freezers, washing machines and dishwashers are covered by the new Ecodesign Regulations and the criteria document needs to be updated to take these into account.

The aim of this revision is to focus on the conclusions from the review:

- One criteria document for white goods
- Tumble dryers included in the criteria document
- Generic and product-specific requirements – it must be easy to expand the document to include other products that have energy labelling.
- The criteria complement and provide synergies with other criteria such as housing, furniture and heating.
- The technical requirements are coordinated with the Ecodesign and Energy Labelling Directives, the BAT report, industry contacts, expertise within Nordic Ecolabelling and other sources. The technical requirements that are to be evaluated or updated are:
  - Energy consumption
  - Warranties/quality
  - Metals and surface treatment

[27] Rüdenauer I et al. "Eco-efficiency analysis of washing machines" (2005), Öko-Institut e.V.Geschäftsstelle Freiburg

- Chemical requirements (flame retardants, nanomaterials and antibacterial compounds, insulation material, sealants, etc.)
- User instructions

6.2 *About this criteria review/revision*

Project manager:	Thomas Christensen/Charlotte Vincentz Fischer
Denmark:	Thomas Christensen/Charlotte Vincentz Fischer
Finland:	Not participating
Norway:	Ola Rise
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7 Justification of the requirements

A review of the requirements for the Nordic Ecolabelling of white goods, from 2010, shows that it is appropriate to set environmental requirements for white goods, since there is a potential for further environmental gains and there is potential to steer manufacturers towards more environmentally aware production. Nordic Ecolabelled white goods refers to different types of white good and, for the consultation draft, Nordic Ecolabelling has chosen to tighten the requirements for different types of product in the following main groups: refrigerators and freezers, dishwashers, washing machines and tumble dryers. Generally speaking, we are seeing many white goods meet the Nordic Ecolabel requirements, which suggests that there is scope to make the requirements more stringent. The legislation has also been tightened through the Ecodesign and Energy Labelling Directives, as well as the WEEE and RoHS Directives.

Since the aforementioned life cycle analyses show that energy consumption during the use phase has the greatest environmental impact, Nordic Ecolabelling is focusing on tightening the requirements concerning energy efficiency. The Ecodesign Directive, Lot 13 (refrigerators and freezers), Lot 14 (washing machines and dishwashers) and Lot 16 (tumble dryers), highlights the fact that energy consumption is the most important environmental parameter. The Ecodesign Directive for washing machines and dishwashers also focuses on water consumption, an area where Nordic Ecolabelling will also tighten the requirements.

To prevent the increased spread of harmful substances into the environment, Nordic Ecolabelling has set new environmental requirements concerning materials (see section 2).

Below is an explanation of the background to the proposed new requirements for white goods.

8 Manufacture

This section describes the basic requirements that have to be met for all product types.

8.1 *What can carry the Nordic Ecolabel?*

The Ecodesign Directive (2009/125/EC) and the Energy Labelling Directive (2010/30/EU) for white goods form the basis for which white goods can carry the Nordic Ecolabel.

Refrigerators and freezers (also in combination) for household use:
The Energy Labelling Regulation (1060/2010/EU) for refrigerators and freezers applies to refrigerators and freezers for household use with a storage volume of 10 litres to 1500 litres. It is therefore reasonable for Nordic Ecolabelled refrigerators and freezers also to fall within these volume parameters.

The Ecodesign Regulation (643/2009/EC) and the Energy Labelling Regulation (1060/2010/EU) are applicable to:

- Mains electrical refrigerators and freezers for household use, including those sold for use in a non-household context or to refrigerate products other than food.
- The regulations also apply to mains electrical refrigerators and freezers for household use that can also be battery-powered.

The Ecodesign Regulation (643/2009/EC) and the Energy Labelling Regulation (1060/2010/EU) are not applicable to:

- Refrigerators and freezers that are primarily powered by energy sources other than electricity, e.g. LPG, solar panels and biodiesel.
- Battery-powered refrigerators and freezers that can be connected to the mains using an AC/DC transformer that is purchased separately.
- Specially manufactured refrigerators and freezers that are produced as individual examples and that are not equivalent to any other models of refrigerator or freezer.
- Refrigerators or freezers for use in the service sector, where removal of the frozen food is detected electronically and the information conveyed automatically through a network connection to a remotely controlled reporting system.
- Refrigerators and freezers whose main function is not to preserve food through chilling, such as standalone ice machines or vending machines for chilled drinks.

Absorption refrigerators do not hold any major share of the Nordic market. They also have high energy consumption, as do compressor-type refrigerators and freezers. Consumption can be as much as three times higher. There is therefore no interest in considering ecolabelling of absorption refrigerators in this revision.

Washing machines and dishwashers for household use:
The Ecodesign Directive that applies to washing machines and dishwashers is limited to mains-powered machines for household use, including those that can also be battery-powered. It also applies to washing machines and dishwashers that are sold for purposes other than household use and built-in washing machines for household use.

Tumble dryers for household use:
The Energy Labelling Regulation (392/2012/EU) for tumble dryers for household use applies to:

- Mains electricity and gas-powered tumble dryers for household use and built-in tumble dryers for household use, including those sold for purposes other than household use.
- This Regulation does not apply to combined washer/dryers or spin dryers for household use.

The Ecodesign Regulation for tumble dryers for household use is expected to be published in autumn 2012.
Machines for connection to hot water as an energy source (hot water converter (HWC) machines) are not mentioned in the Energy Labelling Regulation. However, Nordic Ecolabelling believes that HWC machines have environmental advantages, as they can reduce the use of electricity for heating. The heat may instead derive from district heating, bioenergy, solar hot water systems and heat pumps.

There are also gas-powered tumble dryers, where the heat source is gas flames, but these are not common in the Nordic region. They are used to a very small extent further south in Europe[28]. Nordic Ecolabelling does not wish to ecolabel gas-powered tumble dryers.

Combined washer/dryers, tumble dryers and drying cupboards for household use:
The Energy Labelling Directive 96/60/EC of 19 September 1996 is starting to become outdated. Such machines are not particularly common in the Nordic market. See Appendix 3 for information on Energy Labelling Directive 96/60/EC.
Combined washer/dryers use slightly more energy than separate machines. The drying part of the combined machine is often smaller than in a separate tumble dryer, so there is often a need to dry the clothes twice[29]. Due to their energy consumption, Nordic Ecolabelling does not wish to ecolabel combined washer/dryers.

Proposed product group definition:
The following household white goods may carry the Nordic Ecolabel:

- Refrigerators and freezers
- Washing machines
- Dishwashers
- Tumble dryers

[28] "Household gas tumble dryers represent less than 1% market share in the EU" Lot 16 WORKING DOCUMENT on the ecodesign and labelling of household tumble dryers, 25.06.2011
[29] http://www.goenergi.dk/forbruger/lys-og-apparater/hvidevarer/toerretumblere/fakta

Gas-powered appliances, washer/dryers, drying cupboards, coffee machines, extractor fans, ovens for household and commercial use, hobs/grills for household and commercial use, microwave ovens, food processors and kitchen appliances, plus battery-powered and absorption-type refrigerators and freezers cannot be given the Nordic Ecolabel under these criteria.

The delimitation of the product group is the same as in the related Ecodesign Regulations and Energy Labelling Regulations as stated in Table 8. There is also a desire for hot water converter (HWC) machines to be given the Nordic Ecolabel.

Table 8 Overview of current Ecodesign and Energy Labelling Regulations

	Ecodesign Regulation	*Energy Labelling Regulation*
Refrigerators and freezers	***643/2009/EC***	***1060/2010/EU***
Household washing machines	***1015/2010/EU***	***1061/2010/EU***
Household dishwashers	***1016/2010/EU***	***1059/2010/EU***
Household tumble dryers	***Publication expected autumn 2012***	***392/2012/EU***

8.2 *Product requirements*

8.2.1 Description of manufacturing process and materials

Background to requirement

This is a new requirement. Manufacturers of white goods have experienced increased competition in existing markets in recent years. This has resulted in mergers and acquisitions of competitors, but also transfers of the actual manufacturing, mainly to European and Asian manufacturers. According to Nordic Ecolabelling, there are currently licensees that produce semi-finished and also finished white goods via subcontractors in Europe and Asia (e.g. in Japan, China). Production is, in many cases, spread across several subcontractors. Through the new requirements, Nordic Ecolabelling wishes to gain a good overview of the manufacturing processes and who the subcontractors are. Nordic Ecolabelling may conduct inspection visits at different points along the production chain.

Nordic Ecolabelling requires a description of the production process that covers the whole production flow (production planning, component purchasing, component assembly, finishing (cleaning, surface treatment)), final assembly, storage and distribution. Additional documentation may include production diagrams showing the individual production chain (including raw materials and semi-finished goods).
To give a better overview of the subcontractors used, it is desirable to state the subcontractor involved in surface treatment and metal plating. The information is to include subcontractors (name and place of production) plus a description of what each subcontractor produces.

Nordic Ecolabelling has a focus on energy/energy consumption and the associated environmental effects, such as global warming, acidification and eutrophication.

Previous life cycle analyses show, as mentioned earlier (section 2.2), that the majority of the environmental impact is caused during usage. Energy consumption during the production of the white goods therefore constitutes a minor element of the overall environmental impact, although it still has some significance. It may be worth discussing new requirements concerning energy consumption during the production of white goods. A requirement might, for example, relate to energy consumption per unit produced. Since the producers use many different subcontractors, it is however extremely difficult for the licensees to produce energy data for the different materials and semi-finished goods. What is needed is precise clarification on which parts of the production process should be included in the requirement. There have therefore been discussions on introducing a requirement for restrictions on energy consumption in production, but the fact that there are so many subcontractors creates a problem in this context. According to proposals received, the requirement relating to energy and energy consumption should be investigated further as part of the next revision of the criteria.

The new material requirement ensures that Nordic Ecolabelling is able to gain a full overview of all the materials used in the white goods, and will make it easier to set relevant requirements regarding materials as part of the next revision. Nordic Ecolabelling requires a summary of all the parts that make up the individual white good. Acceptable documentation includes the material description and the technical drawings that the test laboratories approve in conjunction with their tests.

Comments have been put forward that cheap white goods may not have the same quality or service life as the more expensive ones. Poor quality affects the white good's electricity consumption, which may affect emissions. If the white good is tested according to the standard, this type of problem will be minimised. There is a requirement that the white goods must be long-lasting. The white goods are to carry a warranty of at least two years under normal usage. See also section 10.1.2: Warranties.

The reason that the criteria require certain materials and certain techniques for the construction of white goods to be reported is to ensure low environmental impact over the long term. It is important to make sure that the quality of the white good does not deteriorate and that it meets the Nordic Ecolabel requirements during the whole period that the licence is valid. The laboratory's annual quality check is a good way of confirming the quality of the white good. Nordic Ecolabelling considers it important to ensure that the materials used in Nordic Ecolabelled white goods are safe and of high quality.

There is also a requirement for information about the environmental licences that the producers have for the final manufacture/assembly of white goods (at the premises of the end manufacturer) or control reports by environmental authorities, and about emissions of different substances under the environmental licence. This is the kind of information that Nordic Ecolabelling wishes to gather so that, as part of the next revision, it can assess what requirements may appropriately be applied to the production of white goods.

Proposed requirement

R1 Description of manufacturing process

The manufacturing process for the white good is to be described.
The description must, as a minimum, contain the following details:

- A summary of all the parts in the white good, stating the type and materials.
- A description of the manufacturing process for the white good, stating the different stages of the process. The production technology and cleaning technology for surface treatment and metal plating of parts is to be stated.
- Name and location of:
  - factory/factories for final assembly of the white good.
  - subcontractors for the production of core components (such as compressor unit, drum, pipework, etc.)
  - subcontractors for surface treatment and metal plating.
- Copy of environmental licence/permit or control reports/documents from environmental authorities for final assembly.

Final assembly of white goods relates to assembly of core components (such as compressor unit, drum, pipework, etc.) into a finished white good. Final assembly does not refer to production of inputs such as metals, insulation materials or plastic parts.

✉ A material description of the white good's parts, a description of the white good's manufacturing process and subcontractors, plus a copy of the environmental licence/permit in line with the requirement.

8.2.2 Chemical products, classification

Background to requirement

This is a new requirement and it has been formulated to make it clear that Nordic Ecolabelling is focusing on the properties of the chemicals used. The requirement applies to the classification of the chemical products used. Substances that would fall into the same classification may be present, but in such small quantities that the chemical product is therefore not classified. The requirement is not particularly strict since it is the first time that such a requirement has been included in the criteria for white goods. In the surface treatment of white goods, coatings are used that are classified as environmentally harmful (N with R52/53) and with the following risk phrases: Harmful to aquatic organisms may cause long-term adverse effects in the aquatic environment. Products with this classification will not be prohibited under these criteria.

The requirement is limited to the final assembly of the white goods and to surface treatment, since it can be difficult for the white goods supplier to source information from all subcontractors (which may be as many as 20) on which individual substances were used in the raw material production. The manufacturer of white goods is, however, able to control its own production. The requirement regarding substances may be directed at end manufacturers of white goods. The requirement concerns

chemicals such as adhesives, sealants (silicon, putty), cleaning products (such as degreasers) for white goods, paints and lacquers. The requirement does not apply to the production of raw materials for white goods.

Manufacturers of white goods have not previously needed to produce safety data sheets for chemicals, so there may be a need for information and education.

Proposed requirement

R2 Chemical products, classification

The manufacturer must compile a list of the chemicals used in final assembly of white goods and in surface treatment. The safety data sheet for the chemical products is to be submitted.
Chemical products, such as cleaning products, paints, lacquers, adhesives and sealants, that is used in the final manufacture of white goods and for surface treatment must not be classified in line with the risk phrases in Table 9 below.
An exemption to the requirement applies to metal plating of parts. When plating metal parts, the terms of requirement R4 must be met.

Table 9 Classification of chemical products

Classification	*EU classification until 1 December 2010**	*EU classification after 1 December 2010**
Toxic to the environment	*N with R50, R50/53, R51/53 and/or R59*	*Toxic to aquatic organisms. Category acute 1 H400, category chronic 1 H410, category chronic 2 H411. Ozone EUH 059*
Very toxic	*T x (T+ in Norway) with R26, R27, R28, R39*	*Acute Tox. 1/2 with H330, H310, H300,* *STOT SE 1 with H370*
Toxic	*T with R23, R24, R25, R39, R48*	*Acute Tox. 2/3 with H331, H330, H301* *STOT SE 1 with H370* *STOT RE 1 with H372*
Allergenic	*Xn with R42, Xi with R43*	*Resp sens 1 with H334 or Skin sens 1 with H317*
Carcinogenic	*Xn with R40 or T with R45, R49*	*Carc 1A/1B/2 with H350, H350i and/or H351*
Mutagenic	*T with R46 or Xn R68*	*Mut 1B/2 with H340 and/or H341*
Toxic for reproduction	*T with R60 and/or R61. Or Xn with R62 and/or R63*	*Repr 1A/1B/2 with H360F, H360D, H361f, H361d, H360FD, H361fd, H360Fd, H360Df* *Lact with H362*

** The classification applies under Directive 67/548/EEC and Directive 1999/45/EC (until 1 December 2010 and during transition period 2010-2015) or Regulation (EC) No 1272/2008 (from 1 December 2010). The requirement also covers combinations of the above risk phrases, e.g. T+ R26/27/28.*
Final assembly of white goods relates to assembly of core components (such as compressor unit, drum, pipework) into a finished white good. Final assembly does not refer to production of inputs such as metals, insulation materials or plastic parts.

✉ List of chemical products used in final assembly of white goods and surface treatment.

Safety data sheet/product data sheet in line with prevailing legislation in the country of application, e.g. Annex II to REACH (Regulation 1907/2006/EC) for each product.

8.2.3 Chemical substances

Background to requirement
This is a new requirement. The current Nordic Ecolabelling criteria do not have any specific requirement that the products used in the manufacture must comply with the RoHS Directive. However, the substances referred to in the Directive should be prohibited in the manufacture of white goods. The substances in question are lead, mercury, cadmium and hexavalent chromium. A proposal has been put forward that chemical agents containing these hazardous substances (under the RoHS Directive) should not be permitted in the manufacture of white goods.

The Norwegian Climate and Pollution Agency has proposed comprehensive regulation of the substances listed in this requirement regarding chemical substances.

Halogenated organic substances are organic compounds that contain halogenated substances such as chlorine, bromine, fluorine or iodine. Halogenated organic substances include many substances that are harmful to health and the environment, as well as being highly toxic to aquatic organisms and also carcinogenic and harmful to health in other respects. It is extremely difficult to break down halogenated organic substances, which increases the risk of harmful effects from these substances. In light of this, there is a requirement that chemical products used in the production of white goods must not contain halogenated organic substances. This means, among other things, that halogenated flame retardants, chloroparaffins, perfluoralkyl compounds (such as PFOA and PFOS) and halogenated organic solvents must not be added.

Alkylphenol ethoxylates (APEO) and alkylphenol derivatives, i.e. substances that release alkylphenols during degradation, may not currently be used in ecolabelled white goods. APEOs can occur in cleaning agents, binders, dispersants, thickeners, siccatives, anti-foaming agents, pigments, waxes, etc. APEOs have a host of properties that are problematic and harmful to health and environment. APEOs are not easily degradable according to current standardised tests. They have a tendency to bioaccumulate, they have been found to exist in high concentrations in wastewater sludge, and the degradation products from APEO are alkylphenols and APEO with one or two ethoxy groups. They are highly toxic to aquatic organisms and certain alkylphenols are suspected of being endocrine disruptors – alkylphenols and bisphenol A are among the more potent of the oestrogen chemicals that may occur in wastewater.

APEO-containing raw materials may be replaced with APEO-free raw materials that are based on three groups of surfactants: alkyl sulphates, alkyl ether sulphates and alcohol ethoxylates. These three groups of surfactants are readily degradable under aerobic and anaerobic conditions, and they are toxic or highly toxic to aquatic

organisms. The alkyl sulphates and alkyl ether sulphates are not considered to be bioaccumulating, but free alkohol ethoxylates (in long chains with few ethoxylate units) have the potential to bioaccumulate. Even if the substituted surfactants are toxic or highly toxic to aquatic organisms, there is an environmental advantage to the substitution, since they are quickly degradable in the environment. A further advantage of the substitution is that the degradation product nonylphenol is avoided. This product may be an endocrine disruptor.

The group of substances known as phthalates comprises many different chemicals, such as di-2-ethylhexyl phthalate (DEHP), dibutyl phthalate (DBP), benzyl butyl phthalate (BBP), diisodecyl phthalate (DIDP), diisononyl phthalate (DINP) and diisobutyl phthalate (DIBP). Some phthalates are classified as harmful to reproduction, and some are also classified as environmentally harmful. Phthalates occur in many places in the environment, including freshwater, saltwater, wastewater, air and organisms such as mussels and fish. The phthalates are used primarily as plasticisers, particularly in PVC, but can also be found in other products such as sealants, adhesives, paints and lacquers.

Nordic Ecolabelling also wishes to limit the amount of aromatic and organic solvents used in products such as cleaning agents. These are volatile organic compounds that pose particular problems because of their intrinsic properties. “Organic solvents can be absorbed through the lungs and skin and cause damage to multiple organs. The damage caused can be acute or chronic. Acute injuries due to inhaling vapour manifest themselves in the form of headaches, fatigue, etc. Organic solvents can also cause irritation of the mucous membranes of eyes, nose and throat. Organic solvents degrease the skin and can cause eczema. Prolonged exposure to organic solvents may cause chronic damage to the brain and nervous system. In addition, certain organic solvents add to the greenhouse effect. Some solutions contribute to photochemical ozone formation at ground level, while others contribute to the depletion of the ozone layer in the atmosphere.”

Volatile organic compounds with one or more benzene rings are called aromatic hydrocarbons and they are very stable . The term ‘aromatics’ refers to benzene, toluene, mixed xylenes, ortho-xylene, para-xylene and meta-xylene (collectively known as BTX). Benzene is used in the production of styrene, cumene and cyclohexane. Toluene is used primarily in the production of benzene, phenol and toluene diisocyanate.

The use of products with high VOC content is governed mainly by two executive orders: VOC Executive Order No. 350 of 29 May 2002, based on Directive 1999/13/EC and VOC Product Executive Order No. 1049 of 27 October 2005, based on Directive 2004/42/EC. VOC Executive Order No. 350 regulates emissions from 20 different types of facilities in which the annual consumption of VOC exceeds the specified thresholds. The Directive stipulates a regulatory minimum, which means that EU Member States may impose stricter requirements, for example by legislating for a higher degree of protection for the country’s environment than is required by the Directive. The VOC executive order stipulates, in regard to metal surface treatments, a maximum use of 5 tonnes of solvent per year. This means that the large producers of white goods in particular are forced to use different methods for recycling/incineration of VOCs to meet legal requirements . The use of VOC-based chemicals is further

regulated in national health and safety legislation. Nordic Ecolabelling wishes to restrict the quantities of VOC to the minimum level of 5% by weight in surface treatment agents.

Nanotechnology, which also includes nanoparticles, is also used to an increasing extent in the construction and home furnishing industries. A major problem is the use of nanoparticles, which can be released and affect health and the environment. Nanoparticles may, for example, penetrate healthy cells and then damage the cell or its core DNA.

Particles at nano level have special properties and are increasingly used in various consumer products to give new and improved functions to the products, including chemical products such as paints and coatings. Nanoparticles may also constitute an undesirable risk to health and the environment. In particle form, it is possible for them to reach places in the body and the environment that are otherwise protected, for example[30]. Their size can also lead to increased reactivity, since small structures will, in relative terms, have a much greater contact surface than larger particles. Research into the risk of using nanomaterials has primarily focused on health effects, and in some cases damage has been proven[31]. It has certainly been shown that nanoparticles can penetrate cells and degrade them[32]. This does not mean that all nanoparticles will cause damage. There is currently a lack of knowledge about the effects that nanoparticles have on health and the environment, particularly long-term effects and environmental effects[33]. Nordic Ecolabelling applies the precautionary principle when it comes to the use of nanomaterials.

Proposed requirement

R3 Chemical substances

The following substances must not be actively added* to the chemical products named in R2 (for example, cleaning products, paints, lacquers, adhesives, sealants used in final assembly of white goods and surface treatment):

- lead (Pb), mercury (Hg), hexavalent chromium (Cr^{VI}), cadmium (Cd) and their compounds
- halogenated organic substances
- alkylphenols, alkylphenol ethoxylates or other substances that may form alkyphenols or alkylphenol ethoxylates
- phthalates, listed in R7
- volatile organic compounds at more than 1% by weight

[30] Norwegian Board of Technology, 2008: Nanomaterialer, risiko og regulering, report 2008
[31] Norwegian Board of Technology, 2008: Nanomaterialer, risiko og regulering, report 2008
[32] Janne K. Folkmann, Lotte Risom, Nicklas R. Jacobsen, Håkan Wallin, Steffen Loft, Peter Møller: Oxidatively Damaged DNA in Rats Exposed by Oral Gavage to C60 Fullerenes and Single-Walled Carbon Nanotubes, Environ. Health Persp, 117(5), 2009
[33] Janne K. Folkmann, Lotte Risom, Nicklas R. Jacobsen, Håkan Wallin, Steffen Loft, Peter Møller: Oxidatively Damaged DNA in Rats Exposed by Oral Gavage to C60 Fullerenes and Single-Walled Carbon Nanotubes, Environ. Health Persp, 117(5), 2009

- volatile organic compounds (VOC**) at more than 5% by weight in surface treatment agents
- nanoparticles (from nanomaterials***)

** Substances that are not actively added by the chemical manufacturer or its suppliers and that appear in quantities of less than 100 ppm are excluded from the requirement.*

***VOCs are defined as organic compounds that at 293.15 K have a steam pressure of 0.01 kPa or more.*

**** The definition of a nanomaterial follows the European Commission's definition of nanomaterials from 18 October 2011, with the exception of the limit for particle size distribution, which is reduced to 1%: A nanomaterial is a natural, incidental or manufactured material containing particles, in an unbound state or as an aggregate or as an agglomerate and where, for at least 1% of the particles in the number size distribution, one or more external dimensions is in the size range 1-100 nm. This definition applies to the whole material, including particles exceeding the interval of 1-100 nm, as long as 1% of the material is particles of 1-100 nm. The definition applies to nanoparticles both in an unbound and in a bound state.*

Final assembly of white goods relates to assembly of core components (such as compressor unit, drum, pipework, etc.) into a finished white good. Final assembly does not refer to production of inputs such as metals, insulation materials or plastic parts.

An exemption to the requirement applies to metal plating of parts. When plating metal parts, the terms of requirement R4 must be met.

✉ Declaration or other equivalent certification (documentation) from the chemical manufacturer/chemical supplier. Appendix 2 can be used.

8.2.4 Metal plating of parts

Background to requirement
This is a new requirement. The plating of metals has an environmental impact (relevance). Substances harmful to health and the environment are used in certain metal plating, for example chrome plating. The environmental impact of metal plating varies according to the processes and substances used (potential). Nordic Ecolabelling consequently places requirements on metal plating (controllability).

Current criteria for white goods (refrigerators and freezers, dishwashers and washing machines) do not include a requirement regarding metal plating. The Nordic Ecolabel requirement concerning metal plating for products such as furniture, stoves and heat pumps is that metals must not be plated with chromium, nickel or their compounds. The exception is that small parts and surfaces may be plated with chromium or nickel where this is necessary on the grounds of chemical or mechanical wear or on the grounds of another specific technical need.

As part of the introduction of future criteria, Nordic Ecolabelling proposes that lead, mercury, cadmium, chromium and nickel must not be used for metal plating, since these substances are classified as hazardous in accordance with Section 8.2.2: Chemical products, classification.

The exception is that parts may be plated with chromium or nickel where this is necessary on the grounds of chemical or mechanical wear or on the grounds of another specific technical need.
The chroming process is to be based on trivalent chromium, and there must not be any hexavalent chromium used in plating. Chrome plating and nickel plating processes must be carried out with the help of cleaning technology, membrane technology or similar technology in order to ensure the greatest possible recovery of the chemical products. Emissions from the plating are to be recovered or destroyed. The system must be closed and have no discharges.

We will thus be introducing a requirement that special types of cleaning apparatus are to be installed by subcontractors to the manufacturer of the Nordic Ecolabelled white goods.

Proposed requirement

R4 Metal plating

Metals may not be plated with cadmium, chromium, nickel, zinc or alloys of these.
In exceptional cases, parts may be coated with trivalent chromium, nickel or alloys of these where this is necessary on the grounds of chemical or mechanical wear or on the grounds of another specific, documented, technical need.

Any chrome plating and nickel plating processes must be carried out with the help of cleaning technology, membrane technology or similar technology in order to ensure the greatest possible recovery of the chemical products. Emissions from the plating are to be sent for recovery or waste processing. The system must be closed and have no discharges.

✉ Declaration from the manufacturer/supplier saying that the metal plating requirement is fulfilled and specification of which cleaning technology. Appendix 3 can be used.

8.2.5 Marking of plastic parts

Background to requirement

Current criteria for white goods (refrigerators and freezers version 5.2, dishwasher's version 3.4 and washing machines version 4.4) require marking of plastic parts that weigh 50 grams or more. The proposal for the new criteria is that the requirement remains in place, but with the weight limit lowered to 25 grams, to bring it in line with Nordic Ecolabelling's electronic product groups. Cables have been exempted from the requirement and the proposal is for a nominal limit for plastic parts with a smooth surface of less than 200 mm^2.

Proposed requirement

R5 Marking of plastic parts

Plastic parts that weight 25 grams or more must be marked in accordance with ISO 11469. (Cables and plastic parts with a smooth surface of less than 200 mm^2 are excluded from the requirement).

✉ Declaration from the white good manufacturer that the requirements are fulfilled.

8.2.6 Flame retardants in plastic and rubber parts

Background to requirement

All electrical and electronic products carry a risk of fire. Various flame retardants are used to minimise this risk. The choice of flame retardant is governed by various factors, including the material to be protected, fire safety standards and price. The flame retardant must also not impinge on the product's intended technical functions.

It is intended that flame retardants will provide protection throughout a product's life cycle. They are therefore intentionally designed not to break down easily, which means that the substances may not be readily degradable when they enter the environment. A great deal of attention has been focused on *brominated* flame retardants, not least because they have been detected in breastmilk and in blood. Of the flame retardants that are not brominated, the most common are metal compounds, organic phosphorus and nitrogen compounds or inorganic salts.

There are around 70 brominated flame retardants on the market and knowledge regarding their effect on health and the environment varies. Table 10 gives a summary of the different flame retardants, along with their risks and usage restrictions. The five brominated flame retardants that have been used most and about which there is a great deal of knowledge are[34]:

- pentabromodiphenyl ether
- octabromodiphenyl ether
- decabromodiphenyl ether
- hexabromocyclododecane (HBCDD)
- tetrabromobisphenol A (TBBP-A)

The three top chemicals fall into the group of polybrominated diphenyl ethers (PBDE). Under the EU's Restriction of Hazardous Substances (RoHS) Directive, polybrominated diphenyl ethers and polybrominated biphenyls (PBB) have been prohibited in new electrical and electronic equipment since July 2006. The European Commission decided in October 2005 that the flame retardant decaBDE[35] should generally be excluded from the ban in the RoHS Directive. However, on 1 April 2008, the European Court of Justice ruled that the Commission's decision on such an exemption was invalid. As a consequence decaBDE was also banned in electrical and electronic products from 1 July 2008.

[34] http://www.kemi.se/sv/Innehall/Fragor-i-fokus/Flamskyddsmedel/

[35] Penta-, octa- and decabromodiphenyl ethers belong to the same chemical group, polybrominated diphenyl ethers, which is abbreviated to PBDE. These have different numbers of bromine atoms in their structure. All three are non-readily degradable and persistent substances, but their bioaccumulation and toxicity varies.

No new substances have been banned in the recently revised RoHS Directive (which entered into force in June 2011). The flame retardants that the Commission was tasked with working into the RoHS Directive were the brominated flame retardants HBCDD and TBBP-A.

Sweden was rapporteur for the risk assessment of HBCDD under the EU's Existing Substances Programme. The conclusions in the report are that the substance is persistent, bioaccumulating and highly toxic to aquatic organisms, and may cause damaging long-term effects in an aquatic environment. In animal tests, HBCDD has been shown to affect the liver and thyroid and be toxic for reproduction. The EU's risk assessment of HBCDD has been completed. HBCDD has been identified as a Substance of Very High Concern (SVHC), and has been entered on the Candidate List (REACH). HBCDD has also been included on the Authorisation List, Annex XIV, in REACH.
TBBP-A has also been risk assessed under the EU's Existing Substances Programme. As a result, the substance has been classified as highly toxic to aquatic organisms, and may cause damaging long-term effects in an aquatic environment. TBBP-A is considered non-readily degradable and may bioaccumulate. Alternatives to TBBP-A as a flame retardant have been developed and their use is increasing.

TBBP-A is the most widely used brominated flame retardant in global terms. It is used primarily in printed circuit boards. Since it is chemically bonded to the material in the printed circuit board and is thus not as easily spread into the surrounding environment, the EU has judged that it poses no risk to human health in this application.

Chloroparaffins, which can also be used as a flame retardant, are stable and non-readily degradable substances that can bioaccumulate in the environment. Short and medium chain chloroparaffins are highly toxic to aquatic organisms, and may cause damaging long-term effects in an aquatic environment. Short chain chloroparaffins have been identified as Substances of Very High Concern (SVHC), and have been entered on the Candidate List.

Table 10 Summary of flame retardants, their risks and usage restrictions

Flame retardant	**Rule**	**Risk assessment**	**Nordic Ecolabel stipulation for white goods**
Polybrominated biphenyls (PBB)	Banned in new electrical and electronic equipment since July 2006 under RoHS Directive	PBB was the first brominated flame retardant that proved to be harmful. The substance has been well studied and as far as we know PBB is no longer made.	Must not be present
Polybrominated diphenyl ethers (PBDE)	Banned in new electrical and electronic equipment since July 2006 under RoHS Directive (since July 2008 for decaBDE)	pentaBDE: persistent, harmful to health and environment. POP substance (UNEP) octaBDE: endocrine disruptor, persistent and bioaccumulating. POP	Must not be present

Flame retardant	Rule	Risk assessment	Nordic Ecolabel stipulation for white goods
		substance decaBDE: suspected to be harmful but risk assessment pending.	
Hexabromocyclo dodecane (HBCDD)	Use permitted	Classed as SVHC. Included on Candidate List.	Current criteria: No requirement Revised criteria: Must not be present
Tetrabromobisph enol A (TBBP-A)	Use permitted	Highly toxic to aquatic organisms. May cause damaging long-term effects in an aquatic environment.	Current criteria: No requirement Revised criteria: Must not be present
Short chain chloroparaffins	Use permitted	Classed as SVHC. Included on Candidate List.	Chain length of 10-13 carbon atoms and chlorine content > 50 must not be present
Medium chain chloroparaffins	Use permitted	Highly toxic to aquatic organisms. May cause damaging long-term effects in an aquatic environment.	Current criteria: No requirement Revised criteria: Must not be present

A washing machine comprises an estimated 1.5 kg[36] electronics that may need flameproofing.

The plastic-based insulation materials cellular rubber and expanded polystyrene (EPS) may contain brominated flame retardants. Alternatives without brominated flame retardants are, however, available on the market.

The insulation in a refrigerator or freezer is also usually foam rubber (cellular polyurethane plastic).

Table 11 below shows a list of the brominated flame retardants used in commonly occurring polymers.[37]

Table 11 List of brominated flame retardants used in commonly occurring polymers

Polymer	Content (%)	Substance(s)
Polystyrene foam	0.8-4	HBCDD

[36] Rüdenauer I et al. "Eco-efficiency analysis of washing machines" (2005), Öko-Institut e.V.Geschäftsstelle Freiburg

[37] Pedro Arias, Brominated flame retardants – an overview. 2nd International Workshop on BFR, Stockholm, 2001

Polymer	Content (%)	Substance(s)
High-impact polystyrene	11-15	decaBDE, brominated polystyrene
Epoxy resin	0-0.1	TBBP-A
Polyamides	13-16	decaBDE, brominated polystyrene
Polyolefins	5-8	decaBDE, propylene dibromostyrene
Polyurethanes	n/a	no brominated flame retardants available
Polyethylene terephthalate (PET)	8-11	brominated polystyrene
Unsaturated polyesters	13-28	TBBP-A
Polycarbonate	4-6	brominated polystyrene
Styrene copolymers	12-15	brominated polystyrene

The current Nordic Ecolabel criteria for refrigerators and freezers (version 5.2), dishwashers (version 3.4) and washing machines (version 4.3) set the requirement that plastic parts must not contain PBB or PBDE flame retardants (in line with the RoHS Directive). Plastic parts must also not contain flame retardants made from chloroparaffin with a chain length of 10-13 carbon atoms and a chlorine content > 50% by weight. There is also a Nordic Ecolabel requirement that plastic parts weighing more than 25 grams must not contain flame retardants that are classified as R45, R46, R60 or R61. The required documentation must include the name and CAS-number of the flame retardants used.

Against this background, particularly the credible risk assessment, the following is proposed:

1. A continued ban on polybrominated diphenyl ethers (PBDE) and polybrominated biphenyls (PBB), under which the requirements in RoHS must be met. RoHS now also includes a ban on decaBDE, which is not incorporated into the current criteria.

2. The revised criteria should be toughened to include a ban on high chlorine short chain and high chlorine medium chain chloroparaffins.

3. The revised criteria should be toughened to include a ban on hexabromocyclododecane (HBCDD) and tetrabromobisphenol A (TBBPA).

4. As is the case today, flame retardants used in constituent plastic and rubber parts must not, at the time of the ecolabel application, have been given or have the potential to be given the following risk phrases:

    - R45 (may cause cancer)
    - R46 (may cause inherited genetic harm)

- R60 (may impair fertility)
- R61 (may cause harm to the unborn child)

5. Other halogenated flame retardants must not be added, although an exception may be acceptable where this is necessary for electrical or fire safety reasons under the Low Voltage Directive 73/23/EEC or standard EN 60335-1 (electrical appliances for household use).

The requirement has the same structure as in the current criteria for white goods (refrigerators and freezers (version 5.2), dishwashers (version 3.4) and washing machines (version 4.3)) but more brominated flame retardants have been added.

Printed circuit boards and plastic/rubber parts weighing < 25 grams that are integral to electronic parts are exempted from the requirement. However, neither of these are permitted to contain PBB, PBDE, HBCDD, TBBP-A or chloroparaffins in concentrations higher than 0.1% by weight in homogenous material (limit for pollutant). There may be a need to fully exclude cables from the requirement.

Nordic Ecolabelling has found that licensees have great difficulty in providing CAS-numbers for all the flame retardants used, as is required. There are several links back down the chain between the manufacturer of the end product and the manufacturer of the components (plastic parts)/chemicals. It is therefore proposed that CAS-numbers should not be included as part of the required documentation.

Proposed requirement

R6 Flame retardants in plastic and rubber parts

a) Hexabromocyclododecane (HBCDD), tetrabromobisphenol A (TBBPA) and high chlorine short chain and high chlorine medium chain chloroparaffins must not be added.

b) Other halogenated organic flame retardants and other flame retardants that have been given the following risk phrases must not be added:
   - R45 (may cause cancer)
   - R46 (may cause inherited genetic harm)
   - R60 (may impair fertility)
   - R61 (may cause harm to the unborn child)

   An exemption from requirement b) may be given for halogenated flame retardants:
   - In cases where these are required for electrical or fire safety reasons under the Low Voltage Directive 73/23/EEC or standard EN 60335-1
   - Printed circuit boards, PCBs
   - Plastic and rubber parts weighing < 25 grams that are integral to electronic parts

The exemption does not apply to the flame retardants governed by a) that are prohibited under the RoHS Directive.

✉ Duly completed declaration from the manufacturer/supplier of the plastic and rubber parts, see Appendix 4.

8.2.7 Phthalates

Background to requirement

Phthalates are used chiefly as plasticisers in plastic and rubber and may account for up to 40% of the finished product. A particular focus is placed on the use of DEHP, (di-2-ethylhexyl phthalate), which is a plasticiser in PVC. Plasticisers are not firmly bound to the PVC polymer and therefore phthalates are secreted from plastic products throughout their lifetime. This diffuse dissemination means that phthalates are found almost everywhere in the environment[38].

DEHP, dibutyl phthalate (DBP) and butyl benzyl phthalate (BBP) are classified as toxic and specifically toxic to reproduction, which means that they may impair fertility and may cause harm to the unborn child. DBP is also classified as environmentally harmful and highly toxic to aquatic organisms. These three most harmful phthalates (DEHP, DBP and BBP) are totally banned[39] in toys and childcare items. The three less harmful substances (DINP, DIDP and DNOP) are banned in toys and childcare items that can be put in the mouth.

The current Nordic Ecolabel criteria for white goods (refrigerators and freezers, dishwashers and washing machines) do not include a requirement regarding phthalates.

It is proposed that the revised criteria should have a new requirement banning those phthalates that are shown or may be shown to be harmful. This means those that comprise linear medium, linear long or branched carbon chains.
All the requirements regarding phthalates are to cover plastic and rubber components that weigh 25 grams or more. Printed circuit boards and plastic/rubber parts weighing < 25 g that are integral to electronic parts are exempted.

Proposed requirement:

R7 Phthalates

The following phthalates must not be added to plastic or rubber materials:

- Di-2-ethylhexyl phthalate (DEHP)
- Dibutyl phthalate (DBP)
- Benzyl butyl phthalate (BBP)
- Dicyclohexyl phthalate (DCO)
- Diisobutyl phthalate (DIBP)
- Diisooctyl phthalate (DIOP)
- Diisononyl phthalate (DINP)

[38] Swedish Chemicals Agency, http://www.kemi.se/templates/Page____3283.aspx
[39] If the level of the product exceeds 0.1%.

- Diisodecyl phthalate (DIDP)
- Diethyl butyl phthalate (DEBP)
- Dihexyl phthalate (DHP)
- Di-n-decyl phthalate (DNDP)

The following are exempted from the requirement:

- Printed circuit boards, PCBs
- Plastic and rubber parts weighing < 25 g that are integral to electronic parts

✉ Duly completed declaration from the manufacturer/supplier of the plastic and rubber parts, see Appendix 4.

8.2.8 Antibacterial properties

Background to requirement:

The requirement exists in the current criteria for refrigerators and freezers, version 5. The new change for this requirement is that it applies to all white goods in this document, and that silver ions are now also counted as antibacterial substances. Today we know that antibacterial substances are found in the environment and in breast milk, blood plasma and other parts of the food chain. Nanosilver particles are used in refrigerators, for example, and act as an antibacterial coating. Some washing machines also have a built-in device that can release silver ions during the rinse programme. Nanosilver and silver ions can prevent bad odours.
Particles are not intended to be released from the surface treatment, since their effect is to be restricted to the coating. A certain amount of wear, and thus a certain amount of particle release, must however be expected[40]. Both nanosilver and silver ions affect aquatic organisms. One problem is that silver particles can reduce the effectiveness of water treatment plants. Water treatment plants use bacteria to clean the wastewater, but these can be killed by silver. Silver can also continue into the aquatic environment and cause damage there. The possibility that the bacteria may become resistant to nanosilver is also a cause for concern[41].

Nordic Ecolabelling should prevent the unnecessary use of antibacterial agents and the negative consequences that such agents have, such as bacterial resistance and destruction of good bacteria.

Proposed requirement:

R8 Antibacterial properties

Chemicals or additives that are added to create an antibacterial or disinfectant surface, in or on the product or to be released during the use of the product, must not be used.

[40] Stuer-Lauridsen, Frank et al.: "Kortlægning af produkter som indeholder nanopartikler eller er baseret på nanoteknologi", No. 81, 2007**,** Danish Ministry of the Environment.
[41] http://www.forbrugerkemi.dk/test-og-rad/hjemmet/rad-om-harde-hvidevarer/fakta-om-harde-hvidevarer

Silver ions are not counted as antibacterial substances.

An antibacterial chemical inhibits or stops growth of microorganisms such as bacteria, fungi or protozoa (single-celled organisms).

✉ Declaration from the producer/supplier that the requirement is fulfilled, see Appendix 5.

8.2.9 Nanoparticles on surfaces

Background to requirement:
Some manufacturers of white goods use nanoparticles as an antibacterial agent, for example in washing machines and refrigerators. The particles are often nanosilver and the products are marketed as having health benefits in part due to these coatings.

A research project led by Nofima Mat in Ås, Norway, studied chopping boards with claims of bacteria killing properties[42]. In the study, triclosan was the only one of the substances tested that showed a certain noticeable effect. The nanosilver ions were shown to have no effect on organic material, and would therefore not work in food preparation. Silver ions have a certain effect on a clean and damp chopping board, but if the board dries, the bacteria will die anyway. Nanosilver was not found to have any effect on bacteria, which indicates that nanosilver is not sufficiently robust, according to Langsrud at Nofima Mat. See also section 8.2.3: Classification of chemical products.

Proposed requirement:

R9 Nanoparticles on surfaces

Nanoparticles* (of nanomaterials) must not actively be added to the product's inner or outer surfaces.

** The definition of a nanomaterial follows the European Commission's definition of nanomaterials from 18 October 2011, with the exception of the limit for particle size distribution, which is reduced to 1%: A nanomaterial is a natural, incidental or manufactured material containing particles, in an unbound state or as an aggregate or as an agglomerate and where, for at least 1% of the particles in the number size distribution, one or more external dimensions is in the size range 1-100 nm. This definition applies to the whole material, including particles exceeding the interval of 1-100 nm, as long as 1% of the material is particles of 1-100 nm. The definition applies to nanoparticles both in an unbound and in a bound state.*

✉ Declaration from the producer/supplier that the requirement is fulfilled, see Appendix 6.

8.2.10 Packaging

Background to requirement:

[42] http://www.tu.no/forbruker/article280975.ece (March 2011)

Requirements concerning packaging have so far only been included in the Nordic Ecolabelling criteria for refrigerators and freezers. It must be possible to recycle or reuse the packaging material. Packaging shall be disposed of for recycling. Packaging material must be free from halogenated plastics, such as chlorine based plastics, or wood that has been treated with preservatives/biocides. This is in line with the principle of restricting these materials in packaging, which Nordic Ecolabelling considers to have an environmental impact. The requirements are therefore designed for multiple product groups.

Proposed requirement:

R10 Packaging

It must be possible to recycle or reuse the materials in the packaging and transport protection. The producer must submit a description of the packaging and transport protection and how it will be handled in the Nordic countries where the Nordic Ecolabelled white good will be sold.
Chlorine based plastics and biocide treated/impregnated timber must not be used in the packaging.

✉ Description of packaging and how it will be handled, and description in the user instructions.

8.2.11 Waste

Background to requirement:
This is a new requirement. Waste minimisation and proper waste management are important environmental parameters that can be carried out by the producer or a subcontractor.

Requirements regarding waste management may, to ensure quality assurance, be directed towards the end manufacturer.

The manufacturer shall sort waste at source into the fractions that arise during production. A waste plan must be prepared by the manufacturer of the white good in order to facilitate sorting. Waste fractions and waste recipients must be specified. The requirement does not apply to subcontractors in the present revision.

Proposed requirement:

R11 Waste

The manufacturer must sort different types of waste that arise from the production of the white good, for example wood waste, glass waste, plastics and metals. A waste plan is to be included, listing waste fractions and a description of how the waste will be handled (e.g. recycling, landfill and incineration) and who will deal with the waste.

✉ Waste plan with waste fractions and waste management for the activity from the manufacturer of the white good.

8.3 *Operation of the Nordic Ecolabelled white good*

8.3.1 Energy consumption on standby and switched off

Background to requirement:

The requirement regarding energy consumption in standby and switched off is covered by the Ecodesign Directive via Regulation (EC) No 1275/2008 (requirements for standby and off mode electric power consumption of electrical and electronic household and office equipment).

Applicable requirement:
Energy consumption switched off: max 1.00 W
Energy consumption on standby: max 1.00 W with regard to a pure reactivation function, max 2.00 W if it involves information or status display (either exclusively or in combination with a reactivation function).

All products must, except where inappropriate for intended use, be equipped with an off mode and/or standby mode and/or some other suitable mode that ensures the Ecodesign requirements for standby and off mode are not exceeded.

Applies from 7 January 2013
Energy consumption switched off: max 0.50 W
Energy consumption on standby: max 0.50 W with regard to a pure reactivation function, max 1.00 W if it involves information or status display (either exclusively or in combination with a reactivation function).

For further information on the Ecodesign Regulations concerning energy needs in standby and off mode for all equipment, see Appendix 1.

Nordic Ecolabelling sees several examples of washing machines being marketed with extremely low or no electricity use in standby mode[43]. The consultation draft therefore contains a proposed requirement for energy consumption in off and standby mode of 0.4 W, and 0.80 W on standby with information or status display (either exclusively or in combination with a reactivation function).

Proposed requirement:

R12 Energy consumption on standby and switched off

Energy consumption may be max:

- 0.40 W switched off
- 0.40 W on standby with reactivation function
- 0.80 W on standby with information or status display (either individually or in combination with a reactivation function)

✉ Test report on energy consumption switched off and on standby in W (watts), rounded off to 2 decimal places, cf. Regulation (EC) No 1272/2008. Requirement for test method and laboratories, see Appendix 1.

[43] http://www.lg.com/no/hvitevarer/vaskemaskiner/LG-F1403FD.jsp

8.3.2 Energy consumption

Background to requirement:
White goods are currently regulated primarily by the Ecodesign and Energy Labelling Regulations. The Ecodesign Regulations set out minimum requirements (e.g. requirements for white goods covered by the Directive regarding energy consumption during use, i.e. on standby and switched off, minimum level of energy efficiency, measurements for verification, instruction book for users, etc) that must be met before a product can be placed on the market within the EU. Since the Regulations have identified key environmental parameters for each product group, the Nordic Ecolabel has decided to use the same parameters as a basis for setting stricter requirements than the minimum contained in the Regulations (e.g. cleaning and drying efficiency as required under Regulation (EU) No 1016/2010 for dishwashers).

The Ecodesign Regulations set out requirements for energy consumption by requiring provision of an energy efficiency index (EEI), which is a quotient based on the machine in question's energy consumption divided by the energy consumed by a standard machine. The EEI can then be converted into an energy efficiency class via the Energy Labelling Regulations.

One problem with these formulae is that the manufacturers are not forced to improve efficiency as a way of cutting energy consumption (which is the primary purpose). Instead they are driven to maximise energy consumption within the machine's performance requirements and include more functions. Nordic Ecolabelling can make a difference here by setting a requirement for usability and 'sufficiency', rather than just efficiency as a relative figure in combination with an inflation in functions.

Refrigerators and freezers
Ecodesign Regulation (EC) No 643/2009 sets requirements regarding ecodesign for household refrigerators and freezers. These requirements apply for refrigerators and freezers with a storage volume of up to 1500 litres.

Table 12 Energy efficiency classes for household refrigerators and freezers. Energy Labelling Regulation (EU) No 1060/2010

Energy efficiency classes	Proposal until June 2014	Proposal after June 2014	Ecodesign requirements where storage volume >10 litres. In line with 643/2009/EC
A+++	EEI < 22	EEI < 22	
A++	22 ≤ EEI < 33	22 ≤ EEI < 33	
A+	33 ≤ EEI < 44	33 ≤ EEI < 42	From 1 July 2014 EEI < 42*
A	44 ≤ EEI < 55	42 ≤ EEI < 55	From 1 July 2012 EEI < 44*
B	55 ≤ EEI < 75	55 ≤ EEI < 75	From 1 July 2010 EEI < 55*
C	75 ≤ EEI < 95	75 ≤ EEI < 95	
D	95 ≤ EEI < 110	95 ≤ EEI < 110	
E	110 ≤ EEI < 125	110 ≤ EEI < 125	
F	125 ≤ EEI < 150	125 ≤ EEI < 150	
G	EEI ≥ 150	EEI ≥ 150	

*For specific ecodesign requirements under Regulation (EC) No 643/2009, see Appendix 1.

Table 13 Regulation (EC) No 643/2009 identifies the following Best Available Technology (BAT) on the market for household refrigerators and freezers regarding EEI (when the Regulation entered into force):

Type	EEI	Energy (kWh/year)	Storage volume (l)	Noise (dB(A))	Climate class
Refrigerator, compressor	29.7	115	300	33	T
Refrigerator, absorption	97.2	245	28	0	N
Fridge/freezer, compressor	28.0	157	236	33	T
Upright freezer, compressor	29.3	172	195 ****	35	T
Chest freezer, compressor	27.4	153	223 ****	37	T

The current Nordic Ecolabelling criteria for refrigerators and freezers (version 5.3) require the products to meet the standards of energy efficiency class A+ or better under Regulation (EU) No 1060/2010 with regard to energy labelling of household refrigerators and freezers.

The documentation required is a complete test report from the measurement of energy consumption in compliance with Regulation (EU) No 1060/2010 with regard to energy labelling of household refrigerators and freezers.

The energy efficiency index (EEI) is also to be calculated in compliance with Regulation (EU) No 1060/2010 with regard to energy labelling of household refrigerators and freezers.

Washing machines

Regulation (EU) No 1015/2010 with regard to ecodesign requirements for household washing machines.

The ecodesign requirements do not relate to combined washer/dryers.

Table 14 Energy efficiency classes for household washing machines, Regulation (EU) No 1061/2010

Energy efficiency classes	Energy Efficiency Index (EEI)	Ecodesign requirements under 1015/2010/EU
A+++	EEI < 46	
A++	46 ≤ EEI < 52	
A+	52 ≤ EEI < 59	
A	59 ≤ EEI < 68	From 1 December 2013 EEI < 59*
B	68 ≤ EEI < 77	From 1 December 2011 EEI < 68*
C	77 ≤ EEI < 87	
D	EEI ≥ 87	

*For specific ecodesign requirements under Regulation (EC) No 1015/2010, see Appendix 1.

Table 15 According to a preparatory study for Regulation (EU) No 1061/2010, the performance of the market's best machines (BAT) was as follows at the time of publishing the draft.

Load capacity (kg)	Energy consumption/ wash cycle (kWh)	Energy consumption/kg (kWh/kg)	Energy consumption per year in low energy mode (kWh/year)	Water consumption (Wt) (l/ wash cycle)	Water consumption (Wt) 220 cycles = 1 year (l/year)	Washing efficiency (kg)	Noise wash/spin (dB(A))
3	0.70	0.23	12.5	39	8580	1.03	53/74
4.5	0.76	0.17	12.5	40	8800	1.03	55/70
5	0.850	0.17	12.5	39	8580	1.03	53/73
6	1.02	0.17	12.5	39	8580	1.03	54/78
7	1.02	0.15	12.5	43	9460	1.03	48-59/62-73
8	1.200	0.15	12.5	56	12320	1.03	54/71-74

The current Nordic Ecolabelling criteria for washing machines (version 4.4) require the washing machine to have energy consumption of 0.19 kWh/kg laundry (standard programme), along with a requirement of 0.23 kWh/kg laundry as an average over four different cycles. This is comparable with energy efficiency class A.

Dishwashers

Regulation (EU) No 1016/2010 with regard to ecodesign requirements for household dishwashers.

Ecodesign Regulation (EU) No 1016/2010 for dishwashers states the following:

1. From 1 December 2011:
    a. For all household dishwashers, except household dishwashers with a rated capacity of 10 place settings and a width equal to or less than 45 cm, the energy efficiency index (EEI) shall be less than 71, corresponding to energy class A
    b. For all household dishwashers with a rated capacity of 10 place settings and a width equal to or less than 45 cm, the energy efficiency index (EEI) shall be less than 80, corresponding to energy class B
2. From 1 December 2013:
    a. For household dishwashers with a rated capacity equal to or higher than 11 place settings and household dishwashers with a rated capacity of 10 place settings and a width higher than 45 cm, the energy efficiency index (EEI) shall be less than 63, corresponding to energy class A+
    b. For household dishwashers with a rated capacity of 10 place settings and a width equal to or less than 45 cm, the energy efficiency index (EEI) shall be less than 71, corresponding to energy class A
3. From 1 December 2016:

For household dishwashers with a rated capacity of 8 and 9 place settings and household dishwashers with a width equal to or less than 45 cm, the energy efficiency index (EEI) shall be less than 63, corresponding to energy class A+.

Table 16 Energy efficiency classes for household dishwashers, Regulation (EU) No 1059/2010

Energy efficiency classes	Energy Efficiency Index (EEI)	Ecodesign requirements under 1016/2010/EU
A+++	EEI < 50	
A++	50 ≤ EEI < 56	
A+	56 ≤ EEI < 63	
A	63 ≤ EEI < 71	From 1 December 2013 EEI < 63*
B	71 ≤ EEI < 80	From 1 December 2011 EEI < 71*
C	80 ≤ EEI < 90	
D	EEI ≥ 90	

*For specific Ecodesign requirements under Regulation (EC) No 1016/2010, see Appendix 1.

Table 17 BAT values for dishwashers published in the draft of the ecodesign requirements March 2010.

No. of covers	Energy consumption/wash cycle (kWh)	Energy consumption /year (280 wash cycles (kWh/year)	Energy consumption per year in low energy mode (kWh/year)	Water consumption (1/wash cycle)	Drying efficiency (I_D)	Cleaning efficiency (I_c)	Noise wash cycle (dB(A))
14	0.950	278.5	12.5	10	>1.08	>1.12	41
12	0.950	278.5	12.5	9	>1.08	>1.12	41
9	0.800	236.5	12.5	9	>1.08	>1.12	44
6	0.63	208.5	12.5	7	>0.86	>1.12	45
4	0.51	155.3	12.5	9.5	>0.86	>1.12	53

The current Nordic Ecolabelling criteria for dishwashers (version 3.4) require the dishwasher to meet the standards of energy efficiency class A or better under Regulation (EU) No 1059/2010 with regard to energy labelling of household dishwashers.

Tumble dryers:

Regulation (EU) No 392/2012 setting out energy labelling requirements for tumble dryers was published in May 2012[44]. The Ecodesign Regulation is expected to be published in autumn 2012.

A tumble dryer removes water quickly, but uses relatively large amounts of energy to do so. The energy is required chiefly to heat up the air used in the machine during the drying programme. It is therefore good to spin the clothes properly before putting them in the dryer. It is also recommended that the tumble dryer has an electronic

[44] http://www.eceee.org/Eco_design/products/%20%20laundry_driers

moisture detector, which enables the tumble dryer to shut off automatically when the laundry is dry, thus saving energy.

There are basically two types of tumble dryer: vented dryers and condenser dryers. A vented tumble dryer is connected to the property's ventilation system and uses that route to remove all the air-borne moisture from the load in the machine. In a condenser dryer, a heat exchanger is used to separate the moisture from the air that has passed through the load, so that the air can then be reused in the tumble dryer. The heat exchanger may be passive (electric or HWC) or in the form of a heat pump. Since the air that is reused normally has a higher moisture content than cold ambient air, the drying process in a condenser dryer normally takes longer than in a vented dryer.

Nordic Ecolabelling has no previous criteria for tumble dryers, but is expanding the criteria to include them under this revision. The relevant Directive 95/13/EC only includes energy labelling for household tumble dryers, and of the appliances on the market, only tumble dryers with heat pump technology achieve the best energy class. Tumble dryers with heat pump technology are the best method of improving energy efficiency, giving gains of 39% with an estimated payback on the investment of around 13 years[45]. Alongside energy class, capacity and noise (which are already included in the current labelling), the addition of parameters such as programme time and condenser efficiency is also under discussion.

The proposal for ecodesign requirements for household tumble dryers (as per 25 July 2012) states the following:

Household tumble dryers must meet the following requirements:

1. From (The Ecodesign Regulation is expected to be published in autumn 2012):
    a) The energy efficiency index (EEI) shall be less than 85. This will phase out energy labelling class D.
    b) For condenser household tumble dryers, the weighted condensation efficiency shall not be lower than 60%. This will phase out class E.
2. From (The Ecodesign Regulatoin is expected to be published in autumn 2012):
    c) The energy efficiency index (EEI) shall be less than 76. This will phase out class C.
    d) For condenser household tumble dryers, the weighted condensation efficiency shall not be lower than 70%. This will phase out class D.

Table 18 Energy efficiency classes for household tumble dryers, Regulation (EU) No 392/2012

Energy efficiency classes	Energy Efficiency Index (EEI)	Proposal for ecodesign requirements for household tumble dryers as per 25 July 2012
A+++	EEI < 24	
A++	24 ≤ EEI < 32	

[45] Preparatory studies for Ecodesign requirements
of Energy using Products (EuP) – Lot 16, March 2009, Page 337

A+	32 ≤ EEI < 42	
A	42 ≤ EEI < 65	
B	65 ≤ EEI < 76	
C	76 ≤ EEI < 85	
D	85 ≤ EEI	

According to the Swedish Energy Agency[46] the Energy Labelling Regulation will enter into force in Q4 2013. The Ecodesign Regulation is planned to come into force on 1 January 2014.

Incorrect labelling/declaration[47]

According to a survey by the Norwegian Water Resources and Energy Directorate (NVE) in 2009, one in three white goods carried the wrong energy labelling, meaning that 66% of the white goods checked were correctly labelled. The year before, the figure was 57%. The results for 2009 are still the best since 2004. The Danish Energy Saving Trust carried out a similar survey[48], showing that 4 in 10 refrigerators/freezers are incorrectly labelled.

Previous surveys have produced extremely poor results. A survey from 2007[49] showed, for example, that only 36% of the white goods checked were correctly energy labelled. Another example is a survey conducted by the Swedish Energy Agency's test lab in May 2007, in which as many as 7 in 10 combined fridge/freezers were stated as having a higher/better energy class than the actual consumption measurements were able to confirm for the appliances.

When it comes to incorrect labelling, the survey shows that white goods are usually attributed too high a class.

NVE and the Norwegian electronics industry have entered into a cooperation agreement to register white goods sold per energy class, a system that was launched on 1 January 2008. No data has, as yet, been presented from this register.

The Energy Labelling Directive can be seen as an aid in formulating the requirements for the Nordic Ecolabel. Nordic Ecolabelling currently uses the energy labelling scale to set requirements across several criteria documents, including small houses, apartment buildings and pre-school buildings.

Several of the specific requirements for washing machines and dishwashers state that the machine must meet the requirements in the respective Regulations (1060/2010/EU washing machines and 1016/2010/EU dishwashers). The requirements must be documented and tested by an analysis laboratory that must fulfil the general requirements of standard EN ISO 17025 or have official GLP status. This is to ensure correct declaration of the appliance.

[46] Discussion with Swedish Energy Agency, April 2012
[47] NVE www.energimerking.no
Consumer Electronics Trade Magazine "Bedre energimerking av hvitevarer"
http://www.elmag.no/Forside/fagbladet/?article_id=6052
Dinside "Feil i energimerking" 16 February 2007 http://www.dinside.no/php/art.php?id=369685
[48] www.dr.dk/Nyheder/Penge/2009/11/19/112916.htm?sms_ss=email&at_xt=4cbe9b490d2daca7,0
[49] http://energimyndigheten.se/sv/Hushall/Tester/Testresultat/Kyl-och-frysskap/

Background to requirement level

New Ecodesign and Energy Labelling Regulations set out requirements concerning energy efficiency classes that change over the validity period of the Regulations. To ensure that Nordic Ecolabelled white goods are better than the statutory requirement, it is proposed in this consultation draft that a Nordic Ecolabelled refrigerator, freezer, washing machine or dishwasher must meet energy efficiency class A+++ or better in the relevant Energy Labelling Regulation. There are already refrigerators, freezers, washing machines and dishwashers on the market that are labelled as A
Ecodesign requirements for household tumble dryers[50] are not particularly ambitious (requirement for energy efficiency class B) and the proposal in this consultation is that a Nordic Ecolabelled tumble dryer must meet the standard for energy efficiency class A+ or better in the relevant Energy Labelling Regulation.

The Nordic Ecolabelling requirement concerning energy efficiency class therefore breaks down as follows:

Table 19 Nordic Ecolabelling requirement for energy efficiency class

Energy Labelling Regulation	Date From	Ecodesign requirement	Requirement in Nordic Ecolabelling criteria
Fridge/freezer 1060/2009/EC	1/7/2012	A	A+++
Fridge/freezer 1060/2009/EC	1/7/2014	A+	
Washing machines 1015/2010/EU	1/12/2011	A	A+++
Washing machines 1015/2010/EU	1/12/2013	A+	
Dishwashers 1059/2010/EC	1/12/2011	A	A+++
Dishwashers 1059/2010/EC	1/12/2013	A+	
Tumble dryers 392/2012/EU	?	B	Min A+

Proposed requirement:

R13 Energy efficiency

Refrigerators, freezers, washing machines and dishwashers must achieve energy efficiency class A+++ or better in accordance with the applicable Energy Labelling Regulation.
Tumble dryers must achieve energy efficiency class A+ or better in accordance with the applicable Energy Labelling Regulation.

[50] http://www.eceee.org/Eco_design/products/%20%20laundry_driers

Table 20 Nordic Ecolabelling requirement for energy efficiency class

Energy Labelling Regulation	Date From	Ecodesign requirement	Requirement in Nordic Ecolabelling criteria
Fridge/freezer 1060/2009/EC	1/7/2012	A	A+++
Fridge/freezer 1060/2009/EC	1/7/2014	A+	
Washing machines 1015/2010/EU	1/12/2011	A	A+++
Washing machines 1015/2010/EU	1/12/2013	A+	
Dishwashers 1059/2010/EC	1/12/2011	A	A+++
Dishwashers 1059/2010/EC	1/12/2013	A+	
Tumble dryers 392/2012/EU	?	B	Min A+

✉ Test report and calculation in line with EU Regulation that verifies energy efficiency index (EEI) and corresponding energy labelling. Requirement for test method and laboratories, see Appendix 1.

8.3.3 Noise

Background to requirement:

Noise requirements in current Nordic Ecolabelling criteria:

Table 21 Noise requirements in current Nordic Ecolabelling criteria

Nordic Ecolabel criteria	Requirement level	Standard
Refrigerators and freezers, version 5.3	40 dB(A)	EN 28960
Washing machines, version 4.4	56 dB(A) during wash programme 76 dB(A) during spin	EN 60704-2-4*
Dishwashers, version 3.4	48 dB(A)	EN 60704-2-4*

* measured according to the stated test method and with the same standard 60ºC cotton programme

Nordic Ecolabelling has no criteria for tumble dryers at the moment.

Refrigerators and freezers:

Regulation (EC) No 643/2009 with regard to ecodesign for household refrigerators and freezers sets out requirements on stating noise levels, but no limits. According to the Regulation, the following best available technology (BAT) on the market for household refrigerators and freezers produces the following noise levels:

- Refrigerator, compressor: 33 dB(A)
- Refrigerator, absorption: 0 dB(A)
- Refrigerator with frost box, compressor: 33 dB(A)
- Upright freezer, compressor: 35 dB(A)
- Chest freezer, compressor: 37 dB(A)

Washing machines:

Regulation (EC) No 1015/2010 with regard to ecodesign for household washing machines sets out requirements on stating noise levels, but no limits. According to the Regulation, the following best available technology (BAT) on the market for household washing machines produces the following noise levels:

Table 22 BAT values for noise in washing machines, 1015/2010/EU

Load capacity kg	Noise wash/spin dB(A)
3	53/74
4.5	55/70
5	53/73
6	54/78
7	48-59/62-73
8	54/71-74

Dishwashers:
Regulation (EC) No 1016/2010 with regard to ecodesign for household dishwashers sets out requirements on stating noise levels, but no limits. According to the Regulation, the following best available technology (BAT) on the market for household dishwashers produces the following noise levels:

Table 23 BAT values for noise in dishwashers, 1016/2010/EU

No. of covers	Noise wash (dB(A))
14	41
12	41
9	44
6	45
4	53

Tumble dryers:
The ecodesign proposal (background report, LOT 16) for household tumble dryers sets out requirements on stating noise levels, but no limits. According to the proposed Regulation, the following best available technology (BAT) on the market for tumble dryers produces the following noise levels:

Table 24 BAT values for noise in tumble dryers, LOT 16[51]

Load capacity kg	Vented dryer dB(A)	Condenser dryer dB(A)
3	69	-
5	n.a	n.a
6	67	n.a
7	65	65
8	65	n.a

Proposed requirement:

[51] http://www.eceee.org/Eco_design/products/%20%20laundry_driers

R14 Noise

Refrigerators, freezers, dishwashers, washing machines and tumble dryers must meet the specific requirements for noise listed in Table 25, tested to standard EN 60704:

Table 25 Max limit dB(A) for airborne noise

White good type	*Max limit dB(A) Airborne noise*
Refrigerators / freezers	*35*
Washing machines, wash programme, cotton 60˚C, to EN 60456	*56 during wash programme* *76 during spin*
Dishwashers	*44*
Tumble dryers	*65*

✉ Test report showing that the requirement is fulfilled. Requirement for test method and laboratories, see Appendix 1.

9 Specific product requirements

9.1 *Refrigerators and freezers*

9.1.1 Ozone depletion- and global warming potential in refrigerants and foaming agents

Background to requirement:
The refrigerant is the working medium that circulates inside a refrigerator and freezer, transporting heat away and thus chilling the inside of the appliance. A refrigerant must, first and foremost, have good transport properties (low viscosity) and good heat transfer properties.

Ozone-depleting refrigerants are also used as a foaming agent for insulation materials (usually polyurethane) for refrigerators and freezers. Cyclopentane is currently considered the best insulation material on the market in environmental terms[52].

Regulation (EC) No 1005/2009 on substances that deplete the ozone layer has governed the phasing out of ozone depleting substances. The Regulation was previously known as (EC) No 2037/2000, but it has been amended on so many occasions that a reworking was necessary.
The Regulation (EC) No 842/2006 on certain fluorinated greenhouse gases regulates refrigerants in the HFC group. National laws and regulations, which in many cases are tougher, supplement the European legislation.

[52] http://www.forbrugerkemi.dk/test-og-rad/hjemmet/rad-om-harde-hvidevarer/koleskabe-og-frysere/fakta-om-koleskabe-og-frysere

Ozone depleting refrigerants (CFC and HCFC) have not been used in new refrigerators and freezers for many years[53]. They were largely replaced by fluorinated gases containing no chlorine: HFCs. HFC refrigerants have no depleting effect on the ozone layer, but they are potent greenhouse gases. Nowadays hydrocarbons are used as refrigerants. Factors that mitigate the greenhouse effect of refrigerants are:

- good materials and good connections that minimise the risk of leakage
- use of as little refrigerant as possible
- refrigerant with as low a GWP factor[54] as possible.

The main refrigerants used in household refrigerators and freezers on the market are:

- CFC, which has been banned in Europe since 1995
- HCFC, being phased out, banned in Europe since 2003
- HFC, being phased out, banned in Europe since 2006
- Hydrocarbons, usually found in today's products
- CO_2, which is not used much at the moment, but is likely to become more common in the future. CO_2 is currently used as a foaming agent for insulating foam.

The table below shows data for refrigerants used in refrigerators and freezers[55].

Table 26 Data for refrigerants used in refrigerators and freezers

	Ozone depleting	**Greenhouse effect GWP_{100} factor**	**Toxic/ flammable**	**Status regarding use**
CFC	High	High	Y/N	None in new appliances
HCFC	Moderate	High	Y/N	None in new appliances
HFC	None	High	N/N	None in new appliances
Hydrocarbons	None	Low < 5	Y/N	Often used in new appliances
CO_2	None	Low < 1	N/N	May be found in new appliances

Most refrigerators and freezers nowadays use R600a (isobutane) as their refrigerant. Isobutane does not break down the ozone layer and is only a very mild greenhouse gas

[53] http://www.miljoevejledninger.dk/ordbog/uddybendeforklaringer/k/koslashlemedier
[54] The GWP_{100} value states the strength of a substance's greenhouse effect compared with carbon dioxide over a period of 100 years.
[55] http://www.miljoevejledninger.dk/ordbog/uddybendeforklaringer/k/koslashlemedier

(GWP_{100} factor = 4)[56]. R600 (butane) and R290 (propane) also have a GWP_{100} factor < 5.

Fact box - Phasing out ozone depleting substances

The Montreal Protocol, which came into force in 1987, has had an impact on the concentrations of ozone depleting substances in the atmosphere. The total amount of ozone is still 3.5% below the levels before the production of ozone depleting substances. Ozone depletion was steady during the years 2002-2005, which suggests that ozone levels have stopped dropping. According to forecasts by WMO/UNEP, a turning point for ozone depletion should be observable in around 2020. This means that the minimum level of ozone layer thickness will have been passed and then it is expected that the ozone layer will start to recover. However, the forecast relies on the continued success of the Montreal Protocol and being able to manage the disturbing rise in global HCFC consumption.

The phasing out of ozone depleting substances has been a success in the industrial nations.
The introduction of CFC products to the European market has long been phased out. Today, CFCs only remain in products that were launched on the market before the CFC ban came into force. There is also a ban on installing new refrigerators and freezers that contain HCFCs or HFCs.

It has also been shown that climate change is affecting the development of the ozone layer via the changes in global circulation, chemical composition and temperature in the atmosphere that come with a changing climate. Conversely, changes in the ozone layer also affect the climate.
Although the effects of a changing climate on depletion of the ozone layer have been studied intensively, there is still no clear consensus on the extent to which the effects will delay or accelerate recovery of the ozone layer. This shows how the issue of phasing out ozone depleting substances is interwoven with the problems of greenhouse gases.

The current Nordic Ecolabelling criteria only set requirements concerning declaration of refrigerants/foaming agents.

In its own criteria for refrigerators and freezers (Refrigerators and Freezers RAL-UZ 138, July 2009), Germany's Blaue Engel sets out the requirement that appliances must not contain halogenated organic substances as refrigerants, and foaming agents are not permitted in the manufacture of insulating material.

Proposed requirement:

R15 Ozone depletion- and global warming potential in foaming agents

Foaming agents for insulating foam must have an ozone depletion potential (ODP) and a global warming potential (GWP) equal to 0 (calculated in CO_2 equivalents over a period of 100 years).

[56] http://www.forbrugerkemi.dk/test-og-rad/hjemmet/rad-om-harde-hvidevarer/koleskabe-og-frysere/fakta-om-koleskabe-og-frysere

The foaming agents must not contain halogenated organic compounds.

✉ List of refrigerants and foaming agents plus declaration from producer/supplier of foaming agents showing that the requirement is fulfilled. Use Appendix 7.

9.1.2 Global warming potential

Background to requirement:
See above, background to ozone depletion potential.

Proposed requirement:

R16 Ozone depleting- and global warming potential in refrigerants for the refrigeration process

Refrigerants for the refrigeration process musk have an ozone depletion potential (ODP) equal to 0 and a global warming potential (GWP) that is 5 or lower (calculated in CO_2 equivalents over a period of 100 years).
The refrigerants must not contain halogenated organic compounds.

✉ List of refrigerants for the refrigeration process including their global warming potential, plus declaration from producer/supplier of refrigerants showing that the requirement is fulfilled. Use Appendix 7.

9.1.3 Statement of refrigerants/foaming agents

Background to requirement:
The aim of the requirement, which is the same as in the current criteria for refrigerators and freezers, version 5.2, is to help make any future recycling easier.
Proposed requirement:

R17 Statement of refrigerants/foaming agents

The type of refrigerants and foaming agents used must be written next to or on the nameplate to make any future recycling easier.

✉ Declaration that the requirement is fulfilled.

9.1.4 Polycarbonate in direct contact with food

Background to requirement:
Polycarbonate is made from carbon dioxide and bisphenol A or some other similar phenol. Bisphenol A can affect our hormone system. There are therefore rules on how much may be released from a product into food. The European Food Safety Authority believes that the rules are sufficient to protect people against the potential risks of bisphenol A[57].

[57] http://www.forbrugerkemi.dk/test-og-rad/hjemmet/plast/polycarbonat-pc/?searchterm=polycarbonat

Denmark has a temporary national ban on bisphenol A in products aimed at children aged 0-3 years old. This ban covers babies' bottles and sippers as well as material that is intended to be in contact with food for children in this age group. The ban has been in force since 1 July 2010.

Nordic Ecolabelling wishes to ban the use of polycarbonate that contains bisphenol A in drawers intended for food storage (e.g. vegetable drawers), based on the precautionary principle.

Proposed requirement:

R18 Polycarbonate in direct contact with food

Polycarbonate must not be used in drawers intended for food storage (e.g. vegetable drawers).

✉ List of plastics used in storage drawers in refrigerators and freezers plus declaration that the requirement is fulfilled.

9.2 *Washing machines*

9.2.1 Water consumption

Background to requirement:
Ecodesign Regulation (EU) No 1015/2010 has introduced a limit on water consumption. The maximum permitted water consumption (Wt) is calculated as follows: Wt = c x 5 + 35, where c is the machine's normal capacity on its standard 60°C cotton programme (full load) or standard 40°C cotton programme (full load), depending on which value is lower. From 1 December 2013, the requirement will be tightened further, when the calculation will apply the capacity value for a half load using the formula: Wt = 5 x $c_{½}$+35.

The water consumption requirement in the current Nordic Ecolabelling criteria permits a maximum of 16 litres of water per kg of laundry in line with standard EN60456, on the same standard 60°C cotton programme (full load). A 6 kg machine may thus use 6x16=96 litres of water.

Under the Ecodesign Regulation, a 6 kg machine may use a maximum of 6x5+35=65 litres of water, and from 1 December 2013 5x6/2+35=50 litres of water.

A review of tests carried out shows that the consumption varies, with small machines in particular having higher water consumption per kg of laundry. It also appears to be the case that the machines that have higher water consumption generally also have better results when it comes to rinsing performance[58]. In October 2011, the Danish Consumer Council tested seven washing machines with a capacity of 5.5-7 kg. All the machines were good on water consumption, but only received an 'average' grade for their rinsing performance. One model was graded as 'below average'[59].

[58] Råd&Rön 9/03
[59] Tænk, October 2011

Proposed requirement:

R19 Water consumption

The washing machine must meet the requirement for maximum permitted water consumption on the standard programme as outlined in Ecodesign Regulation (EU) No 1015/2010.

✉ Test report in line with Regulation (EU) No 1061/2010. Requirement for test method and laboratories, see Appendix 1.

9.2.2 Spinning performance

Background to requirement:

The Energy Labelling Regulation for washing machines (1061/2010) has introduced a requirement regarding spinning performance via calculation of remaining moisture content (D), which is then linked to spin-drying efficiency classes. There is no requirement for an absolute spin-drying efficiency class.

The weighted moisture content (D) for a household washing machine is calculated as a percentage according to the following formula, with the result rounded to the nearest whole number:

$D = (3 \times D_{60} + 2 \times D_{60½} + 2 \times D_{40½})/7$

where:

- D_{60} is the remaining moisture content for the standard 60°C cotton programme (full load), expressed as a percentage and rounded to the nearest whole number,
- $D_{60½}$ is the remaining moisture content for the standard 60°C cotton programme (half load), expressed as a percentage and rounded to the nearest whole number,
- $D_{40½}$ is the remaining moisture content for the standard 40°C cotton programme (half load), expressed as a percentage and rounded to the nearest whole number,

Table 27 Spin-drying efficiency classes under 1061/2010/EU

Spin-drying Efficiency Class	Remaining moisture content 'D' on 60ºC cotton programme
A (most efficient)	$D < 45\%$
B	$45\% \leq D < 54\%$
C	$54\% \leq D < 63\%$
D	$63\% \leq D < 72\%$
E	$72\% \leq D < 81\%$
F	$81\% \leq D < 90\%$
G (least efficient)	$90\% \leq D$

In the current criteria for washing machines, Nordic Ecolabelling requires a remaining moisture content < 54% for machines with a capacity greater than 3.5 kg, which corresponds to spin-drying efficiency class B.

Machines with a capacity of 3.5 kg or less must achieve a remaining moisture content < 60%, on a standard 60°C cotton programme, which corresponds to spin-drying efficiency class C. This is so that small households are not encouraged to buy unnecessarily large machines, as this will not benefit the environment.

It is proposed that the requirement level for spinning performance remains at the same level as in the current criteria. One reason for this is the Nordic Ecolabelling requirement on the use of a test lab. As previously outlined in section 3.2: Energy consumption and in the section on Incorrect labelling/declaration, manufacturers of white goods do not always state the correct efficiency class. The Nordic Ecolabelling requirement for laboratory testing ensures that controls are in place and that the products are correctly classified.

Proposed requirement:

R20 Spinning performance

Machines with a capacity of 3.5 kg or less must achieve a remaining moisture content of less than 54% in a test measured according to the stated test method and with the same standard 60ºC programme for cotton as when measuring energy efficiency.
Machines with a capacity of 3.5 kg or less must achieve a remaining moisture content of less than 60% in a test measured according to the stated test method and with the same standard 60ºC programme for cotton as when measuring energy efficiency.

✉ Test report in line with Regulation (EU) No 1061/2010. Requirement for test method and laboratories, see Appendix 1.

9.2.3 Washing performance

Background to requirement:
The Energy Labelling Regulation for washing machines (1061/2010) has introduced a requirement to a washing performance index ≥ 1,03. The requirement level for washin performance is suggested to be at the same level as in the current criteria (washing performance ≥ 1). The requirements must be documented and tested by an analysis laboratory that must fulfil the general requirements of standard EN ISO 17025 or have official GLP status. This is to ensure correct declaration of the appliance.

New technical solutions have been introduced by washing machine manufacturers to increase performance.

One technique involves atomising the laundry detergent and the other is automatic detergent dosing.

Several of the specific requirements for washing machines and dishwashers state that the machine must meet the requirements in the respective Regulations (1060/2010/EU washing machines and 1016/2010/EU dishwashers). The requirements must be documented and tested by an analysis laboratory that must fulfil the general requirements of standard EN ISO 17025 or have official GLP status. This is to ensure correct declaration of the appliance.

Proposed requirement:

R21 Washing performance

The machine must, on the standard programme, have a wash efficiency index ≥ 1.03 in line with Ecodesign Regulation (EU) No 1061/2010.

✉ Test report in line with Regulation (EU) No 1061/2010. Requirement for test method and laboratories, see Appendix 1.

9.2.4 Rinsing performance, alkali method

Background to requirement:

The rinsing performance requirement in version 4 of the Nordic Ecolabelling criteria is based on two different tests. One is rinsing performance according to the alkali method, which measures levels of soluble substances remaining in the laundry after the washing programme. Nordic Ecolabelling required the top grade, which is 5. The second is rinsing performance according to the zeolite method, which measures levels of particles remaining in the laundry after the washing programme. Nordic Ecolabelling required a grade of 3 on a scale of 1 to 5.

Testing by the Consumer Council in Sweden (Råd & Rön) and Denmark (Tænk) over a number of years[60] shows a trend of deteriorating rinsing performance, which is linked to the machines becoming increasingly water-efficient. Since amounts of water in the machines are also falling, there is a risk that the problem of poor rinsing performance will increase further. It also appears that it is more difficult to achieve good rinsing performance with softer water – which the Nordic region has, compared with the rest of Europe. Testing of rinsing performance is not a requirement in Ecodesign 1015/2010/EU and therefore the manufacturers rarely test this parameter.

In Nordic Ecolabelling's experience[61] the alkali method is the most widely used test method. This method is also used by the Swedish Asthma and Allergy Association[62]. This consultation draft of the criteria therefore proposes only to set a rinsing performance requirement by requiring testing according to the alkali method. The requirement level remains the top grade, which are 5.

From a health perspective, it is important that a washing machine has good rinsing performance, since recent years have seen a rise in problems of irritation and allergies arising from laundry detergent residues. This is thought to be due to reduced water consumption. Nordic Ecolabelling realises that a washing machine's normal programme should provide a satisfactory rinsing result, but sees a need to offer an extra rinse programme alongside the standard programme to meet the Nordic Ecolabelling requirement for rinsing performance. This is due to the tougher requirement concerning water consumption.

[60] Tænk, October 2011 – www.taenk.dk
[61] Conversation with Rasmus Partsch, Danish Consumer Council, January 2012
[62] http://www.astmaoallergiforbundet.se/

If the rinsing performance is fulfilled based on the standard programme, separate programme or with the help af an option function for the standard programme, the washing machine energy consumption should not exceed 0.19 kWh/kg. Energy efficiency is measured according to the specified test method.

Proposed requirement:

R22 Rinsing performance, alkali method

The machine must pass a rinsing performance test using the alkali method with a score ≥ 5. The requirement can be fulfilled based on the standard programme, a separate programme or with the help of an option function for the standard programme. If the rinsing performance is fulfilled based on the standard programme, separate programme or with the help af an option function for the standard programme, the washing machine energy consumption should not exceed 0.19 kWh/kg. Energy efficiency is measured according to the specified test method.

✉ Test report in line with the instructions in standard EN 60456. If an extra rinse programme is used (rinse option in main programme), this is to be described. Requirement for test method and laboratories, see Appendix 1.

9.3 *Dishwashers*

9.3.1 Water consumption

Background to requirement:

New technology, such as more advanced pumps whose speed can be controlled and more advanced rinsing systems, coupled with computer controls, has allowed the dishwashing process to be made more efficient in terms of water consumption and other factors, which has enabled the water consumption to be reduced. It is now possible, at least on more expensive machines, to find solutions that store the water from the rinsing phase in a special tank in the machine so that it can be reused in the prewash phase in a new wash cycle later on.

In the current criteria for dishwashers (version 3.4), the requirement is for water consumption to be a maximum of 1.2 litres of water per place setting. Testing is to be conducted in line with standard EN 50242.

This consultation draft proposes tightening the water consumption requirement by making the figure 1.0 litres of water per place setting. According to the BAT values (section 8.2.2), this will make it difficult for small machines to meet the requirement.

Proposed requirement:

R23 Water consumption

The dishwasher must use a maximum of 1.0 litres of water per place setting in accordance with standard EN 50242.

✉ Test report in line with the instructions in standard EN 50242. Requirement for test method and laboratories, see Appendix 1.

9.3.2 Cleaning performance

Background to requirement:
From 1 November 2011, there will be a statutory requirement for cleaning efficiency of at least 1.12 under Regulation (EU) No 1016/2010. No further rises in cleaning efficiency are stated in the Regulation. The new Energy Labelling Regulation requires no reporting of cleaning efficiency. The Nordic Ecolabelling requirement in version 3.4 is for cleaning performance of class A, under 1016/2010/EU. The proposal is for no tightening of this requirement.

Several of Nordic Ecolabelling's specific requirements for washing machines and dishwashers state that the machine must meet the requirements in the respective Regulations (1060/2010/EU washing machines and 1016/2010/EU dishwashers). The requirements must be documented and tested by an analysis laboratory that must fulfil the general requirements of standard EN ISO 17025 or have official GLP status. This is to ensure correct declaration of the appliance.

Proposed requirement:

R24 Cleaning performance

The dishwasher must meet the requirements for cleaning performance stated in Regulation (EU) No 1016/2010.

✉ Test report in line with Regulation (EU) No 1016/2010. Requirement for test method and laboratories, see Appendix 1.

9.3.3 Drying performance

Background to requirement:
From 1 December 2013, the drying efficiency index under Regulation (EU) No 1016/2010 for a dishwasher must be higher than 1.08. Version 3.4 of the Nordic Ecolabelling criteria sets a requirement for drying efficiency of class A, which means an index Ic >= 1.08, the same as the coming statutory requirement. No future toughening of this requirement has been indicated in the coming Regulation. The proposal is thus for no adjustment to this requirement in the next version of the Nordic Ecolabelling criteria.

Proposed requirement:

R25 Drying performance

The dishwasher must meet the requirements for drying performance stated in Regulation (EU) No. 1016/2010.

✉ Test report in line with Regulation (EU) No 1016/2010. Requirement for test method and laboratories, see Appendix 1.

9.4 *Tumble dryers*

9.4.1 Condensing efficiency

Background to requirement:
Regulation (EU) No 392/2012 setting out energy labelling requirements for household tumble dryers will be published in May 2012[63]. The Ecodesign Regulation is expected to be published in autumn 2012.
The proposal for ecodesign requirements for household tumble dryers (as per 25 July 2012) states the following:
Household tumble dryers must meet the following requirements:

From (The Ecodesign Regulation and date are expected to be published in autumn 2012):

For condenser household tumble dryers, the weighted condensation efficiency shall not be lower than 60%. This will phase out class E.

From (The Ecodesign Regulation and date are expected to be published in autumn 2012):

For condenser household tumble dryers, the weighted condensation efficiency shall not be lower than 70%. This will phase out class D.

Below is a draft of the weighted condensation efficiency for household tumble dryers:

Table 28 Energy efficiency classes for household tumble dryers, Regulation (EU) No 392/2012

Condensation efficiency class	Weighted condensation efficiency
A (most efficient)	C_t >90
B	$80 < C_t \leq 90$
C	$70 < C_t \leq 80$
D	$60 < C_t \leq 70$
E	$50 < C_t \leq 60$
F	$40 < C_t \leq 50$
G (least efficient)	$C_t \leq 40$

Proposed requirement:

R26 Condensing efficiency

The tumble dryer must meet the requirements for condensation efficiensy class B as stated in Regulation (EU) No 393/2012. The tumble dryer must be equipped with a moisture sensor for automatic termination of the drying programme.

✉ Test report in line with Regulation (EU) No 392/2012. Requirement for test method and laboratories, see Appendix 1.

9.4.2 Refrigerants in heat pump

Background to requirement:
Condenser tumble dryers usually contain a heat pump. See above, background to ozone depletion potential (section 9.1.1).

[63] http://www.eceee.org/Eco_design/products/%20%20laundry_driers

Proposed requirement:

R27 Refrigerants in heat pump

If the tumble dryer contains a heat pump, the refrigerant must comply with requirements R15, R16 and R17.

✉ See R15, R16 and R17.

10 Customer information

10.1.1 Installation and user instructions

Background to requirement:

The product's installation and user instructions must contain information on the fact and the way that the product affects the environment during its use. All white goods use a great deal of energy and they should therefore be used with the utmost efficiency.

The Nordic Ecolabelling of tumble dryers is new and the following proposals have been made concerning installation and user instructions:

Information, that sun and wind are energy-efficient for drying clothes. Therefore, use an outdoor clothesline when the weather permits.

Requirement for information about fire risk: Due to the risk of fire, it is not permitted to dry textiles that have not been washed or are not sufficiently clean and still have remnants of oil, fat or other dirt (e.g. kitchen textiles, textiles used for cosmetics with residues of oils, fats and creams). If textiles are not sufficiently clean, there may be a risk of them self-igniting, even after the drying cycle has finished and after they have been taken out of the tumble dryer. It is also not permitted to dry textiles that contain residues of flammable liquids, cleaning agents, setting lotion, hairspray, nail polish remover or suchlike[64].

Instructions, that the machine must not be overfilled. It is not good to load the tumble dryer with too few or too many clothes. With too few clothes, the tumble dryer uses a great deal of energy to dry them. There is also an increased risk that the clothes will dry too much, which can cause them both to crease and to shrink. If the tumble dryer is overfilled, it takes a long time to dry the clothes and uses a lot of energy[65].

Instructions on sorting clothes: Clothes made from different materials have different drying times, e.g. cotton and synthetic materials.

Instructions on maintaining the tumble dryer: This reduces the drying time and thus the energy consumption.

[64] http://www.msr.se/kriterier/vitvaror
[65] http://www.forbrugerkemi.dk/test-og-rad/hjemmet/rad-om-harde-hvidevarer/fakta-om-harde-hvidevarer

Proposed requirement:

R28 Installation and user instructions for refrigerators and freezers

The appliance is to be sold with installation and user instructions that shall include directions on installation, correct use with regard to the environment and recommendations for optimal energy consumption. The cover or first page of the user instructions is to carry the following text or similar wording: "The user instructions contain more information on how to avoid consequences for the environment."

The installation and user instructions must contain the following information:

a) How the packaging is to be dealt with in the Nordic countries where the white good is sold.
b) Instructions on how to install the appliance.
c) Instructions on the placement or installation of the appliance stating, for example, the minimum space around the appliance to guarantee sufficient air circulation.
d) Instructions that the consumer should avoid placing the appliance near a heat source (e.g. oven or radiator) or in direct sunlight. Recommendations that the consumer should, where relevant, consider insulating the appliance from heat sources in the walls or under the floor.
e) Information that the temperature in the room affects or limits the function or energy efficiency of the appliance.
f) Instructions that when the appliance has been moved, it is necessary to wait for around an hour before the appliance is reconnected to the mains power.
g) Instructions that the thermostat setting depends on the room temperature and that it should therefore be checked with the help of a suitable thermometer (with explanation of how to do this).
h) Instructions that hot food should be cooled down before being placed in the appliance, but that the cooling period should be as short as possible for health reasons.
i) Instructions that the evaporator should be kept free from thick layers of ice, and how and how often to defrost the appliance.
j) Instructions that the seal around the door should be replaced if it stops working properly.
k) Instructions that the condenser on the back of the appliance and the space below the appliance should be kept clear of dust and kitchen dirt.
l) Information that not following the above advice can lead to higher energy consumption.
m) Information that damage to the condenser (heat exchanger) on the back of the appliance, or anything else that might lead to refrigerants leaking out, should be avoided due to the risks to health and the environment. The user instructions must specifically state that sharp objects (such as knives, screwdrivers, etc.) should not be used to remove ice, since this could damage the evaporator.
n) Information that the appliance contains fluids and is made from parts and materials that can be reused and recycled.
o) Service and warranty information.

p) Information on the type of refrigerants and foaming agents.

✉ Installation and user instructions.

R29 Installation and user instructions for washing machines

The appliance is to be sold with installation and user instructions that shall include directions on installation, correct use with regard to the environment and recommendations for optimal consumption of energy, water and laundry detergent when the machine is used. The cover or first page of the user instructions is to carry the following text or similar wording: "The user instructions contain more information on how to avoid consequences for the environment."

The user instructions must contain the following:

a) How the packaging is to be dealt with in the Nordic countries where the white good is sold.
b) Instructions on how to install the appliance.
c) Information that Nordic Ecolabelled laundry detergents are available.
d) Information that the detergent dosing should be adapted to the hardness of the water, the type of laundry to be washed, the amount of laundry and how dirty it is (a half load, for example, requires less detergent).
e) Instructions on the appropriate sorting of laundry according to material and fabric, and on setting the washing temperature according to the material. The instructions must also state that in most cases it is no longer necessary to wash at higher temperatures when using modern washing machines and Nordic Ecolabelled laundry detergent.
f) Information on the washing machine's consumption of energy and water at different temperatures and with different load sizes, so that the consumer can select the appropriate programme for minimum energy and water consumption.
g) Instructions that the washing machine should be turned off once the programme has finished to avoid any energy losses. The user instructions are to state how long the different programmes take.
h) The energy used on the following settings: switched off, timer set (programmed) and programme finished.
i) Instructions that the user should, if possible, avoid the pre-wash option on the machine.
j) Instructions that an extra rinse option must be activated/selected in the normal programme/standard programme to achieve the rinse performance required by Nordic Ecolabelling.
k) Instructions on maintaining the washing machine, including regular cleaning of the filters and pumps and removal of deposits.
l) Information that not following the above advice can lead to higher consumption of energy, water and/or laundry detergent, which can lead to increased running costs and poorer washing performance.
m) Information that the consumer can make use of the manufacturer's take-back offer.

✉ Installation and user instructions

R30 Installation and user instructions for dishwashers

The appliance is to be sold with installation and user instructions that shall include directions on installation, correct use with regard to the environment and recommendations for optimal consumption of energy, water and detergent when the machine is used. The cover or first page of the user instructions is to carry the following text or similar wording: "The user instructions contain more information on how to avoid consequences for the environment."

The user instructions must contain the following:

a) How the packaging is to be dealt with in the Nordic countries where the white good is sold.
b) Instructions on how to install the appliance.
c) Information on the addition/dosing of rinse aid and salt.
d) Information that Nordic Ecolabelled dishwasher detergents are available.
e) Information that the detergent dosing should be adapted to the hardness of the water, the type of items to be washed, the size of the load and how dirty it is (a half load, for example, requires less detergent).
f) Information on the dishwasher's consumption of energy and water at different temperatures and with different load sizes, so that the consumer can select the appropriate programme for minimum energy and water consumption. It is to be made clear that the Nordic Ecolabelling requirements are fulfilled by the recommended normal programme.
g) Information on how long the different programmes take.
h) Instructions on maintaining the dishwasher, including regular cleaning of the filters.
i) Information that not following the above advice can lead to higher consumption of energy, water and/or dishwasher detergent, which can lead to increased running costs and poorer cleaning performance.
j) Information that the consumer can make use of the manufacturer's take-back offer.

✉ Installation and user instructions.

R31 Installation and user instructions for tumble dryers

The appliance is to be sold with installation and user instructions that shall include directions on installation, correct use with regard to the environment and recommendations for optimal energy consumption. The cover or first page of the user instructions is to carry the following text or similar wording: "The user instructions contain more information on how to avoid consequences for the environment."

The user instructions must contain the following:

a) How the packaging is to be dealt with in the Nordic countries where the white good is sold.
b) Instructions on how to install the appliance.
c) Information that sun and wind are energy-efficient for drying clothes. Therefore, use an outdoor clothesline when the weather permits.

d) Information about the tumble dryer's energy consumption for different programmes.
e) Information about the fire risk when drying different types of fabric and product.
f) Instructions that the machine must not be overfilled. Overfilling the tumble dryer adds to the drying time.
g) Instructions about sorting clothing according to material since mixed materials can damage the moisture sensor.
h) Instructions on maintaining the tumble dryer, including regular cleaning of the lint filters and heat exchanger, and emptying collected water in a condenser dryer.
i) Information that collected condenser water must not be used as drinking water.
j) Information that the consumer can make use of the manufacturer's take-back offer.

✉ Installation and user instructions.

10.1.2 Warranties

Background to requirement:
There is a requirement that the white goods must be long-lasting. The white goods are to carry a warranty of at least two years under normal usage (the warranty is to be inserted in the operating/care instructions). The requirement is the same as in the current criteria.

Proposed requirement:
R32 Warranties

The manufacturer is to provide a warranty that the white good will work for at least two years. The warranty is to apply from the day that the machine is delivered to the customer.

✉ Declaration that the requirement is fulfilled.

10.1.3 Replacement parts

Background to requirement:
The requirement has not been changed compared with the current criteria.

Proposed requirement:
R33 Replacement parts

The availability of replacement parts shall be guaranteed for 10 years from the time that production ceases.

✉ Declaration that the requirement is fulfilled.

11 Quality and regulatory requirements

11.1.1 Laws and regulations (regulatory requirements)

Background to requirement:
The laws and regulations of the local authorities must always be followed, wherever in the world the manufacturer or the subcontractors are based. The regulatory requirements also include the REACH system. The requirement text includes the fact that worker safety is to be covered by the requirement. The requirement has thus been adjusted in this version of the criteria.

Proposed requirement:

R34 Laws and regulations (regulatory requirements)

The licensee shall ensure compliance with all applicable local laws and provisions at all production facilities for the Nordic Ecolabelled white good. For example, local rules and provisions on health, safety and the working environment, environmental legislation (including REACH) and factory-specific permit terms/conditions are to be followed in the country in which the white good is manufactured.

✉ Declaration from the licensee, that the requirement is fulfilled, plus a report to the regulatory authority. See Appendix 8.

11.1.2 Licence administrators

Background to requirement:
The company shall appoint an individual responsible for ensuring the fulfilment of Nordic Ecolabel requirements, and a contact person for communications with Nordic Ecolabelling. This requirement appears in all the criteria for the Nordic Ecolabelling of products. No change has been made in relation to the previous version of the criteria.

Proposed requirement:

R35 Licence administrators

The company shall appoint an individual responsible for ensuring the fulfilment of Nordic Ecolabel requirements, and a contact person for communications with Nordic Ecolabelling.

✉ Organisational chart showing who is responsible for the above.

11.1.3 Documentation

Background to requirement:
Application-related documentation that the licensee must keep is specified here under the auspices of quality assurance.

Proposed requirement:

R36 Documentation

The licensee must be able to present a copy of the application and factual and calculation data supporting the documents submitted with the application (including test reports, documents from suppliers and suchlike).

✉ On-site inspection at licensee/manufacturer's site.

11.1.4 Quality of the white good

Background to requirement:
Once a manufacturer has a licence for the production of Nordic Ecolabelled white goods, guarantees are to be given that the requirements will be met for the whole of the licence period.

Proposed requirement:

R37 Quality of the white good

The licensee must guarantee that the quality of the Nordic Ecolabelled white good is maintained throughout the validity period of the licence.

✉ Procedures for collating and, where necessary, dealing with claims and complaints regarding the quality of the Nordic Ecolabelled white good.

11.1.5 Changes, non-conformities and traceability

Background to requirement:
R38 Planned changes, R39 Unforeseen non-conformities and R39 Traceability are all general requirements that appear in Nordic Ecolabelling criteria documents.
The requirements have not been changed compared with the previous version.

Proposed requirement:

R38 Planned changes

Written notice of planned product and marketing changes that affect the Nordic Ecolabelling requirements must be given to Nordic Ecolabelling.

✉ Procedures detailing how planned product and marketing changes are dealt with.

R39 Unforeseen non-conformities

Unforeseen non-conformities that affect Ecolabelling requirements must be reported to Nordic Ecolabelling in writing and logged.

✉ Procedures detailing how unforeseen non-conformities are handled.

R40 Traceability

The licensee/manufacturer must have a traceability system for the production of the Nordic Ecolabelled white good.

✉ Description of/procedures for fulfilment of the requirement.

11.1.6 Take-back system

Background to requirement:
Previous requirement. No change.

Proposed requirement:

R41 Take-back system

Relevant national regulations, legislation and/or agreements within the sector regarding take-back systems for products and packaging shall be complied with in all the Nordic countries where the Nordic Ecolabelled white good is marketed.

✉ Declaration from the applicant regarding affiliation to existing recycling/processing agreements.

11.1.7 Marketing

Background to requirement:
The Nordic Ecolabel is a very well-known and well-reputed trademark in the Nordic region. Nordic Ecolabelled white goods may be marketed using the Nordic Ecolabel so long as the associated licence is valid.

Proposed requirement:

R42 Marketing

Marketing of Nordic Ecolabelled white goods must comply with the "Regulations for the Nordic Ecolabelling of Products" dated 22 June 2011 or later versions.

✉ Duly completed Appendix 9.

12 Test methods, function and test laboratory requirement

12.1 *Analysis and measurement methods*

The EU has been thorough and far-reaching in drawing up and compiling analysis and measurement methods for determining the performance of the product group 'white goods' as part of the development of its directives/regulations for ErP (ecodesign and labelling). Requirements state that the methods should be based on reliable, accurate and reproducible measurements that take account of recognised measurement methods at the latest technical level, including, where applicable, the harmonised standards that have been adopted by European standardisation bodies. These methods are established and used by the manufacturers in the industry. Nordic Ecolabelling has therefore also decided to use these methods for testing and analysis.

12.1.1 Requirement for testing institute/analysis laboratory

Sampling is to be carried out in a competent manner. The testing institute/test laboratory shall be impartial and competent, and shall fulfil the general requirements of standard EN ISO 17025 or have official GLP status.

12.1.2 Analysis methods for refrigerators/freezers

Energy efficiency on the recommended normal programme, in line with Regulation (EU) No 1060/2010.

Energy efficiency on the recommended normal programme is to be tested according to EN 153.

Noise is to be tested according to EN 60704-2-14.

12.1.3 Analysis methods for washing machines

Energy efficiency, water consumption and spin performance on the recommended normal programme, in line with Regulation (EU) No 1061/2010.

Energy efficiency, water consumption, spin performance and washing performance with a full load on the standard programme, cotton 60°C and 40°C, are to be tested according to EN 60456:2010.
A full load is defined as the machine's declared capacity.

Rinsing performance alkali method according to IEC 60456. Energy efficiency with full load on the standard programme, cotton 60°C and 40°C, are to be tested according to EN 60456:2010.
A full load is defined as the machine's declared capacity.

Noise is to be tested according to EN 60704-2-3 and EN 60704-3.

12.1.4 Analysis and measurement methods for household dishwashers

Energy efficiency, water consumption, drying performance and cleaning performance on the recommended normal programme, in line with Regulation (EU) No 1016/2010.

Energy efficiency, water consumption, drying performance and cleaning performance on the recommended normal programme are to be tested according to EN 50242.

Noise is to be tested according to EN 60704-2-3 and EN 60704-3.

12.1.5 Analysis and measurement methods for tumble dryers

Energy efficiency and condensing efficiency on the recommended normal programme in line with Regulation (EU) No 392/2012.

Noise is to be tested according to EN 60704-2-6.

13 Changes compared to previous version

The new criteria include the following changes:

- Criteria for refrigerators & freezers, washing machines and dishwashers are now gathered in a new criteria document for white goods.
- Tumble dryers are now covered by the criteria.
- New material requirements.
- New tighter limits for energy efficiency, water consumption, noise, washing performance.
- New requirements for condensing efficiency for tumble dryers.
- New requirements concerning refrigerants in refrigerators & freezers and tumble dryers.
- New requirement that nanoparticles (of nanomaterials) must not actively be added to the product's inner or outer surfaces.
- Clarification of instructions to customers.

13.1 *Future development of white goods*

The white goods industry has started to find other energy sources to power appliance such as dishwashers and washing machines. District heating or self-generated heat from solar panels can be used as a heat source instead of electricity, which is considered a better use of resources, since district heating often comes from biofuel, household waste and/or surplus heat from industry. Washing with steam and tumble dryers with heat pump technology are other developments happening in the market that Nordic Ecolabelling needs to consider. However, the appliances remain connected to the mains to power the pumps and electronics.

The mains electricity grid of the future will also be more efficient. To tackle the climate issue, we need to increase the supply of renewable energy. However, energy sources such as solar and wind are rather unpredictable and conditions can vary from one hour to the next. A SmartGrid can balance out this variation and increase the stability of the grid, for example through advanced management and energy storage. This can enable renewable energy sources to be integrated on a major scale. One example is intelligent solutions in the home that automatically start the washing machine and charge the electric car when there is good availability of cheap green electricity. Another example is a management system that automatically helps industries to disconnect low-priority processes when electricity is less readily available.

The vast majority of the energy consumed (63%) in a wash cycle (60°C cotton) is used to heat the water. The proportion of energy expended by the motor and through

heat loss is 14% and 16% respectively. The white goods industry therefore has a major focus on reducing the temperature of the wash cycle. Dropping the water temperature from 95°C to 60°C brings about a 50% reduction in energy consumption. Dropping the water temperature from 60°C to 40°C reduces energy consumption by 25% and moving from 40°C to cold water produces a reduction of 50%[66].

The challenge is to wash at low temperatures and still retain the same hygiene and quality (cleanliness) as laundering at higher temperatures.

The white goods industry also has a major focus on reducing water consumption. A report by the IVL Swedish Environmental Research Institute[67] shows that a research team has managed to construct a demonstration washing machine that can reduce water consumption by 79% (3 kg laundry) with the help of heat exchange and membrane filtering of water.

Automatic dosing of laundry detergent is also a focus area in the white goods industry.

14 References

See footnotes in the document.

[66] Kimmel Tobias – Miele & Cia.KG: "Washing at low temperatures – a washing machine manufacturer's point of view", 7th International Fresenius Conference, 25 April 2012
[67] Rüdenauer I et al. "SWASH, Final report B2009", October 2011, IVL Swedish Environmental Research Institute

Appendix 1 Ecodesign Regulations and BAT (best available technology)

Horizontal Regulations (not product specific)

(EC) No 1275/2008 – Ecodesign requirements for standby and off mode electric power consumption of electrical and electronic household and office equipment.

White goods covered by these ecodesign requirements, as set out in Annex 1 of the Regulation: washing machines, tumble dryers, dishwashers, electric stoves, microwave ovens.

Applicable requirements:
Energy consumption switched off: max 1.00 W
Energy consumption on standby: max 1.00 W with regard to a pure reactivation function, max 2.00 W if it involves information or status display (either exclusively or in combination with a reactivation function).

All products must, except where inappropriate for intended use, be equipped with an off mode and/or standby mode and/or some other suitable mode that ensures the ecodesign requirements for standby and off mode are not exceeded.

Applies from 7 January 2013
Energy consumption switched off: max 0.50 W
Energy consumption on standby: max 0.50 W with regard to a pure reactivation function, max 1.00 W if it involves information or status display (either exclusively or in combination with a reactivation function).

All products must, except where inappropriate for intended use, be equipped with an off mode and/or standby mode and/or some other suitable mode that ensures the ecodesign requirements for standby and off mode are not exceeded.

Power management – The product shall offer a power management function that, after the shortest possible period of time and without impeding the function of the product, automatically switches the product into standby or off mode, thus ensuring that the ecodesign requirements for standby and off mode are not exceeded.

Measurements (with regard to requirements) – The aforementioned power consumption shall be established by a reliable, accurate and reproducible measurement procedure, which takes into account the generally recognised state of the art. Measurements of power of 0.50 W or greater shall be made with an uncertainty of ≤ 2% at the 95% confidence level. Measurements of power of less than 0.50 W shall be made with an uncertainty of ≤ 0.01 W at the 95% confidence level.

Information – Manufacturers must provide technical documentation for the purposes of conformity assessment. The documentation shall contain the following elements:

a) For each standby and/or off mode:

- The power consumption data in Watts rounded to the second decimal place
- The measurement method used

- Description of how the appliance mode was selected or programmed
- Sequence of events to reach the mode where the equipment automatically changes modes
- Any notes regarding the operation of the equipment

b) Test parameters for measurements:

- Ambient temperature
- Test voltage in V and frequency in Hz
- Total harmonic distortion of the electricity supply system
- Information and documentation on the instrumentation, set-up and circuits used for electrical testing

c) The characteristics of equipment relevant for assessing conformity with the ecodesign requirements, including the time taken to automatically reach standby, or off mode, or another condition which does not exceed the applicable power consumption requirements for off mode and/or standby mode. In particular, a technical justification shall be provided where the standby and off mode requirements are deemed inappropriate for the intended use of the equipment.

(EC) No 640/2009 – ecodesign requirements for electric motors

Came into force on 11 August 2009. Applies for the placing on the market and for the putting into service of motors, including where integrated in other products, and as described in Point 2 of Article 1: motors completely integrated into a product of which the energy performance cannot be tested independently from the product.

Requirements:
From 16 June 2011, motors shall not be less efficient than the IE2 efficiency level, as defined in Annex I.

From 1 January 2015, motors with a rated output of 7.5-375 kW shall not be less efficient than the IE3 efficiency level, as defined in Annex I, point 1, or meet the IE2 efficiency level, as defined in Annex I, Point 1, and be equipped with a variable speed drive.

From 1 January 2017, all motors with a rated output of 0.75-375 kW shall not be less efficient than the IE3 efficiency level, as defined in Annex I, point 1, or meet the IE2 efficiency level, as defined in Annex I, Point 1, and be equipped with a variable speed drive.

The product information requirements on motors are as set out in Annex I, Point 1, Table 1 for IE2 and Table 2 for IE3.

There is also a requirement regarding measurements for assessment of conformity with the ecodesign requirements and regarding market surveillance checks by the authorities, as set out in Articles 4 and 5 of the Regulation.

It is unclear whether this Ecodesign Regulation applies to the white goods that are currently or could be Nordic Ecolabelled, since no data has been gathered on motor

output in dishwashers, washing machines and tumble dryers or for compressors in refrigerators/freezers.

(EC) No 641/2009 – ecodesign requirements for for glandless standalone circulators and glandless circulators integrated in products

Came into force on 11 August 2009. Applies (among other things) to glandless circulators integrated in products.

The Regulation does not apply to circulators integrated in products and placed on the market no later than 1 January 2020 as replacement for identical circulators integrated in products and placed on the market no later than 1 August 2015. The replacement product or its packaging shall clearly indicate the product(s) for which it is intended.

The term ‘glandless circulator’ means an impeller pump which has the rated hydraulic output power of between 1 W and 2500 W and is designed for use in heating systems or in secondary circuits of cooling distribution systems, and whose rotor is directly coupled to the impeller, with the rotor immersed in the pumped medium.

Requirements regarding energy efficiency index (EEI) and schedules are contained in Annex I of Regulation (EC) No 641/2009, which also carries product information. requirements.

Fans (draft Regulation 1 June 2010)
Regards draft ecodesign requirements for fans driven by electric motors of 125 W to 500 kW, including those that are integrated into equipment covered by the Ecodesign Directive.

Does not apply to fans that are integrated into tumble dryers and dishwashers (for drying of laundry and tableware) and that have a maximum rated output of 3 kW or integrated fans that are placed on the market no later than 1 January 2015 as replacement for identical fans integrated in products and placed on the market no later than 1 July 2012. The packaging shall clearly indicate the product(s) for which these fans are intended.

As the draft stands at the time of reviewing the Nordic Ecolabelling of white goods, this Regulation is not deemed to set requirements for white goods with integrated fans.

Product specific Regulations

(EC) No 643/2009 – ecodesign requirements for household refrigerating appliances

Electric mains-operated household refrigerating appliances (refrigerators & freezers) with a storage volume up to 1500 litres. (Also applies to household appliances sold for non-household use or electric mains-operated household appliances that can be battery-operated.)

Generic ecodesign requirements as set out in Annex II, Point 1
The manufacturer shall provide information on the combination of drawers, baskets and shelves that result in the most efficient use of energy for the appliance and how the user can minimise the energy consumption of the household refrigerating appliance in the use phase.

From 1 July 2013:

- The fast freezing facility, or any similar function achieved through modification of the thermostat settings, in freezers and freezer compartments, shall, once activated by the end user according to the manufacturer's instructions, automatically revert to the previous normal storage temperature conditions after no more than 72 hours.
- Fridge/freezers with one thermostat and one compressor which are equipped with an electronic control board and can be used in ambient temperatures below +16°C according to the manufacturer's instructions shall be such that any winter setting switch or similar function guaranteeing the correct frozen-food storage temperature is automatically operated according to the ambient temperature where the appliance is installed.
- Household refrigerating appliances with a storage volume below 10 litres shall automatically enter an operating mode with a power consumption of 0.00 Watt after no more than 1 hour when empty. The mere presence of a hard off switch shall not be considered sufficient to fulfil this requirement.

Specific ecodesign requirements as set out in Annex II, Point 2, Tables 1 and 2
These requirements apply for refrigerators and freezers with a storage volume of up to 10 litres.
Must comply with the energy efficiency index (EEI) limits:

Compressor-type refrigerating appliances
From 1 July 2010 EEI < 55
From 1 July 2012 EEI < 44
From 1 July 2014 EEI < 42

Absorption-type refrigerating appliances and other types
From 1 July 2010 EEI < 150
From 1 July 2012 EEI < 125
From 1 July 2015 EEI < 110
Measurement requirements are set out in Annex III

Technical parameters to be established:

- Overall dimensions, which are measured to the nearest millimetre
- Overall space required in use, which is measured to the nearest millimetre
- Total gross volumes(s), which is measured to the nearest whole number of cubic decimetres or litres
- Storage volume(s) and total storage volume(s), which is measured to the nearest whole number of cubic decimetres or litres
- Defrosting type
- Storage temperature
- Energy consumption, which is expressed in kilowatt hours per 24 hours (kWh/24h), to three decimal places
- Temperature rise
- Freezing capacity
- Power consumption, which is measured in Watts rounded to two decimal places
- Wine storage compartment humidity, which is expressed as a percentage rounded to the nearest integer

The classification of household refrigerating appliances according to their area of use and compartment composition is determined by the definitions in Annex IV, along with nominal temperatures for EEI, climate classes and storage temperatures. Thermodynamic factors and correction factors are also given.

The energy efficiency index (EEI) compares the annual energy consumption of a household refrigerating appliance with standard annual energy consumption, with this presented in the Regulation as a quotient of the machine in question's energy consumption divided by the energy consumed by a standard machine, as calculated using a table based on classification of the product's category by area of use as stated above (Table 1, Annex IV), the appliance's equivalent volume and a given constant.

BAT/EEI

According to the Regulation, the following has been identified as the Best Available Technology (BAT) on the market for household refrigerators and freezers regarding EEI (when the Regulation entered into force):

Table 29 BAT values for refrigerators and freezers, 643/2009/EC

Type	EEI	Energy (kWh/year)	Storage volume (l)	Noise (dB(A))	Climate class
Refrigerator, compressor	29.7	115	300	33	T
Refrigerator, absorption	97.2	245	28	0	N
Fridge/freezer, compressor	28.0	157	236	33	T
Upright freezer, compressor	29.3	172	195 ****	35	T
Chest freezer, compressor	27.4	153	223 ****	37	T

Regulation (EU) No 1015/2010 – ecodesign requirements for household washing machines

The ecodesign requirements do *not* relate to combined washer/dryers.

1. GENERIC ECODESIGN REQUIREMENTS
    1. For the calculation of the energy consumption and other parameters for household washing machines, the cycles which clean normally soiled cotton laundry (hereafter standard cotton programmes) at 40°C and 60°C shall be used. These cycles shall be clearly identifiable on the programme selection device of the household washing machine or the household washing machine's display, if any, or both, and indicated as 'standard 60°C cotton programme' and 'standard 40°C cotton programme'.
    2. The booklet of instructions provided by the manufacturer shall provide:
    a. The standard 60°C and 40°C cotton programmes, referred to as 'standard 60°C cotton programme' and 'standard 40°C cotton programme', and shall specify that they are suitable to clean normally soiled cotton laundry and that they are the most efficient programmes in terms of combined energy and water consumptions for washing that type of cotton laundry; in addition, an indication that the actual water temperature may differ from the declared cycle temperature.
    b. The power consumption of the off mode and of the standby mode.
    c. Indicative information on the programme time, remaining moisture content, energy and water consumption for the main washing programmes at full or half load, or both.
    d. Recommendation on the type of detergents suitable for the various washing temperatures.
    3. Household washing machines shall offer to end users a cycle at 20°C. This programme shall be clearly identifiable on the programme selection device of the household washing machines or the household washing machines display, if any, or both.
2. SPECIFIC ECODESIGN REQUIREMENTS

    Household washing machines shall comply with the following requirements:
    1. From 1 December 2011:
        - For all household washing machines, the energy efficiency index (EEI) shall be less than 68.
        - For household washing machines with a rated capacity higher than 3 kg, the washing efficiency index (I_w) shall be greater than 1.03.
        - For household washing machines with a rated capacity equal to or lower than 3 kg, the washing efficiency index (I_w) shall be greater than 1.00.
        - For all household washing machines, the water consumption (W_t) shall be:

$$W_t \leq 5 \times c + 35$$

where *c* is the household washing machine's rated capacity for the standard 60°C cotton programme at full load or for the standard 40°C cotton programme at full load, whichever is the lower.

2. From 1 December 2013:
   - For household washing machines with a rated capacity equal to or higher than 4 kg, the energy efficiency index (EEI) shall be less than 59.
   - For all household washing machines, the water consumption shall be:

$$W_t \leq 5 \times c_{½} + 35$$

where *c ½* is the household washing machine's rated capacity for the standard 60°C cotton programme at half load or for the standard 40°C cotton programme at half load, whichever is the lower.

The energy efficiency index (EEI), washing efficiency index (I_w) and water consumption index (W_t) are calculated in accordance with Annex II to the Regulation.

EEI is a quotient based on the machine in question's energy consumption divided by the energy consumed by a standard machine according to the formula EEI = ***(AE_c/SAE_c) x 100***

SAE_c (standard annual energy consumption) is calculated using a formula based on the machine's rated capacity: ***SAE_c = 47,0 x c + 51.7*** where c = the machine's rate capacity for a full load at 40ºC or 60ºC, whichever is the lower.

AE_c (weighted annual energy consumption) is stated in kWh/year to two decimal points and includes energy consumption (E_t), power in off mode (P_0) and standby (P_l), programme time (T_t) and a value for number of standard washing cycles per year. (All values are calculated using the formulae in Annex II.)

I_w is calculated using a formula in Annex II and is based on information from tests of washing efficiency for different washing cycles as defined in the Annex.

W_t is given as the water consumption of the standard 60°C cotton programme at full load = $W_{t,60}$

BAT washing machines

According to the preparatory study, the performance of the market's best machines (BAT) was as follows at the time of publishing the draft:

Table 30 BAT values for washing machines, 1015/2010/EU

Load capacity (kg)	Energy consumption/ wash cycle (kWh)	Energy consumption/kg (kWh/kg)	Energy consumption per year in low energy mode (kWh/year)	Water consumption (Wt) (l/ wash cycle)	Water consumption (Wt) 220 cycles = 1 year (l/year)	Washing efficiency (kg)	Noise wash/spin (dB(A))
3	0.70	0.23	12.5	39	8580	1.03	53/74
4.5	0.76	0.17	12.5	40	8800	1.03	55/70
5	0.850	0.17	12.5	39	8580	1.03	53/73
6	1.02	0.17	12.5	39	8580	1.03	54/78
7	1.02	0.15	12.5	43	9460	1.03	48-59/62-73
8	1.200	0.15	12.5	56	12320	1.03	54/71-74

Regulation (EU) No 1016/2010 – ecodesign requirements for household dishwashers

1. GENERIC ECODESIGN REQUIREMENTS
    1. For the calculation of the energy consumption and other parameters for household dishwashers, the cycle which cleans normally soiled tableware (hereafter standard cleaning cycle) shall be used. This cycle shall be clearly identifiable on the programme selection device of the household dishwasher or the household dishwasher display, if any, or both, and named 'standard programme' and shall be set as the default cycle for household dishwashers equipped with automatic programme selection or any function for automatically selecting a cleaning programme or maintaining the selection of a programme.
    2. The booklet of instructions provided by the manufacturer shall provide:
        a. The standard cleaning cycle referred to as 'standard programme' and shall specify that it is suitable to clean normally soiled tableware and that it is the most efficient programme in terms of its combined energy and water consumption for that type of tableware.
        b. The power consumption of the off mode and of the standby mode.
        c. Indicative information on the programme time, energy and water consumption for the main cleaning programmes.
2. SPECIFIC ECODESIGN REQUIREMENTS

    Household dishwashers shall comply with the following requirements:

    4. From 1 December 2011:
        c. For all household dishwashers, except household dishwashers with a rated capacity of 10 place settings and a width equal to or less than 45 cm, the energy efficiency index (EEI) shall be less than 71.
        d. For household dishwashers with a rated capacity of 10 place settings and a width equal to or less than 45 cm, the energy efficiency index (EEI) shall be less than 80.
        e. For all household dishwashers, the cleaning efficiency index (I_C) shall be greater than 1.12.
    5. From 1 December 2013:
        c. For household dishwashers with a rated capacity equal to or higher than 11 place settings and household dishwashers with a rated capacity of 10 place settings and a width higher than 45 cm, the energy efficiency index (EEI) shall be less than 63.
        d. For household dishwashers with a rated capacity of 10 place settings and a width equal to or less than 45 cm, the energy efficiency index (EEI) shall be less than 71.
        e. For household dishwashers with a rated capacity equal to or higher than 8 place settings, the drying efficiency index (I_D) shall be greater than 1.08.
        f. For household dishwashers with a rated capacity equal to or less than 7 place settings, the drying efficiency index (I_D) shall be greater than 0.86.
    6. From 1 December 2016:
        a) For household dishwashers with a rated capacity of 8 and 9 place settings and household dishwashers with a rated capacity of 10

place settings and a width equal to or less than 45 cm, the energy efficiency index (*EEI*) shall be less than 63.

EEI, I_C and I_D are calculated using the formulae in Annex II to the Regulation.

EEI is a quotient based on the machine in question's energy consumption divided by the energy consumed by a standard machine according to the formula EEI = ***$(AE_c/SAE_c) \times 100$***

SAE_c standard annual energy consumption of the household dishwasher

AE_c annual energy consumption of the household dishwasher

I_C cleaning efficiency index

I_D drying efficiency index

BAT dishwashers

Below is a preparatory study of BAT (Best Available Technology) dishwashers conducted by the EU to support the draft ecodesign requirements presented in March 2010:

Table 31 BAT values for dishwashers, 1016/2010/EU

No. of covers	Built-in/Standalone model	Energy consumption/ wash cycle (kWh)	Energy consumption /year (280 wash cycles (kWh/year)	Energy consumption per year in low energy mode (kWh/year)	Water consumption (1/wash cycle)	Drying efficiency (I_D)	Cleaning efficiency (I_C)	Noise wash/ spin (dB(A))
14	b	0.950	278.5	12.5	10	>1.08	>1.12	41
12	f	0.950	278.5	12.5	9	>1.08	>1.12	41
9	b	0.800	236.5	12.5	9	>1.08	>1.12	44
6	b	0.63	208.5	12.5	7	>0.86	>1.12	45
4	f	0.51	155.3	12.5	9.5	>0.86	>1.12	53

Draft ecodesign requirements for household tumble dryers as per 25 July 2012

The proposed new generic and specific ecodesign requirements for household tumble dryers were adopted by the Regulatory Committee on 10 May 2012. The final Regulation is expected to be published in autumn 2012[68].

Household tumble dryers must meet the following requirements:

3. From (The Ecodesign Regulation and date are expected to be published in autumn 2012):
    a) The energy efficiency index (EEI) shall be less than 85. This will phase out energy labelling class D.
    b) For condenser household tumble dryers, the weighted condensation efficiency shall not be lower than 60%. This will phase out class E.

[68] http://www.eceee.org/Eco_design/products/%20%20laundry_driers

4. From (The Ecodesign Regulation and date are expected to be published in autumn 2012):
    c) For condenser household tumble dryers, the energy efficiency index (EEI) shall be less than 76. This will phase out class C condenser dryers, but not vented dryers.
    d) For condenser household tumble dryers, the weighted condensation efficiency shall not be lower than 70 %. This will phase out class D.

BAT tumble dryers

A life cycle analysis carried out in 'Task 5'[69] as part of a preparatory study showed that the most significant environmental impact from household tumble dryers is energy consumption during the use phase. The issue of the refrigerant from heat pump tumble dryers is considered immaterial, since it is stored in a closed loop until final disposal of the appliance. Leakage is, in practice, very much limited to the time of delivery of the product.

Figure 3: Proposed new reference line (SAEC) and energy efficiency classes for household condenser tumble dryers based on market data from 2008[70],[71].

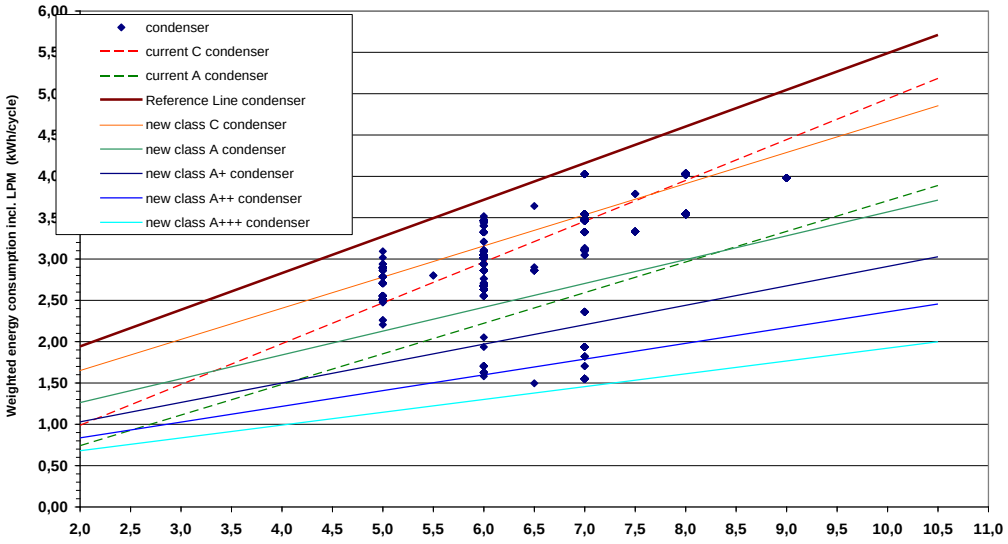
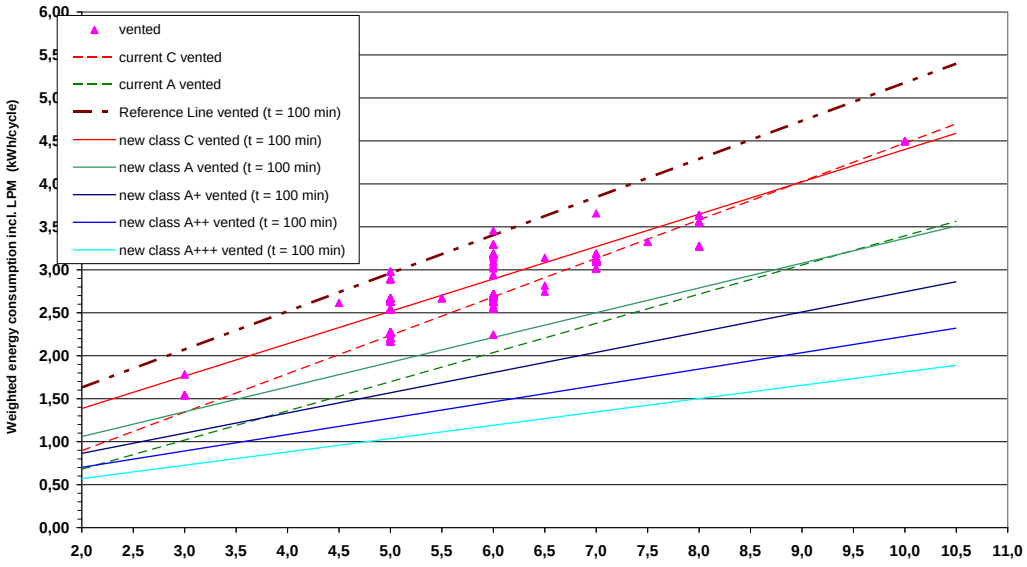


Figure 4: Proposed new reference line (SAEC) and energy efficiency classes for household vented tumble dryers based on market data from 2008[72].

[69] http://www.eceee.org/Eco_design/products/laundry_driers/ FinalReport_Lot16_Laundry_driers
[70] See footnote 7
[71] The energy consumption in kWh/cycle of the household tumble dryers provided on this graph has been adjusted in order to include low power modes. The calculation is based on 160 cycles per year assuming 13.5 kWh low power mode consumption. N.B.: The energy consumption of low power modes should gradually fall around 5 kWh further to the entry into force of the standby regulation as most household tumble dryers have no sensor based safety function and therefore fall into its scope.
[72] See footnote 9



See web page: http://www.eceee.org/Eco_design/products/laundry_driers
'Final Report Lot16 Laundry driers' page 290, VI Task 6: Technical analysis of Best Available Technology (BAT).

Preparatory studies exist/are underway for the product groups

Ovens for household and commercial use (Lot 22, preparatory study underway)
Hobs/grills for household and commercial use (Lot 23, preparatory study underway)

Application of a life cycle perspective when setting requirements

All the Ecodesign Regulations have a section outlining which environmental impact the preparatory study has found to be the greatest over the whole life cycle of the product, but these life cycle analyses have themselves not been studied and should not be seen as material to the development of the Nordic Ecolabelling criteria, since system limits and investigated parameters are unknown at the current time.

Appendix 2 Energy Labelling Regulations

Refrigerators and freezers (also in combination)

Requirements apply from 30 November 2011. Article 3 d and e plus Article 4 b, c and d are, however, applicable from 30 March 2012. Regulation (EU) No 1060/2010.

Table 32 Energy efficiency classes for refrigerators and freezers

Energy Efficiency Class	Proposal until June 2014	Proposal after June 2014	Ecodesign requirements where storage volume >10 litres. In line with 643/2009/EC
A+++	*EEI* < 22	*EEI* < 22	
A++	22 ≤ *EEI* < 33	22 ≤ *EEI* < 33	
A+	33 ≤ *EEI* < **44**	33 ≤*EEI* < **42**	From 1 July 2014 EEI < 42
A	**44** ≤ *EEI* < 55	**42** ≤ *EEI* < 55	From 1 July 2012 EEI < 44
B	55 ≤ *EEI* < 75	55 ≤ *EEI* < 75	**From 1 July 2010 EEI < 55**
C	75 ≤ *EEI* < 95	75 ≤ *EEI* < 95	
D	95 ≤ *EEI* < 110	95 ≤ *EEI* < 110	
E	110 ≤ *EEI* < 125	110 ≤ *EEI* < 125	
F	125 ≤ *EEI* < 150	125 ≤ *EEI* < 150	
G	*EEI* ≥ 150	*EEI* ≥ 150	

For specific ecodesign requirements under Regulation (EC) No 643/2009, see Appendix 1.

Washing machines

Requirements apply from 20 December 2011. Article 3 d and e plus Article 4 b, c and d are, however, applicable from 20 April 2012. Regulation (EU) No 1061/2010.

Table 33 Energy efficiency classes for washing machines

Energy Efficiency Class	Energy Efficiency Index	Ecodesign requirements under 1015/2010/EU
A+++	EEI < 46	
A++	46 ≤ EEI < 52	
A+	52 ≤EEI < 59	
A	59 ≤ EEI < 68	From 1 December 2013 EEI < 59*
B	68 ≤ EEI < 77	From 1 December 2011 EEI < 68*
C	77 ≤ EEI < 87	
D	87 ≥ EEI	

*For specific ecodesign requirements under Regulation (EU) No 1015/2010, see Appendix 1.

Table 34 Spin-drying efficiency classes for washing machines

Spin-drying Efficiency Class	Remaining moisture (%)	Water consumption and noise levels for washing and spinning are stated, but have no associated classes. Same information as required in the Ecodesign Directive and same calculation methods.
A (most efficient)	D < 45	
B	45 ≤ D < 54	
C	54 ≤ D < 63	
D	63 ≤ D < 72	
E	72 ≤ D < 81	
F	81 ≤ D < 90	
G (least efficient)	90 ≥ D	

Dishwashers

Requirements apply from 20 December 2011. Article 3 d and e plus Article 4 b, c and d are, however, applicable from 20 April 2012. Regulation (EU) No 1059/2010.

Table 35 Energy efficiency classes for dishwashers

Energy Efficiency Class	Energy Efficiency Index	Ecodesign requirements in line with Regulation (EU) No 1016/2010
A+++	$EEI < 50$	
A++	$50 \leq EEI < 56$	
A+	$56 \leq EEI <$ **63**	
A	$63 \leq$ EEI < 71	From 1 December 2013 EEI < 63*
B	$71 \leq$ EEI < 80	From 1 December 2011 EEI < 71*
C	$80 \leq EEI < 90$	
D	$EEI \geq 90$	

*For specific ecodesign requirements under Regulation (EC) No 1016/2010, see Appendix 1.

Table 36 Drying efficiency classes for dishwashers

Energy Efficiency Class	Drying Efficiency Index
A	$I_D > 1.08$
B	$1.08 \geq I_D > 0.86$
C	$0.86 \geq I_D >$ **0.69**
D	**0.69** $\geq I_D > 0.55$
E	$0.55 \geq I_D > 0.44$
F	$0.44 \geq I_D > 0.33$
G (least efficient)	$0.33 \geq I_D$

Water consumption and noise levels are stated, but have no associated classes. Same information as required in Ecodesign Directive 1016/2010/EU and same calculation methods. For specific ecodesign requirements, see Appendix 1.

Tumble dryers

Requirements apply from 29 May 2012. Article 3 d and e plus Article 4 b, c and d are, however, applicable from 29 September 2012. Regulation (EU) No 392/2012.

Table 37 Energy efficiency classes for tumble dryers

Energy efficiency class	Energy Efficiency Index	The Ecodesign Regulation is expected to be published in autumn 2012
A+++	EEI < 24	
A++	$24 \leq$ EEI < 32	
A+	$32 \leq$ EEI < 42	
A	$42 \leq$ EEI < 65	
B	$65 \leq$ EEI < 76	
C	$76 \leq$ EEI < 85	From x xxxxxxxx 20xx EEI < 76
D	$85 \leq$ EEI	From x xxxxxxxx 20xx EEI < 85

For proposed specific ecodesign requirements under the draft of the new Regulation, see Appendix 1.

Table 38 Condensation efficiency classes for tumble dryers

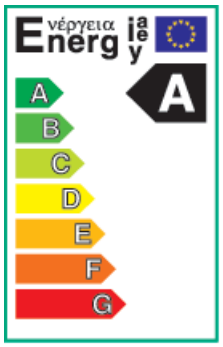
Condensation efficiency class	Weighted condensation efficiency
A	Ct > 90
B	80 < Ct ≤ 90
C	70 < Ct ≤ 80
D	60 < Ct ≤ 70
E	50 < Ct ≤ 60
F	40 < Ct ≤ 50
G	Ct ≤ 40

The old Directive 96/60/EC for combined washer/dryers and the old Directive 95/13/EC for tumble dryers are described in Appendix 3.

Circulators

In March 2005, Europump (the European Association of Pump Manufacturers) launched an energy efficiency labelling system for circulators in heating systems. Circulators in heating systems are considered 'hidden' energy consumers, accounting for up to 15% of the electricity in an average European household. By driving the European market towards more energy-efficient distribution pumps, the average European household could save as much as 10% of its total electricity consumption. In 2006, the European Commission threw its weight behind the Europump initiative.

Energy Efficiency Class	Energy Efficiency Index
A	EEI < 0.40
B	0.40 ² EEI < 0.60
C	0.60 ² EEI < 0.80
D	0.80 ² EEI < 1.00
E	1.00 ² EEI < 1.20
F	1.20 ² EEI < 1.40
G	1.40 ² EEI



The energy efficiency index is calculated as average electricity consumption divided by the electricity consumption of a reference circulator.

$$EEI = \frac{P_{L,avg}}{P_{ref}} \quad [-]$$

Note that Regulation (EC) No 641/2009 with regard to ecodesign requirements for glandless standalone circulators and glandless circulators integrated in products contains the following formula:

$$EEI = \frac{P_{L,avg}}{P_{ref}} \cdot C_{20\,\%}, \text{ where } C_{20\,\%} = 0{,}49$$

This means that the energy efficiency index (EEI) is not the same in the Europump energy labelling system and in Ecodesign Regulation (EC) No 641/2009.

The standard for circulator efficiency is CENELEC EN 1151-1:2006.

Ovens and washer/dryers

Ovens and washer/dryers may become eligible for Nordic Ecolabelling at some future time, but they are not included in this review.

Appendix 3 Directive 96/60/EC Combined washer/dryers and Directive 95/13/EC Tumble dryers

Regarding Directive 96/60/EC Combined washer/dryers:

The Directive sets requirements for energy efficiency, washing performance and water consumption:

Energy consumption:

Table 39 Energy efficiency requirement, 96/60/EC

Energy efficiency class	*Energy Efficiency C*
A	$C \leq 0.68$
B	$0.68 < C \leq 0.81$
C	$0.81 < C \leq 0.93$
D	$0.93 < C \leq 1.05$
E	$1.05 < C \leq 1.17$
F	$1.17 < C \leq 1.29$
G	$1.29 < C$

Washing performance:

Table 40 Washing performance requirement, 96/60/EC

Washing performance class	*'P' Washing performance index, using a standard 60°C cotton 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	$0.88 \geq P$

A machine with both a washing and a drying function can be good for consumers who are short of space. The energy labelling for combined washer/dryers has not been updated. The scale runs from A-G, with A the most efficient. These tumble dryers can cause the laundry to crease, since they do not become as hot as ordinary tumble dryers[73].

Regarding Directive 95/13/EC Tumble dryers:

The energy efficiency class for an appliance is to be established in relation to energy consumption 'C' in kWh per kg load with testing procedures from the harmonised standards named in Article 1.2 for 'dry cotton' cycle:

For vented tumble dryers:

[73] http://www.washerdryerinfo.com/Buying-Guides/Small-Apartments.htm#

Table 41 Energy efficiency requirement, 95/13/EC

Energy efficiency class	*Energy Efficiency C*
A	$C \leq 0.51$
B	$0.51 < C \leq 0.59$
C	$0.59 < C \leq 0.67$
D	$0.67 < C \leq 0.75$
E	$0.75 < C \leq 0.83$
F	$0.83 < C \leq 0.91$
G	$C > 0.91$

For condenser tumble dryers:

Table 42 Energy efficiency requirement (condenser tumble dryers) 95/13/EC

Energy efficiency class	*Energy Efficiency C*
A	$C \leq 0.55$
B	$0.55 < C \leq 0.64$
C	$0.64 < C \leq 0.73$
D	$0.73 < C \leq 0.82$
E	$0.82 < C \leq 0.91$
F	$0.91 < C \leq 1.00$
G	$C > 1.00$