Hearing proposal

On Ecolabelled

Rechargeable batteries

Version 4.0

Background for the Nordic Ecolabel license

12/5-2010

Nordic Ecolabelling

Hearing proposal for rechargeable batteries provided with the Nordic Ecolabel – Background for the Nordic Ecolabel

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1 Summary

In the criteria for rechargeable batteries version 4, a product group definition has been introduced which resembles the definition applied in the EU Battery Directive. Moreover, it is no longer possible for battery chargers separately to carry the Nordic Ecolabel. It is, however, still permitted to sell ecolabelled rechargeable batteries in combined packs with a charger if it is clearly displayed that the ecolabel applies to the batteries and not the charger. Further, a charger sold with rechargeable batteries must meet some requirements to ensure a proper quality and environmental profile of products which are associated by the consumers with an ecolabelled product.

According to Nordic Ecolabelling the most substantial environmental impacts of batteries are the following:

- the spread and use of metals, especially heavy metals, from the batteries.
- the energy consumption used in the production of batteries and the related raw materials
- improper handling of used batteries in the flow of waste
- Excess consumption of batteries due to the use of rechargeable batteries in electrical applications, which drain the batteries too quickly, or due to non-optimal charges.

Furthermore, several other parameters need to be taken into account to ensure that batteries cause as little environmental impact as possible. This applies to e.g. the packaging of the batteries and the use of nanotechnology in the batteries.

To ensure a lower battery consumption with the consumers, Nordic Ecolabelling focuses on ensuring a less extensive flow of batteries in trade and in the flow of waste. This is done e.g. by requiring clear information displayed to the end-user on what exactly the type of battery in question provides optimal performance for. Furthermore, the efficiency of different batteries varies a lot and Nordic Ecolabelling ensures a good quality of rechargeable batteries which can be charged efficiently a repeated number of times, consequently reducing the consumption of rechargeable batteries.

The substances contained in the batteries of today's markets and the concentrations of these substances vary. Consequently, there is potential for differentiating between batteries of more or less environmental hazard. Nordic Ecolabelling will collect this information to be able to assess how we are to make requirements for the ingredients of batteries in the future. Moreover, the existing strict requirements for arsenic, cadmium, lead and mercury are maintained.

The most energy consuming part of battery production is the extraction and processing of raw materials for the batteries[1]. It is likely that the impact on the climate from the production of batteries varies between different manufacturers and battery types - not only due to the difference of production methods or varying suppliers of raw materials, but also due to the source of energy applied.

In the Nordic countries, the collection of batteries is highly efficient. The consumers have access to a variety of possibilities to return their batteries, either on waste stations, in collection containers or collection in connection with the collection of household waste. Furthermore, through the EU Battery Directive (2006/66/EC) of September 6 2006, governmental requirements for the collection of batteries are very strict and efficient. Thus, Nordic Ecolabelling has taken the stand that our Nordic Ecolabel - cannot change or improve this part of the life of a battery.

2 Basic facts about the criteria

Products that may be labelled

Products which may be submitted to application for a Nordic Ecolabel license through these criteria are: Portable batteries which can be recharged according to the definition provided in the EU Battery Directive (2006/66/EC) of September 2006.

According to the EU Battery Directive (2006/66/EC) of September 6 2006, a rechargeable battery is defined as: Any electrical or electronic energy source created by the direct transformation of chemical energy, and which comprises one or more secondary battery cells that can be recharged.

Portable batteries are limited to: Any cylindrical or button cell or any sealed battery pack or accumulator which may be handheld, and which is not an industrial battery, industrial accumulator or a car battery or car accumulator.
The criteria do not include single-use batteries, for which separate criteria exist.

The criteria do not include batteries that are incorporated in or a fixed part of electronic devices, where it is not possible to change the batteries.

Chargers for rechargeable batteries cannot obtain a licence for the Nordic Ecolabel separately. Combined packs where the charger and the rechargeable batteries are sold as one may, however, obtain the Nordic Ecolabel.
The charger must in this case meet requirements O8, O9 and O17. The entire combination pack must fulfil the requirements for packaging (O10, O11 and O12). On these combination packs it must be displayed clearly to consumers that the batteries are the ones carrying the Nordic Ecolabel and not the charger.

By changing the product group definition for the above, the definition of Nordic Ecolabelling is in accordance with the product group definition of the EU battery directive. This way we can compare the batteries of our applicants to the definitions of the Directive, making it easier to assess whether the individual battery falls under the product group.

Thereby, the product group provides an opening for new battery types in the future. The risk may be that the requirements will not be able to match the new products or models, and consequently we cannot ensure that it is only the best one third of these new products or models which will receive a licence. This particularly applies to the requirements for quality testing.

According to Nordic Ecolabelling, the environmental requirements of the criteria are so broad that these will safeguard against new models or products with poor environmental performance. Moreover, there will still be a possibility to extend the criteria by further quality requirements relevant for new products or models during the life of the criteria.

By applying the above mentioned product group definition, it is ensured that automotive batteries and industrial batteries cannot obtain a licence, which corresponds to the aim of Nordic Ecolabelling. Further, Nordic Ecolabelling has chosen to exclude batteries which are incorporated in or a fixed part of electronic devices and thereby unable to be changed. This owes to the fact that Nordic Ecolabelling does not make any further requirements for the electrical device of which the battery is a fixed part and this way we cannot defend that the entire product is environmentally friendly. Furthermore, Nordic Ecolabelling sees it as unnecessary waste of resources to have to throw out the entire electrical device because it no longer works optimally.

Nordic Ecolabelling has chosen to make it possible to provide the best rechargeable batteries on the market with the Nordic Ecolabel by compliance with the criteria document for rechargeable batteries. The market for rechargeable batteries is considerable (see under ”the Nordic market”), and the differences of environmental performance and quality of the various rechargeable batteries are big, making it possible for Nordic Ecolabelling to tell the rechargeable batteries of the best environmental performance and of the best quality apart from the rest.

In version 4 of the criteria, Nordic Ecolabelling has eliminated the possibility to provide chargers sold separately with the Nordic Ecolabel. This is mainly due to the fact that Nordic Ecolabelling is of the opinion that two so different products as a battery and a charger (which is an electrical device) do not belong in the same product group.
However, chargers are often sold in combined packs with rechargeable batteries. In order to ensure that these packs with rechargeable batteries may also carry the Nordic Ecolabel, Nordic Ecolabelling keeps this option open.

The quality of a charger is essential for the life and capacity of a rechargeable battery. Bad chargers do not stop charging the batteries even though these have been fully charged, which wears the battery. Therefore, Nordic Ecolabelling has especially chosen to set quality requirements for chargers when these are sold in combination with ecolabelled rechargeable batteries.

To ensure that no doubt occurs as to which part has been provided with the Nordic Ecolabel when selling rechargeable batteries, the section on marketing specifies how the ecolabel should be placed, and suggestions for captions have been provided in connection with combined packs of battery and charger.

In a separate criteria document, Nordic Ecolabelling also provides an option to provide single-use batteries with the Nordic Ecolabel. Nordic Ecolabelling has not compared rechargeable batteries and single-use batteries in the same criteria document, as a general difference in the majority of cases makes rechargeable batteries an environmentally more friendly choice: One of the products is a single-use

product. When it has been used, it is disposed of. The other product is a recycling product. When it has been emptied, it is recharged and used again. Moreover, the chemical compositions of single-use batteries and rechargeable batteries differ.
In most cases, the environmental performance of rechargeable batteries is more benign than that of single-use batteries, which is confirmed e.g. by Climatops LCA analysis of different batteries, and Nordic Ecolabelling recommends the consumers to use rechargeable batteries.

Motive for ecolabelling with the Nordic Ecolabel

The core principles of prioritising the ecolabel requirements are to proceed from the environmental profile of the product group. The weight of the requirements is laid on those activities and processes which have the greatest relevance, potential and manoeuvrability (RPM) with regard to the life cycle of the product.

Relevance is assessed on the basis of the environmental impact of the product group and on the extent of the problem.

Extensive use of battery-driven products on the market results in the use of rechargeable batteries being very extensive in the Nordic Countries (see market data below). This is in itself a reason to be aware of the environmental impact of batteries.

There are no common Life Cycle Assessment (LCA) reports covering the entire battery business prepared by the European Portable Battery Association (EPBA)[2], but several battery manufacturers have had LCA reports or similar reports carried out on their products. These reports have, however, not been made public.

Studies made in the battery business[3] show that extensive environmental impact arises from batteries that are used in a wrong way, e.g. if batteries of a low capacity are used for devices that are highly energy consuming, the batteries will be discharged more easily. This way, the life or serviceability of the battery is reduced, which means that the consumer often changes the battery, thereby increasing battery consumption.

In a study from Climatop on the CO_2 balance of a variety of batteries[4] it appears that the energy consumption related to the production of rechargeable batteries makes up a substantial part of the total CO_2 balance of the battery. Consequently, it is highly relevant to make requirements for the energy consumption in the production of rechargeable batteries. Moreover, a substantial part of the CO_2 consumption of a battery constitutes energy for charging the battery, i.e. energy consumption in the usage phase.

One report states that the use of LCA analyses is a good tool to define the environmental aspects of batteries. It is, however, important to be aware that the LCA analyses may present some weaknesses, as ecotoxicity is an essential environmental parameter for batteries, and this is difficult to include in an LCA analysis[5]. Another weakness in the assessment of the environmental impact of batteries is the number of parties that are involved in the life of a battery and have very little knowledge of the other parts of the life cycle of the battery.

Nordic Ecolabelling does not only base its requirements on information from LCA analyses but also ensures strict requirements for substances with a high ecotoxicity. The importance of these criteria for the batteries is also confirmed in a study made by Århus Municipality in 2007 showing that the number and types of metals in the batteries are very extensive[6]. The spread of these metals – especially heavy metals that are hazardous to health and the environment – will cause major environmental problems. The spread takes place during the production of the battery and when handling the end-product.

The metals used in the production of batteries are extracted as natural raw materials, of which several of these may be limited resources. Preservation of these limited resources may take place in several ways:

1. limiting the use of metals by producing batteries not containing the metals which are highly limited as a resource.
2. limiting the use of metals by limiting the consumption of batteries. Nordic Ecolabelling seeks to influence this area by setting up requirements for high quality and information to the customers on the correct use of the individual battery.
3. using metals that arise out of the extraction from waste products. Due to requirements for the purity of the applied metals, it is, however, not possible to use recycled metals for batteries.[7]
4. ensuring that the metals from the batteries are collected and recycled in a correct way for other products. e.g. by ensuring efficient public collection schemes and information for the consumers regarding proper disposal of the batteries. Moreover, see to it that the batteries are not recycled as landfill but used in the production of something else. The collection of batteries is covered effectively by EU legislation, and Nordic Ecolabelling or the battery manufacturers do not have any influence on the way the collected batteries are recycled, as this is a governmental decision.

According to Nordic Ecolabelling, the most substantial environmental impacts of batteries are the following:

1. The consumers' excess consumption of batteries due to lack of knowledge on how to optimise the battery use, the use of wrong battery types for electrical devices or the use of batteries of a poor quality.
2. the spread and use of heavy metals of the batteries.
3. the energy consumption used in the production of batteries.
4. the wrong handling of used batteries in the flow of waste.

Furthermore, several other parameters need to be taken into account to ensure that batteries cause as little environmental impact as possible. This applies to e.g. the packaging of the batteries and the use of nanotechnology in the batteries.

The annual use of primary packaging for the batteries – especially cardboard and PET – in Europe is expected to be more than 8000 tons (more than 5000 tons of cardboard and more than 3000 tons of PET).
By increasing the share of recycled cardboard and plastics in the packaging, the consumption of resources related to the batteries is reduced According to FTI (Repa), the energy consumption for the production of packaging can be reduced by approx.

30 % by using recycled plastic in the packaging. It is worthwhile to prioritise lower resource consumption.

A lot of research is made within the use of nanotechnology to improve materials and products, including batteries. This especially applies to rechargeable batteries, where the purpose of nanotechnology is to ensure longer lives[8] of the rechargeable batteries.

This will result in less change of batteries and is therefore an environmental advantage, why Nordic Ecolabelling will not rule out the use of nanotechnology solutions in ecolabelled rechargeable batteries.
Nanotechnology should be handled with care, as incorrect handling of nanomaterial may have consequences for the health, both during production and during the recycling process of the batteries.

Nordic Ecolabelling has been informed that especially batteries incorporated in computers and other electronic devices are flown into Europe from Asia.

According to Climatop's report on batteries,[9] the energy consumption of transportation is insignificant for the type of batteries examined.

The charger: The charger is an extra product for the main product, which consists of the rechargeable battery. The battery manufacturers purchase chargers from subcontractors, and thus the manufacturers have less manoeuvrability, control or overview of the composition of the charger. The difference of the quality of chargers is significant, and consequently of how much electricity a charger uses, and of how much they "wear" the batteries when charging them[10].

The potential is normally assessed on the basis of the possible environmental gain within the specific product group and with regard to the individual areas of the criteria to which different requirements apply.

There are several ways to ensure lower battery consumption of the consumers. Many of these deal with information on the environmental impact of energy consuming products on e.g. the climate. In the present document, Nordic Ecolabelling has chosen to focus on the potential offered by the battery itself to ensure a smaller number of batteries in trade and in the flow of waste.

In order to ensure longer lives of the batteries, it is essential to provide clear information to the end-user on what exactly the individual type of battery is optimal for. Today, the level of information intended for the customers on battery packaging varies a lot, and consequently there is a large potential for making requirements for this information.

Furthermore, the efficiency of various batteries differs, which provides a potential for assessing which batteries have the least environmental impact as a result of their quality and consequently their longer lives.

The most energy consuming part of the battery production is the extraction and processing of raw materials for the batteries[11]. Currently, it remains uncertain to Nordic Ecolabelling whether differences exist between the individual battery

manufacturers or types of batteries and the energy consumption that the production requires. It is very likely that the impact on the climate from the production of batteries varies between different manufacturers and battery types - not only because of the difference of production methods or varying suppliers of raw materials, but also due to the source of energy applied.

The substances contained in the batteries of today's markets and the concentrations of these substances vary. Consequently, there is potential for differentiating between batteries of more or less environmental hazard. Nordic Ecolabelling will collect this information to be able to assess how we are to make requirements for the ingredients of batteries in the future. For further information on this, see section 4.1.1.

In the Nordic countries the collection of batteries is highly efficient. The consumers have access to a variety of possibilities to return their batteries, either on waste stations, in collection containers or collection in connection with the collection of household waste. Furthermore, through the EU Battery Directive (2006/66/EC) of September 6 2006, governmental requirements for the collection of batteries are very strict and efficient. Thus, Nordic Ecolabelling has taken the stand that our ecolabel – the Nordic Ecolabel – cannot change or improve this part of the life of a battery.

Packaging for batteries often consists of varying amounts of recycled materials such as cardboard and plastics. It is possible to make sure that a large share of recycled cardboard and plastics is used in battery packaging and some manufacturers make an active effort to increase the share of recycled material in packaging.

The use of nanotechnology in batteries may be an environmental advantage because it can ensure longer lives and greater capacity of the batteries. Handling of the nano-material should, however, take place with care to prevent the nanoproducts from causing health risks for those who handle the batteries.

Transport of the batteries may take place in many ways, of which airplanes are the most resource consuming means of transportation per kilo battery. It is, however, for regular consumer batteries most common to transport by ship and train and truck[12].

Chargers: A study of 40 different battery chargers on the Nordic market has shown that the energy consumption of different chargers varies a lot[13], which has an influence both on the environmental impact caused by the charger itself, and also on the environmental profile of the batteries as this is related to the charger.

Manoeuvrability is assessed based on the possibility to make requirements within the relevant environmental parameters that have potential for improvement.

The consumer may gain financial and environmental benefits by choosing the right batteries with the most suitable capacity for the electronic device, leading to long and optimal lives of the batteries.

Today, good examples of information for the consumer on how each type of battery is properly used are already available. These good examples represent a model for the requirements which Nordic Ecolabelling may make to the licence-holders in order to provide their batteries with the Nordic Ecolabel. Nordic Ecolabelling is in a position

to specify requirements for this information, and the manufacturers are in a position to decide what to inform on their products.

A report from Sagentia Catella AB[14] explains that batteries on today's markets represent differences in quality, and that it is possible to make sure that only the best one-third of the batteries on the market are able to be labelled with the Nordic Ecolabel by making strict requirements for the capacity of the battery.

The knowledge of Nordic Ecolabelling on the energy consumption of battery production is currently scarce, and so is the knowledge on which unit is to be used for measuring the energy consumption of the production. Consequently, Nordic Ecolabelling has chosen not to specify absolute requirements for energy consumption in version 4 of the criteria but to require statements on the annual energy consumption of the production. Subsequently, the information gathered will be applicable for establishing absolute requirements for the energy consumption in the next version.

The differences of the ingredients and the concentrations of three substances that are hazardous to health and the environment (lead, cadmium and mercury) and arsenic in batteries vary. These substances are under governmental surveillance, because they may lead to damage to the health. For further information on this, see section 4.1.2. This is a parameter relatively easy to test for and determine for the applicant of a licence. Nordic Ecolabelling has established strict requirements for these substances, because they also represent a significant environmental parameter of batteries. In Nordic Ecolabelling, the knowledge on the consequences of a ban of a number of other metals in batteries is scarce, and consequently requirements have not been specified for other substances than the four mentioned above based on their environmental and health effects.

The consumers' handling of depleted batteries is hard for Nordic Ecolabelling to manage. The licence is given to the manufacturer or the retailer who have no control over the customers' handling of the depleted batteries. European legislation has ensured collection programmes for the proper handling of batteries in all the Nordic countries and the rest of the EU. Thus, Nordic Ecolabelling's requirements for batteries in the waste management phase are limited to deal with information given to the customer on the proper handling of depleted batteries.

The collection and recycling of cardboard and plastics for packaging is becoming more and more efficient and the quality of recycled materials is also good. Therefore, it has become easier to produce packaging from recycled materials and it is an area in which the battery manufacturers have influence on manoeuvrability. This represents a possibility to require a significant share of recycled material of the packaging. Some battery manufacturers have already taken an active part in increasing the share of recycled material in the packaging and have reached a considerable level.

To which degree nanotechnology is used in the production of batteries today is difficult to get an overview of, but continuous research on nanotechnology and the development of batteries is being processed[15]. If the success of this research is as considerable as preliminary results show, this research will be implemented in the battery production of the industry. In order to make sure that implementation of this new technology does not result in causing health problems, Nordic Ecolabelling has

chosen to specify requirements for the handling of nanomaterial in production with the consumer and in waste management.

According to the industry, it is normal to transport batteries by ship, train or truck and transportation by plain is not used for the common household batteries which these criteria address. Consequently, Nordic Ecolabelling finds that the possibility to influence the transport methods is small.

Chargers: Often, it is not the manufacturer of the rechargeable batteries that produces the charger. It is, however, expected that the battery manufacturers are in a position to place demands for the charger, if it is to be sold in packs combined with the rechargeable batteries.

The version and applicability of the criteria

Ecolabelling of rechargeable batteries version 2 of the criteria adopted in 1996 and version 3 of the criteria adopted in 2002. Version 4 of the criteria was submitted to hearing on 17 June 2010.

The Nordic market

Norway has been used as an example of the entire Nordic market. This is due to the fact that Norway has very broad information on which batteries are imported to the country, and meanwhile the country does not manufacture batteries itself, so all batteries come from import[16]. The project group has taken the stand that Norway can be considered representative of the entire consumption of batteries in the Nordic countries.

Distribution of battery types traded:

Single-use / rechargeable battery	Type of battery	Import to Norway
Single-use	Galvanic manganese dioxide elements and batteries, alkaline	1,499,460 kg
	Galvanic manganese dioxide elements and batteries, of the zinc / carbon type	44,585 kg
	Galvanic elements and batteries, of lithium	169,067 kg
	Galvanic elements and batteries, of oxides zinc	18,850 kg
	Galvanic elements and batteries, of silver oxide (in Norway defined as environmentally hazardous)	9,300 kg
	Total import of single-use batteries in Norway	**1,741,262 kg Of this, 9,300 kg environmentally hazardous**
Rechargeable	Lead accumulators, e.g. for starting piston engines (in Norway defined as environmentally hazardous)	10,739,151 kg
	Remaining lead batteries (in Norway defined as environmentally hazardous)	4,927,865 kg
	Nickel-cadmium batteries / accumulators (in Norway defined as environmentally hazardous)	202,969 kg
	Nickel-iron accumulators	3,429 kg
	Remaining rechargeable batteries	541,685 kg
	Total import of rechargeable batteries in Norway	16,415,099 kg, of this 15,869,985 kg environmentally hazardous
	TOTAL import of batteries in Norway	**18,156,361 kg**
	TOTAL import of environmentally hazardous batteries in Norway	**15,879,285 kg**

Source: Statistisk Sentralbyrå, Norge and Rebatt, Norway (statistics, Norway)
The definition of environmentally hazardous batteries follows Norway's specification hereof in their recycling system[17]

If these figures are extrapolated up to the Nordic market (presuming that Norway makes up 1/5 of the total Nordic market), it would result in the following consumption of batteries in the Nordic countries (2009):
Total consumption of single-use batteries: approx. 8,700 tons
Total consumption of rechargeable batteries: approx. 82,000 tons If Pb, NiFe and NiCd, which are not included in the requirements of Nordic Ecolabelling, are excluded; the consumption (relevant to ecolabelling) is approx. 2,700 tons of rechargeable batteries.

It should be noted that these figures do not include batteries imported to Norway/the Nordic countries as ”on board” batteries in electronic devices.

In Denmark there is one manufacturer of alkaline batteries, and in Sweden there is one manufacturer of nickel-cadmium batteries. Moreover, some Swedish businesses produce battery packs for specific products, but the cells are produced abroad.

By far the most batteries for the Nordic market come from manufacturers in the entire world. Germany provides a substantial part of batteries on the European market, but the countries of Asia, especially China, have also become significant suppliers of batteries[18].

It is difficult to obtain a complete overview of the sale of rechargeable batteries, as a large part of these batteries are sold as extras for other products, and consequently these are not included in import statistics.

Other labels

According to the EU Battery Directive (2006/66/EC) of September 6 2006, substantial tightening of battery labelling has been adopted in order to ensure that the batteries are not disposed of as common waste (the symbol ”crossed-out wheeled bin”). Furthermore, the Directive states that batteries with more than 0.0005% (ppm) mercury, 0,002% (20 ppm) cadmium and/or 0,004% (40 ppm) lead should be labelled with information on the content of these heavy metals. Moreover, the Directive bans the marketing of common consumer batteries with a content of mercury exceeding 5 ppm and cadmium exceeding 20 ppm. This way, legislation has already brought about substantial labelling of the product. The requirements of the Nordic Ecolabel for the above mentioned heavy metals are stricter than those of the directive.

Europe provides a variety of labelling schemes for batteries, focusing on the environment.

Blaue Engel provides criteria for rechargeable AlMg batteries and connected chargers. The latest version is from May 2009. Main focus of these criteria is to ensure that the batteries can be recharged at least 25 times and that the batteries may not contain substances from EU's list over hazardous substances (Annex I of directive 67/548/EEC), or which have been classified carcinogenic, mutagenic or reprotoxic (CMR). Furthermore, the content of cadmium may not exceed 10 ppm and mercury may not exceed 5 ppm. Requirements for chargers are focused on the energy consumption when finished charging.

Climatop is a Swiss CO_2 label which, based on a CO_2 balance calculation, has assessed that rechargeable batteries represent the best environmental performance for the consumer and consequently rechargeable batteries may carry this label[19].

According to the EPBA, ecolabelling of batteries in the Grenelle Envt of France and the Carbon Trust label of Great Britain also exists.

According to information from the EPBA[20] the number of labelling schemes for batteries on the European market is large, and the schemes are incoherent. Too many national or regional labelling schemes with different requirements exist and the EPBA

wants these labelling schemes to be concurred in common European labelling, or that the various labelling schemes specify the same requirements.

3 About the development / review of the criteria

Aim of the development / review
In order to ensure further improvement of the environment and to ensure reliability of the Nordic Ecolabel as an ecolabel only given to the one-third of the products on the market that has the best environmental performance, Nordic Ecolabelling aims to tighten the requirements. During the development of the criteria it turned out that new parameters not earlier in focus have significant influence on the environmental impact of the batteries. This way, the review has not only focused on tightening the current requirements but also to ensure that the relevant requirements are specified.

About this development / review of the criteria
The review of the criteria for providing batteries with the Nordic Ecolabel has been carried out as an internal project at Nordic Ecolabelling.

Dialogue with collection organisations and national battery associations has taken place in connection with studies of the market and applicable legislation.

Our licence-holders and the EPBA are regularly updated on the development of the criteria and they are used for answering questions in connection with new requirements and the tightening of requirements. During the hearing period, workshops / meetings will be held with stakeholders to ensure input for the proposed criteria.

4 Motivation behind requirements

4.1 Assessment requirements

4.1.1 Composition of the battery

Up until now, only requirements for the three heavy metals mercury, cadmium and lead, hazardous to health and the environment, have been specified. These metals are also regulated through the EU Battery Directive. Nevertheless, information from a report on the substances of depleted batteries gathered in 2007 in Århus has shown that a significant number of other metals and chemical substances are also part of the ingredients of batteries. The report states that 25 different substances have been tested, some of which are known as having impact on the environment and health. This applies to e.g. chromium, cobalt and arsenic classified as poisonous / hazardous to health and the environment[21]. Practically all 25 substances tested for were found in large or small quantities in the tested batteries[22].

The report groups batteries into 5 main groups, where pyrolusite and alkaline batteries are in one, and button cells are not specified in types. Thus, it is not directly possible

to specify specific requirements for individual substances in the individual batteries through the information given in this report.

Detailed information on substances in the various types of batteries can be found on data sheets on the websites of manufacturers[23] together with official information from the battery industry stating substances that appear in large amounts (above 1 %) or that are regulated by legislation[24].

There is a substantial need for requirements for maximum concentrations of chemical substances or metals which are known as hazardous to health or the environment, or which are a limited resource. The current data basis to specify such requirements is fragile, especially because Nordic Ecolabelling does not know the consequences of a ban or limitation when taking account of e.g. quality. Thus, Nordic Ecolabelling chooses instead to specify a requirement for consumer information on ingredients, which in a future version can be used for assessing the usefulness and hazards of the substances, and to what extent substitution may result in a better environmental performance.

The requirement is:

Composition of the battery

The applicant is to submit a list of all the substances (metals, other solid substances and liquid chemical substances) contained in the battery. The list must contain chemical appellation, concentration (in ppm or weight percentage) and a description of the purpose of the substance.

”Contained” means all substances in the product including additives in ingredients. Contaminants are, however, not included. Contaminants are residue from the production of raw materials that are contained in the product in concentrations below 100 ppm of the completed battery, and which are not actively added to a raw material or the battery itself with a purpose.

✉ Description of the composition of the battery according to the description of the criteria for each type of battery submitted for application.

4.1.2 Energy consumption of the production

In a study from Climatop on the CO_2 balance of a variety of batteries[25] it appears that the energy consumption related to the production of rechargeable batteries constitutes a substantial part of the total CO_2 balance of the battery. Consequently, it is highly relevant to make requirements for the energy consumption in the production of rechargeable batteries.

The most energy consuming part of battery production is the extraction and processing of raw materials for the batteries.[26]

Currently, it remains uncertain to Nordic Ecolabelling whether differences exist between the individual battery manufacturers or types of batteries and the energy consumption that the production requires. It is very likely that the impact on the climate from the production of batteries varies between different manufacturers and

battery types - not only due to the difference of production methods or varying suppliers of raw materials, but also due to the source of energy applied.

Nordic Ecolabelling is aware that the various ways of production in different parts of the world have different influences on the energy consumption of the production. Where in the EU and the US, machines are mainly used for most of the work, some places in the world it is to a larger degree still carried out manually. Manual productions directly constitute a lower energy consumption, but the consequence may be a larger risk of damage to the health of workers and the spread of substances in the immediate environment of those factories that are characterised by more manual work. This will also be taken into account in connection with the assessment of requirements for energy consumption. For more information, see also section 4.1.11.

The knowledge of Nordic Ecolabelling on the energy consumption of battery production is scarce. Consequently, Nordic Ecolabelling has chosen not to specify absolute requirements for energy consumption in version 4 of the criteria but to require statements on the annual energy consumption of the production. The information gathered will be applicable for establishing requirements for the energy consumption in the next version.

The requirement is:

Energy consumption of the production

A statement of the total energy consumption (in kWh) related to the total amount of batteries produced per year must be sent to Nordic Ecolabelling. The statement must include the energy consumption by extraction and processing of raw materials NORWEGIAN: Metals and other chemicals together with the energy consumed at the battery production site.

Moreover, the applicant is to submit information on the energy source(s) (coal, oil, wind, solar …..) used for the production.

✉ Statement of energy consumed (in kWh) per kilo produced battery and the type of energy source used.

4.2 Environmental requirements

4.2.1 Metal content of batteries

Nordic Ecolabelling has chosen to specify strict requirements for three heavy metals in batteries which are known to constitute a substantial problem for the environment. These metals are:

Mercury, which is highly hazardous to health and the environment, accumulates in the body and is extremely volatile.

Cadmium, which accumulates in the human body, especially the kidneys, and which is known as hazardous to health and the environment and in certain connections it can be carcinogenic, mutagenic or reprotoxic (CMR).

Lead, which is known as reprotoxic, environmentally hazardous and having a negative influence on the nervous system[27].

Arsenic, which may appear in large quantities in rechargeable batteries[28]. Arsenic has been classified as poisonous (R23/R25) and environmentally hazardous (R50/53).

The EU Battery Directive (2006/66/EC) of September 6 2006 specifies requirements for the labelling of batteries, if these contain one or more of the three metals: mercury (maximum 5 ppm), cadmium (maximum 20 ppm) and lead (maximum 40 ppm). Moreover, the Directive bans the marketing of common consumer batteries with a content of mercury exceeding 5 ppm and cadmium exceeding 20 ppm. By introducing these levels, legislation has ensured that higher levels of these three heavy metals are not added with a purpose to the portable batteries today. Contaminants may, however, occur. Already in version 3 of the criteria, Nordic Ecolabelling chose to specify stricter requirements for these metals than the governmental requirements in order to make sure that only the best performing substances with low concentrations of contaminants of the above mentioned metals may be used in batteries provided with the Nordic Ecolabel.

In version 4 of the criteria, Nordic Ecolabelling has chosen to split up the prior requirement of a total concentration of arsenic, lead and cadmium not exceeding 20 ppm. Thus, such a requirement no longer exists. Now, there is a specific limit value for each of these substances in order to ensure the lowest concentrations possible of these three substances and a co-ordination with the EU Battery Directive. Nordic Ecolabelling does, however, specify requirements that are significantly stricter for the three heavy metals and arsenic.

The requirement contains reference to a method of testing the content of these metals, which has been developed for AlMg batteries. Nordic Ecolabelling is aware that other types of batteries may be submitted for application for the Nordic Ecolabel for rechargeable batteries. Nevertheless, no other test methods exist than the one that has been developed for AlMg and today this test method is commonly used for other battery types as well[29].

The requirement is:

Metal content of batteries

The metal content of a battery may not exceed the following limit values:

Metal	Content
Mercury	≤ 0,1 ppm
Cadmium	≤ 5,0 ppm
Lead	≤ 10 ppm
Arsenic	< 5,0 ppm

Note that the requirement of the EU Battery Directive 2006/66/EC for cadmium is maximum 20 ppm and for mercury maximum 5 ppm. To test batteries for a mercury content of < 0.1 ppm may require special equipment at the test laboratory.

At least four examples of relevant products must be analysed, and all four of them must fulfil the requirement. For application purposes, the test result indicated by <, i.e. ”less than”, will be interpreted as =, i.e. "equals".

The metal content is analysed according to “the Battery Industry Standard Analytical Method. For the determination of Mercury, Cadmium and Lead in Alkaline Manganese Cells Using AAS, ICP-AES and ”Cold Vapour”. The European Portable Battery Association (EPBA), the Battery Association of Japan (BAJ), the National Electrical Manufactures Association (NEMA; USA). April 1998”.

Similar test methods can be approved if they have been assessed by a third party as equal to the recommended method in this document.

☒ Report from a test laboratory showing the metal content of the batteries.

☒ Statement showing that the test laboratory is independent and meets the common requirements for test laboratories described below in ”requirements for test laboratories”.

4.2.2 Nanotechnology in batteries

Any uncontrolled use of nanoparticles due to a lack of knowledge on environmental and health impacts from the production, use and waste management of nanoparticles concerns Nordic Ecolabelling. Nevertheless, it has been proposed to permit nanoparticles in battery anodes due to the following line of reasoning:

Interdisciplinary Nanoscience Center at the University of Århus has informed that Stanford University has developed rechargeable batteries which can hold 10 times the amount of electricity than that of normal lithium batteries[30]. This is considered revolutionary progress and seen in an environmental aspect it means that the batteries will have much longer lives and thereby contribute to less consumption of resources.

The European Agency for Safety and Health at Work (EN2) has in the report ”Workplace exposure to nanoparticles” claimed that there are guidelines for the handling of nanoparticles in workplaces, but that these need to be tailored for the individual production sites.

Based on the general lack of knowledge on the health and environmental effects of nanoparticles, Nordic Ecolabelling follows a precautionary principle and chooses to make the following requirements for nanoparticles in rechargeable batteries: Information on the names and sizes of the nanoparticles, handling procedures of the nanoparticles during the production of batteries and during waste management.

Nanoparticles are covered by REACH, and the EU plans a duty to disclose all material facts on nanoparticles in the product register of the member states. The Norwegian product register (a central register of chemical substances and products imported to and produced in Norway) already has a reporting form in place for marking off whether the substance / product is or contains nanoparticles. In the meantime, they have informed (April 2010) that batteries do not fall under the requirement of registration in the product register. It is possible that this will change along the life of the reviewed battery criteria. Therefore, it has been proposed in the new criteria to impose a requirement to report to relevant Nordic product registers.

The requirements are:

Nanotechnology

Nanoparticles in batteries are only allowed in anodes in order to increase the energy efficiency of the batteries.

✉ A statement from the applicant claiming either: that nanotechnology has not been used in the batteries, or: that nanotechnology is only used in anodes for increasing the energy efficiency of the batteries.

Appendix 4 can be used.

Nanoparticles, duty to disclose all material information

When using nanoparticles in the batteries, the manufacturer is to inform on the chemical appellation and size of the nanoparticles. The manufacturer must also show that the nanoparticles have been reported to the relevant national Nordic product registers in the countries where the batteries are to be sold. In the Nordic countries, these are:

Norway: www.produktregistreret.no

Sweden: www.kemi.se

Denmark: www.at.dk

Finland: www.sttv.fi

Iceland: www.ver.is

✉ The manufacturer is to submit information on the chemical appellation and size of the nanoparticles. A confirmation of registration of the batteries containing nanoparticles in the national product registers of the Nordic countries in which the batteries are sold.

Handling of nanoparticles during the production of batteries

When using nanoparticles in batteries, employees must be safeguarded against exposure to the nanoparticles during the production of the batteries and by internal waste management of the nanoparticles and the batteries.

☒ Description of actions that safeguard the employees against exposure to nanoparticles. Description of how waste and spills of nanoparticles are sorted and handled.

Information on the handling of depleted batteries containing nanoparticles

The manufacturer must disclose how battery recycling businesses are to handle batteries containing nanoparticles. This information must especially focus on measures to avoid that employees are exposed to nanoparticles."Disclose" means to publish information on internet websites and similar measures.

☒ Copy of information for battery recycling businesses on the proper handling of batteries containing nanoparticles. Moreover, a description of the accessibility of this information for recycling and waste management businesses.

4.2.3 Requirements for plastics in battery chargers

As to chlorinated plastics, environmental problems mainly arise during the production and waste management hereof[31] [32]. The chlorine production also leads to waste containing e.g. dioxins, heavy metals and hexachlorobenzene. The EU Commission has in the Green Paper "Environmental issues on PVS" ordered four studies to assess the technical aspects of alternatives to waste management of PVC - mechanical recycling, chemical recycling, combustion and waste deposit. First priority is the prevention of waste formation. Furthermore, the Commission prefers material recycling to energy recycling.

The combustion of PVC may take place in combustion stoves and at unintended fires at waste deposits. Apart from hydrochloric acid, which is generated during combustion containing chlorine, small amounts of organic chlorine compounds are also generated, e.g. benzene and phenol, furan, PBC and polychlorinated naphthalene. The contaminants are numerous, and the knowledge hereof is relatively limited. If technology and safety on a production plant work properly, the PVC Information Council in Denmark considers[33] that the most considerable part but not all of the emission of dioxin is retained.

Stabilising chemicals are added to chlorinated plastics for the plastics to withstand the temperature necessary for manufacturing the product. The stabilisers can be based on lead, metal mixtures (such as barium zinc and calcium zinc), tin or cadmium[34]. See section 4.1.2 for environmental and health problems of lead and cadmium. In Europe, the industry has phased out the use of cadmium since 2001[35] and the industry has come far in the phasing out of the use of lead, especially in the Nordic countries, where the use of lead in PVC has been completely phased out[36]. The chargers for batteries are, nevertheless, not only produced in the Nordic countries or in Europe, but to a large degree also in Asia, where the phasing out of these metals has not come this far. Consequently, it is highly relevant to demand a ban against cadmium and lead in plastics.

Chloride paraffin are added to some plastics, among others for the purpose of acting as flame retardants or plasticisers. Chloride paraffin are hard to degrade and they are

bio-accumulative. Consequently, Nordic Ecolabelling does not want to permit these substances in the plastics of chargers for rechargeable batteries that carry the Nordic Ecolabel.

Flame retardants are necessary to make sure that the plastics of electrical products do not ignite when these are heated by the supplied current. This also applies to chargers. When flame retardants are heated during use of the chargers, degasification may occur. As a consequence, Nordic Ecolabelling wants to make sure that these flame retardants are not ones that are classified as carcinogenic, reprotoxic or mutagenic in order to decrease the risk for the consumer when charging the batteries.

Halogenated flame retardants involve substances hazardous to health and the environment, which are very poisonous to organisms in water, carcinogenic or harmful to health in others ways. The halogenated flame retardants are difficult to degrade in the environment, thereby increasing the risk of hazardous effects from the substances. Consequently, Nordic Ecolabelling has specified a requirement stating that halogenated flame retardants may not occur in rechargeable batteries that carry the Nordic Ecolabel[37].

The requirement is:

Requirements for plastics in battery chargers

If the rechargeable batteries are sold together with a charger, the plastics used in the charger must meet the following requirements:

- The plastics of the charger case must be labelled according to ISO 11469.
- The plastics of the case may not be chlorinated plastics.
- Cadmium and lead must not have been added actively to the plastics of the case and of any cables.
- Chloride paraffin must not have been added actively to the plastics of the case and of any cables.
- Halogenated flame retardants must not be added to the plastics of the case and of cables and neither must flame retardants classified as carcinogenic, mutagenic or reprotoxic according to EU chemicals legislation.

✉ Documentation showing that the labelling of the case complies with ISO 11469.

✉ The manufacturer of the charger must make a declaration that the requirements for plastics in the battery charger are met (appendix 3).

✉ Safety data sheet for flame retardants of case and cables.

The safety data sheet must comply with annex II of REACH (Regulation 1907/2006/EC).

4.2.4 Charger - Types of battery

In order to ensure that the consumers do not have to buy as many chargers as they have batteries and thereby increase the environmental impact of the increased production of chargers, Nordic Ecolabelling wants for the chargers sold together with ecolabelled rechargeable batteries to be able to operate with several types of batteries.

The requirement is:

Charger - Types of battery

If the rechargeable batteries are sold together with a charger, the charger must be applicable with at least 3 types of batteries.

✉ The manufacturer of the charger must make a declaration that the charger operates with at least 3 types of batteries (appendix 3). Description/documentation of the charger confirming this must be enclosed.

4.2.5 Packaging – chlorinated plastics

Combustion of PVC waste has shown to have a number of unwanted environmental effects. By the combustion of PVC acid is formed which is subsequently neutralised by adding limestone. When using dry or semi-dry flue gas cleaning systems, the amount of flue gas waste formed is larger than the amount introduced (1 kg PVC creates around 2 kg of waste products from dry/semi-dry cleaning). The waste from flue gas cleaning processes must be deposited in special waste deposits. Deposits of PVC waste are not an environmentally sustainable solution, as they both constitute a loss of resources and various unintended environmental effects[38]. For more information on the environmental impact of PVC and chlorinated plastics, please see section 4.2.4.

If PVC or any other chlorinated plastics are used for packaging, the risk that this packaging will be sent to combustion with regular household waste is significant, and consequently it constitutes an unnecessary environmental impact.

The use of PVC in packaging is very small. In order to make sure that PVC packaging will not occur in ecolabelled batteries, the requirement is specified.

The requirement is:

Packaging – chlorinated plastics

PVC or other chlorinated plastics must not be used in packaging.

✉ Description of types of packaging - both primary and secondary. Declaration that PVC or other chlorinated plastics have not been used in the packaging (See appendix 2).

4.2.6 Primary packaging – recycled material

The annual use of primary packaging for batteries – especially cardboard and PET – in Europe is expected to be more than 8000 tons (more than 5000 tons of cardboard and more than 3000 tons of PET)[39].
By increasing the share of recycled cardboard and plastics in the packaging, the consumption of resources related to the batteries is reduced. Moreover, 30 % of the consumption of resources is saved by using recycled plastics in packaging[40]. In many ways, it is worthwhile to prioritise lower resource consumption. Nordic Ecolabelling has looked at the share of recycled material in the packaging of a manufacturer that

has worked with the aim of reducing resource consumption for packaging and on the basis of this we have estimated that 80 % of post-consumer recycled material in the packaging is an ambitious but achievable level.

The requirement is:

Primary packaging – share of recycled material

The share of post-consumer recycled material of primary packaging for batteries must constitute at least 80 weight percent.

✉ Documentation from the supplier of packaging, showing the share of post-consumer recycled material in their product.

✉ Statement showing that the share of post-consumer recycled material of the primary packaging constitutes more than 80 weight percent.

4.2.7 Recycling system for packaging

In this version of the criteria, Nordic Ecolabelling has chosen not to require documentation for the recycling system for the batteries. Collection of batteries and requirements of efficient recycling systems and taxes for these from the manufacturers are regulated through the EU Battery Directive (2006/66/EC) of September 6 2006 and are under strict control by the public authorities of the Nordic countries.

On the contrary, the possibilities of a more efficient collection of packaging are large – also concerning batteries. Organisations in the Nordic countries ensure that packaging is collected more efficiently, and Nordic Ecolabelling wants this environmental consideration to concern batteries too.

The requirement is:

Recycling system for packaging

Applicable national rules, regulations and / or industrial agreements regarding recycling systems for packaging must be fulfilled in those Nordic countries where the ecolabelled products are marketed. The following systems are available in the Nordic countries:

Norway: www.grontpunkt.no

Sweden: www.repa.se

Finland: www.pyr.fi

Denmark: Not applicable

Iceland: Not applicable

✉ Copy of agreement and / or copy of invoice for the recycling system applicable to the used packaging.

4.2.8 Information for the consumer

Studies made in the battery industry[41] show that extensive environmental impact arises from batteries that are used in a wrong way, e.g. if batteries of a low capacity are used for devices that are highly energy consuming, the batteries will be more easily discharged. This way, the life or serviceability of the battery is reduced, which means that the consumer often changes the battery, thereby increasing battery consumption.

In order to ensure longer lives of the batteries, it is essential to ensure clear information to the end-user on what exactly the individual type of battery is optimal for, and which types of applications they are unsuitable for. Today, the level of the information intended for the customers on battery packaging varies, and consequently there is a large potential for making requirements for the information provided to the customer.

Good examples of information for the consumer already exist, explaining how each type of battery is used correctly. The requirements of Nordic Ecolabelling regarding such information are based on these good examples. The manufacturers are in control of what is displayed on their products which makes manoeuvrability good.

Information on primary packaging for the consumer

On primary packaging it must be clear, which type of device the batteries are recommended for in order to obtain the optimal utilisation of the battery. This information must contain:

1. Information on whether the batteries are suited for devices with high, medium or low energy drainage.
2. Information on whether the batteries are suited for intensive, regular or periodic use within the above mentioned levels of energy consumption.
3. At least two pictograms with examples of types of energy consuming devices which the batteries are suited for.
4. At least two pictograms with examples of types of energy consuming devices which the batteries are not suited for. Crossing out of these pictograms must be clear.

✉ Example on the packaging where it is clear that the requirement is met.

4.2.9 Information on the battery for the consumer

The EU Battery Directive (2006/66/EC) requires that rechargeable batteries are to be marked with capacity indicated in mAh (milliamp ere per hour). The report from Sagentia Catella AB[42] does, however, remark that some examples show that this label ”drowns” in other numeric values given on the battery which may be misinterpreted as indication of the capacity. By making requirements for clear indication of the capacity of a battery, Nordic Ecolabelling ensures better information for the

consumers so that they are in a good position to buy the right type of battery suited for their needs.

The requirement is:

Information on the battery for the consumer

The capacity of the battery must be clearly indicated according to the requirements of the EU Battery Directive (2006/66/EC).

"Clearly indicated" means that the indication of capacity must be indicated by unit (mAh) and other numeric indications on the battery must not cause the consumer to confuse this with the indication of capacity.

✉ Example of information on the battery.

4.2.10 Labour practices

In some parts of the world, the production of batteries constitutes a lot of manual work involving several hundreds of workers who assemble the batteries. As some of the ingredients are highly hazardous to health and are handled manually, labour practices related hereto must be very good in order to safeguard against work-related permanent damage to the health of the workers. In addition, companies with a large share of manual work are often situated in countries where labour practices and freedom of speech are poor/limited. There are examples of strike among factory workers who produce batteries and who have been exposed to high concentrations of poisonous substances and in addition to this live subject to other poor labour practices[43].

It is important to Nordic Ecolabelling that products provided with the Nordic Ecolabel are not only the choice with the best environmental performance but that labour practices of people producing the products are also good. As a consequence, Nordic Ecolabelling has in this version of the criteria for batteries chosen to make requirements for labour practices.

The requirement is:

Labour practices

The licence-holder must have a "code of conduct" which specifies requirements for the licence-holder and their subcontractors to follow the ten principles of the UN's Global Compact.

If the licence-holder or their subcontractors or manufacturers breach this code of conduct, Nordic Ecolabelling may withdraw the licence.

Note: The UN Global Compact takes, among others, the following subjects into account: Human rights, workers rights, environmental protection and corruption. For more information go to http://www.unglobalcompact.org

✉ A Copy of the licence-holder's Code of Conduct. Description of how subcontractors and manufacturers are made aware of this Code of Conduct. Description of how the licence-holder follows up on whether the subcontractors and manufacturers adhere to this "Code of Conduct".

4.2.11 Quality of rechargeable batteries

Nordic Ecolabelling has estimated that the most significant parameter for the environmental impact of batteries is excessive consumption of batteries. The less batteries consumed, the smaller is the environmental impact from batteries. Consequently, it is essential to make sure that ecolabels are only given to the rechargeable batteries of the highest quality with regard to the number of times they can be charged, and the capacity they can reach after several recharges.

In 2008, Nordic Ecolabelling had Sagentia Catella[44] make a study of the level of the working time of batteries today. Based on Sagentia's experience with testing the quality of batteries, the work consisted in specifying the level of requirements for batteries so that only the one third best part of the batteries on today's market will meet the requirement. Furthermore, they have examined whether the referenced standards were updated. Sagentia Catella's proposal for levels of requirements and their formulation were prepared in regard to the product group definition of version 3 of the criteria for rechargeable batteries. Since the proposed new product group definition opens up for a variety of other types of rechargeable batteries, Nordic Ecolabelling found it necessary to further study whether the requirement level should be changed. By dialogue with the licence-holder, Nordic Ecolabelling has chosen a stricter requirement level for battery endurance than that proposed by Sagentia Catella. Formulation of the requirements is in line with the proposal of the report. In spring 2010, experts of Sagentia Catella, now Interteck, did, however, propose some modification of the test formulation to ensure that the test includes more types of batteries, according to which Nordic Ecolabelling modified the requirement.

The requirement is:

Quality of rechargeable batteries

The performance evaluation procedure is carried out using two test methods: Examination of the initial capacity and cycle life endurance. Examination of initial capacity is made to ensure that the cells / batteries have a capacity corresponding to the actual discharge capacity of fresh cells / batteries. The cycle life endurance test is made to ensure that the cells / batteries can perform a reasonable number of charge / discharge cycles at an acceptable performance level.

Both a test of capacity and a test of cycle life endurance must be made.

Each test includes at least 4 batteries per size and brand.

C is the maximum rated capacity of the battery and is indicated on the battery in mAh. The highest capacity value indicated on the cell is applied in the test.

The test begins with discharging until the end voltage C/5 current (residual discharge).

Initial capacity test:

All tested batteries must meet the following requirements:

- **At least one of the 5 cycles carried out in the test must have a discharge time of at least 5 hours**

The capacity test is carried out according to table 1 below.

The rest period between charging / discharging and discharging / charging has been set to 1 hour.

Table 1

Cycle no.	Charging	Discharging
1-5	According to manufacturer's recommendations	0,2C to end voltage[1]

[1]*The end voltage varies with different chemical compositions. Typical end voltage of conventional Li-ion/LiP cells is 3V/cell and 1V/cell for NiMH.*

Nickel metal hydride (NiMH) batteries and cells:

At the time of application, the conditions of the capacity test must be in accordance with the applicable version of IEC 61951-2 for NiMH cells and batteries.

Li-ion/LiP batteries and cells:

At the time of application, the conditions of the capacity test must be in accordance with the applicable version of IEC 61960 for Li-ion/LiP cells and batteries.

Other types of batteries and cells than Li-ion/LiP or NiMH batteries and cells:

The conditions of the capacity test must be in accordance with applicable standards for the batteries in question. The independent test laboratory carrying out the test must evaluate in writing the standard applicable to the type of battery in question.

Cycle life endurance test:

All tested batteries must meet the following requirements:

- **The discharge duration of cycle 799 must be at least 30 minutes (corresponding to 50 % remaining capacity)**
- **Discharge duration for cycle 800 must be at least 3,5 hours (corresponding to 70 % remaining capacity)**

Specifications for the test are available in table 2

Table 2

Cycle no.	Charge	Rest in charged state	Discharge	Rest in discharged state
1-799	According to recommendations of the retailer	30 minutes	1,0C to end voltage[1]	30 minutes
800	According to recommendations of the retailer	1 hour	0,2C to end voltage[1]	

[1]*The end voltage varies with different chemical compositions. Typical end voltage of conventional Li-ion/LiP cells is 3V/cell and 1V/cell for NiMH.*

- ✉ The result of the test according to definition in the requirement, carried out by an independent test laboratory.
- ✉ Statement from the test laboratory showing that the batteries have been tested in accordance with the version of the standard referenced in the requirement which was applicable at the time of application.
- ✉ Statement showing that the test laboratory is independent and meets common requirements for test laboratories described in the section ”Test laboratories”.

4.2.12 Quality - charger

The charger: The charger is an extra product for the main product, which constitutes the rechargeable batteries. The battery manufacturers purchase chargers from subcontractors, and thus the manufacturers have less manoeuvrability, control or overview of the composition of the charger. The difference of the quality of chargers is significant and consequently of how much electricity a charger uses and of how much they "wear" the batteries when charging them[45].

A study of 40 different battery chargers on the Nordic market shows a significant variation of the energy consumption of different chargers, which has an influence both on the environmental impact of the charger but also on the environmental profile of the rechargeable batteries since this is connected with the charger.

Often, it is not the manufacturer of the rechargeable batteries that produce the charger. It is, however, expected that the battery manufacturers are in a position to place demands for the charger, if it is to be sold in packs combined with the rechargeable batteries.

The requirement is:

Quality - charger

If the rechargeable batteries are sold in combination with a charger, the charger must meet the following requirements:

Test of the charger:

C = The maximum capacity (in mAh) indicated on the batteries with which the charger is sold.

Reference charge has been defined as a constant current charging with 1C, cut off at $-\Delta V = 5$ mV/cell.

Discharging to the cut off requirement 1 V/cell

The rest period has been set to 20 minutes between each cycle of charging / discharging and discharging / charging.

Conditions for the battery and determination of charged capacity at 7 cycles:

Cycle 1	Residual discharge	C/5
Cycle 2-5	Conditioning	1C
Cycle 6	Determination of reference charge	1C

Cycle 7 Charge the battery in the charger

Cycles 1-6 should be carried out in equipment for testing rechargeable batteries

The charging phase should be recorded in cycles 6 and 7 in order to determine the charged capacity in the reference charger and in the tested charger.

After cycle 7, the average float charge current and no-load current should be measured.

The measurement must give the following result:

- The charger must have a built-in function that interrupts charging when the battery is fully charged. Fully charged is defined as reference charge with cut-off of at $-\Delta V = 5$ mV $\pm$ 10%.
- The maximum float charge current must be $\leq$ C/20 on an average, based on the lowest battery capacity for which the charger is recommended by the retailer.
- The maximum no-load current must be < C/50 on an average, based on the lowest battery capacity for which the charger is recommended by the retailer.

✉ The result of the test according to definition of the requirement, carried out by an independent test laboratory.

✉ Statement showing that the test laboratory is independent and meets common requirements for test laboratories described in the section ”Test laboratories”.

4.2.13 Quality and governmental requirements

In order to ensure that the product at any time during the life of the license meets the requirements of the Nordic Ecoabel, Nordic Ecolabelling has specified demands for quality procedures of the licence-holder and any subcontractors. Furthermore, Nordic Ecolabelling requires that the licence-holder cannot have an outstanding with any governmental authorities to ensure that the Nordic Ecolabel is only provided to companies that are not infringing laws in any way.

The requirements are:

Person in charge of the Nordic Ecolabel

An employee at the company must be in charge of ensuring that the requirements of the Nordic Ecolabel are met and there must be a contact person who is connected with Nordic Ecolabelling.

✉ An organisational chart showing the employees in charge of the above mentioned areas

Documentation

The licence-holder must present a copy of the application including facts and calculation material (including test reports, documents from subcontractors etc.) supporting the documentation submitted in connection with the application.

☺ Checked on site.

Quality of the rechargeable battery

The licence-holder must guarantee that the quality of the rechargeable batteries carrying the Nordic Ecolabel will not deteriorate during the life of the license.

✉ Routines of handling complaints / claims regarding the quality of the rechargeable batteries carrying the Nordic Ecolabel, when necessary.

Planned changes

Nordic Ecolabelling must be informed in writing of any planned changes that have an influence on the Swan requirements.

✉ Routines showing how planned changes are handled.

Unforeseen nonconformities

Unforeseen nonconformities influencing the Nordic Ecolabel requirements must be journalised and reported to Nordic Ecolabelling in writing.

✉ Routines showing how unforeseen nonconformities are handled.

Traceability

The licence-holder must be able to trace the rechargeable battery carrying the Nordic Ecolabel in the production.

✉ Description of / routines for fulfilling the requirement.

Rules and regulations

The licence-holder must make sure that applicable regulations of safety and working environment, environmental laws and facility-specific terms/concessions are followed at all production sites of the product carrying the Nordic Ecolabel.

✉ Documentation stating that the requirement is met and defining the supervising authority. Appendix 5 must be filled in and submitted to Nordic Ecolabelling.

Marketing

Marketing of rechargeable batteries carrying the Nordic Ecolabel must take place according to Rules on Nordic Ecolabelling of December 12 December 2001 or later versions.

If the rechargeable batteries labelled with the Nordic Ecolabel are sold together with a charger, it must be clear to the consumer that only the batteries are labelled with the Nordic Ecolabel and not the charger, e.g. by placing the Swan Logo and caption on the packaging.

✉ A completed appendix 1

✉ In case the batteries which carry the Nordic Ecolabel are sold together with a charger, an example of the packaging must be submitted, making it clear that only the batteries are labelled with the Nordic Ecolabel and not the charger.

5 Amendments of earlier version

- The product group definition has been made broader and has been aligned with the definition of the EU Battery Directive.
- It is no longer possible to provide a charger with the Nordic Ecolabel through these criteria. Chargers must, however, fulfil these requirements in order to be sold together with rechargeable batteries that carry the Nordic Ecolabel.
- Requirements on information on the composition of the battery have been introduced.
- Requirement for the metal content of batteries has been rephrased so that each of the 4 metals have their own requirement level.
- Requirements for information on the energy consumption of the production have been introduced.
- Requirements for the handling of and information on applied nanotechnology have been introduced.
- Requirements for plastics in chargers have been updated.
- Requirements for a large share of recycled material of packaging have been introduced.
- Requirements for collection schemes for the batteries have been removed.
- Requirements for information for the consumer have been tightened.
- Requirements for labour practices of the production have been introduced.
- Quality requirements for the rechargeable batteries have been tightened and rephrased.
- Quality requirements for the charger have been tightened and rephrased.
- Quality and governmental requirements have been updated according to Nordic Ecolabelling's template for this.

6 New criteria

The possibility to specify further requirements for the ingredients – especially heavy metals - in rechargeable batteries should be evaluated.

The possibility of specifying absolute requirements for the energy consumption of the production of batteries should be evaluated.

7 References

Literature and studies carried out:
Annika Ahlberg Tidblad, Sagentia Catella, July 11 2008, "Nordic ecolabelling criteria for rechargable batteries"

Carl Johan Rydh, 2001 "Environmental Assessment of Battery Systems in Life Cycle Management"

Lotte Fjelsted, Department of Environmental Engineering, Technical University of Denmark July 16 2007, annexed report 6: Analyse af batterier fra husholdninger i Århus Kommune" (analysis of batteries from households in the Municipality of Århus, Denmark).

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Life Cycle Assessment of PVC and of principal competing materials, EU Commission 2004

Persons who have been contacted:
Hans Craen
Pascal Franchet from Energizer Group France and EPBA, January 2010
Rebatt, Norge nett and conversation with Terje Juliussen

Websites and URL addresses
http://www.climatop.ch/index.php?l=d&p=products
www.batteri.dk
Statistisk Sentralbyrå, Norway www.ssb.no
http://www.affaldsinfo.dk/Affaldsh%c3%a5ndtering/Fraktioner/PVC
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http://goodelectronics.org/news-en/chinese-battery-producer-fails-to-be-a-decent-employer/
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