EPBA SUSTAINABILITY REPORT 2010

Looking back, looking ahead

Past achievements, ongoing efforts and future perspectives of the European portable battery industry

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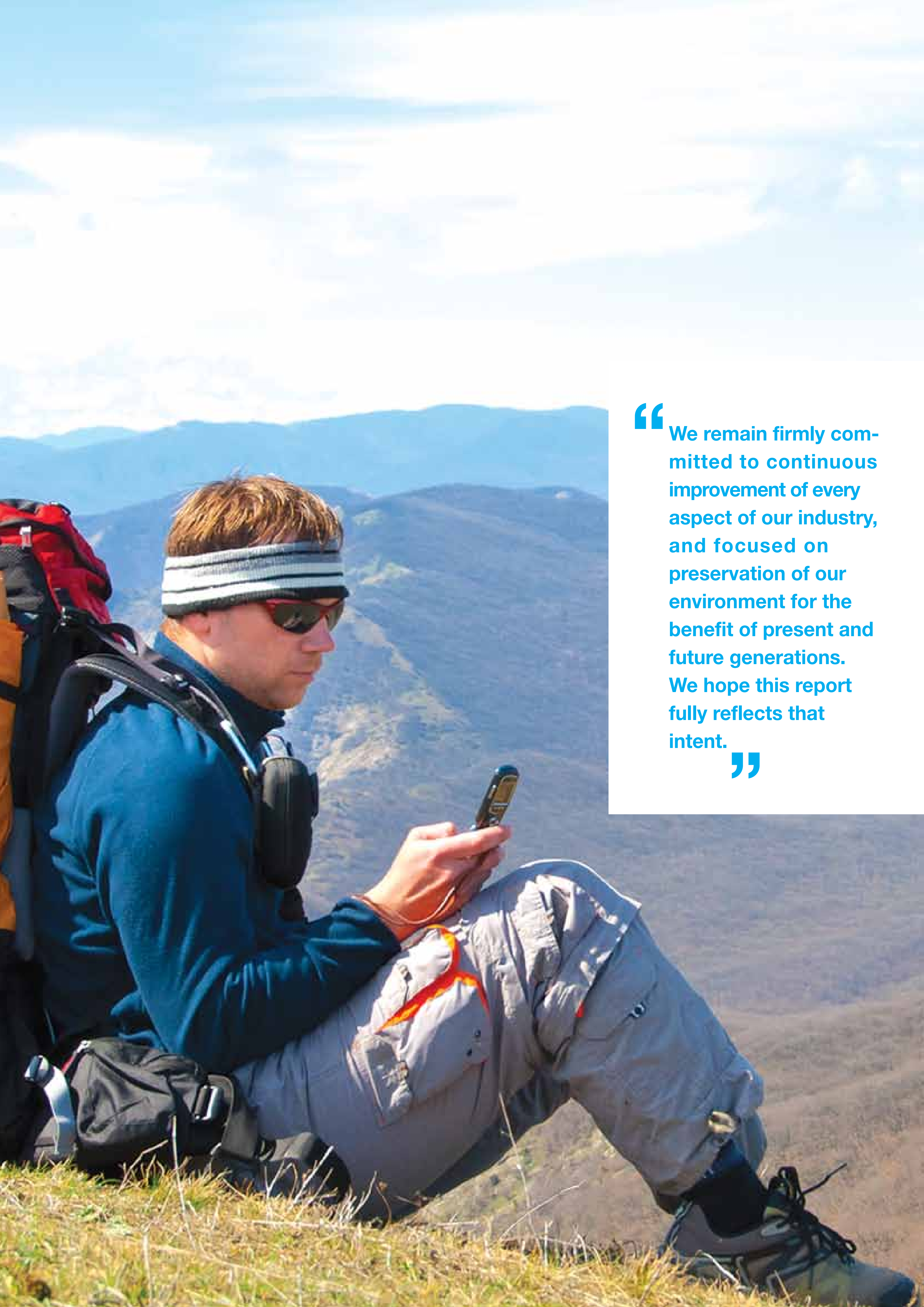


“We remain firmly committed to continuous improvement of every aspect of our industry, and focused on preservation of our environment for the benefit of present and future generations. We hope this report fully reflects that intent.”

2. Foreword by the **EPBA Chairman**

I am delighted to present to you EPBA's first ever sustainability report. Our aim was to provide a clear and comprehensive account of the position of the portable power industry in the light of past objectives and achievements, ongoing challenges and endeavours, and future goals and perspectives.

Sustainability, in its purest sense, is the capacity to endure, but the concept is so broad it often defies definition, or is used in such a way as to become no more than a meaningless buzzword. However, the most widely cited and commonly accepted definition describes it as the ability to meet the needs of the present, without compromising the ability of future generations to meet their needs. And it is from this starting point that we proceed.

In 2010, EPBA launched its strategic plan for 2010-2012, listing sustainability as one of its three key priorities, underlining its importance for our industry. Indeed, sustainability has moved to the top of the agenda for all EPBA members in recent years, and has become both a guiding principle and a driving force.

On the other hand, we have noted a surge in policy considerations at national, European and global level, propelled by and centred on issues of sustainable development and environmental preservation. While EPBA welcomes such initiatives, it is vital they do not result in an increasingly fragmented policy framework.

We are proud of what we have achieved to date, but realise a lot of work still needs to be done. We are nevertheless ready to rise to the challenge, as we have always done in the past. To this end, we look forward to engaging in constructive and productive collaboration with relevant authorities, consumer organisations and all stakeholders of the portable power industry.

We remain firmly committed to continuous improvement of every aspect of our industry, and focused on preservation of our environment for the benefit of present and future generations. We hope this report fully reflects that intent.

Patrick Hedouin
Chairman of the Board of EPBA

3. Executive Summary

Back in 1985, EPBA members launched an important and wholly voluntary initiative to remove mercury from alkaline and zinc batteries

The European Portable Battery Association (EPBA), formerly known as Europile, is the leading organisation representing the interests of the portable battery industry in Europe. Based in Brussels since 1997, EPBA members have made significant progress in recent years in terms of reducing the environmental impact of its products and raising awareness of different aspects of battery use. In the light of growing ecological concerns and an ever increasing emphasis on sustainable development in all domains, we felt it was now time for us to publish our first sustainability report to highlight our achievements over the past 20 years and share our vision for the future.

With over 5 billion batteries placed on the European market by EPBA members in 2009, it is fair to say that demand for our products is considerable, as is the responsibility it inevitably entails. This is something we have always taken very seriously, as reflected in our actions over the years. Indeed, back in 1985, EPBA members launched an important and wholly voluntary initiative to remove mercury from alkaline and zinc batteries, a programme that was successfully completed in 1994, six years before relevant legislation came into force. Another of our objectives involved substitution of mercuric oxide batteries with specially developed new battery chemistries, which also resulted in a major fall in mercury levels in Europe. Thanks to further technological breakthroughs, we are now able to pledge that 95% of button cells on the market will be mercury-free by July 2011, which, by our estimates, will avoid the need to use some 1890 kg of mercury yearly.

Another of our objectives involved substitution of mercuric oxide batteries

Establishing environmentally sound and economically viable systems for recovery and reuse of materials remains a primary focus

We are also pleased to report impressive gains made by our industry in the area of recycling. In the 1990s, we formulated a two-step plan designed to ensure recycling of all spent batteries, and were instrumental in the development of sorting and recycling technologies. Establishing environmentally sound and economically viable systems for recovery and reuse of materials remains a primary focus, and we are confident that these positive trends will continue well into the future.

The battery industry has always engaged in research to enhance its performance and decrease the environmental footprint of its products, constantly looking to improve upon available technologies so that both these goals can be achieved simultaneously. We work closely with the European institutions to promote the development of workable legislation affecting the portable power industry as a whole, and believe in taking a proactive and constructive approach towards decision makers to ensure appropriate, effective and cost-efficient solutions. EPBA also understands the importance of transposing battery legislation at national level, and has taken steps to help the member states define national targets and ensure EU-wide free movement of goods.

Our mission is to provide consumers with complete power solutions

Our mission is to provide consumers with complete power solutions that are sustainable across their life cycle. Our customers have a wide range of portable power needs, which are met by the industry through both primary and rechargeable battery technologies. While primary batteries are best suited to certain applications, rechargeable batteries are more appropriate for others. In terms of environmental impacts generated, there is also a marked difference between these two technologies. Indeed, life cycle analysis (LCA) conducted to identify the extent of impacts sustained during the various life cycle stages showed the mining and refining phase to be a significant contributor in case of both primary and rechargeable products. For the latter,

however, the use phase was also found to be critical, accounting for up to 50% of total impacts, depending to a large degree on how the batteries are utilised and recharged by individual users. Consumers therefore have a crucial role to play in reducing the environmental footprint in this instance.

Consumers therefore have a crucial role to play in reducing the environmental footprint

LCA is thus an important and highly efficient tool that allows the portable power industry to assess the overall potential impact of its products and services across a wide range of environmental parameters. With demand growing all the time, the challenge now is to provide customers with information enabling them not only to buy the right battery for the right purpose, but also to use and recharge it in the right way, before disposing of it where and when appropriate.

EPBA is committed to cultivating a thorough understanding of all factors that influence the sustainability of its products across their entire life cycle, so that this knowledge can be applied to develop best practices in cooperation with suppliers and other stakeholder industries, with whom ongoing dialogue is essential. We will also place particular emphasis on the sustainability aspects of mining and refining of raw materials, as well as the end-of-life stage. On the other hand, we will seek to ensure that consumers receive all necessary information to guide them when purchasing and using our products.

We will seek to ensure that consumers receive all necessary information to guide them

The above clearly demonstrates that understanding and developing the concept of sustainability, and identifying and evaluating relevant indicators thereof, are key to achieving our goal of continuous improvement. Working alongside EU and national authorities, we pledge to do all we can to implement our industry vision and fulfil our obligations towards European consumers, thereby playing our part in the preservation of our environment for the good of both present and future generations.

4. Message by the **European Commission**

Ref. Ares(2011)190001 - 21/02/2011

ENCOURAGEMENT LETTER BY COMMISSIONER POTOČNIK TO EPBA – THE AUTHORITATIVE VOICE OF THE PORTABLE BATTERY INDUSTRY

We live in a world where the pressures on resource use and on our environment are growing far too fast. In the 20th Century the world population grew 4 times, and economic output 40 times. We increased our fossil fuel use by 16 times, our fishing catches by 35, and our water use by 9. This is often called the great acceleration – yet as we continue to accelerate into the 21st Century we can't ignore the fact that with an anticipated world population of 9 billion by 2050, we risk losing our ability to sustain ourselves with what this planet and its finite resources have to offer.

This is why resource efficiency is a key part of the Europe 2020 strategy: our strategy for structural transformation of the European economy. Resources are limited, Europe is highly import dependent, the price of energy and other important raw materials are growing and increasingly volatile, and it is clear that the most resource efficient economies are also the most competitive. The efficient use of resources – and here I also include natural resources like biodiversity and electronic waste, as just two examples – is therefore not only the question of environmental sustainability, but, together with building knowledge and the innovation society, it is also the central question of the future competitiveness of our European economy. This is something that business is increasingly – and correctly – buying into.

In Europe we are trying to align all resources-related policies to help transform the European economy and contribute to global development in a sustainable growth model that can ensure quality of life within our planet's ecological limits.

I am glad to see from EPBA's sustainability report that this is something you understand all too well. I commend the work you have put into the report and your foresight. It shows to me that resource efficiency is already a driving force for business. It is not an academic concept, it is a practise that needs further expansion. For the benefit of business, of society and of our planet.

5. About **EPBA**

The European Portable Battery Association (EPBA) is the leading organisation representing the interests of primary and rechargeable portable battery manufacturers, as well as producers and importers of battery chargers, across Europe. EPBA evolved out of Europile in 1993, which had been operating out of Bern, Switzerland, since the 1980s. It was established in Brussels in 1997.

Our members

EPBA membership includes:

Regular members:

- Cegasa International SA
- Energizer SA
- GP Batteries Europe B.V.
- Eastman Kodak Company
- Panasonic Energy Europe N.V.
- Procter & Gamble International Operations
- Renata AG
- Sony Europe Ltd
- Systems Sunlight SA
- VARTA Consumer Batteries GmbH & Co. KGaA

Associate members:

Apple

Affiliate members:

National battery associations in Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Italy, the Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland, Turkey and the UK.

Structure

EPBA is structured around a general assembly of members, with a board of directors drawn from its membership and supported by four working groups, and a permanent secretariat in Brussels.

The following working groups are active:

Regulatory Affairs Working Group
which monitors and analyses issues linked to national and EU legislation affecting the portable power industry.

Compliance Organisation Working Group
which monitors collection and recycling issues.

Technical Working Group
which conducts technical dialogues relevant to batteries and chargers.

Statistical Working Group
which collects pertinent market data.

The members of each working group are drawn from EPBA member companies.

What we do

EPBA's mission is to **support and defend the common interests of its members**, with respect to both portable batteries and battery chargers, in the European institutions and other leading international bodies, in order to **provide consumers with complete power solutions** that are sustainable across their life cycle.

To achieve this, EPBA has identified three strategic priorities:

1. Compliance with legislation

2. Sustainability

3. Safety and quality issues

The association is recognised as an influential European trade organisation with contacts at the highest level within industry, EU institutions and international forums, as well as national and regional government bodies. We also work closely with national battery collection and recycling organisations.

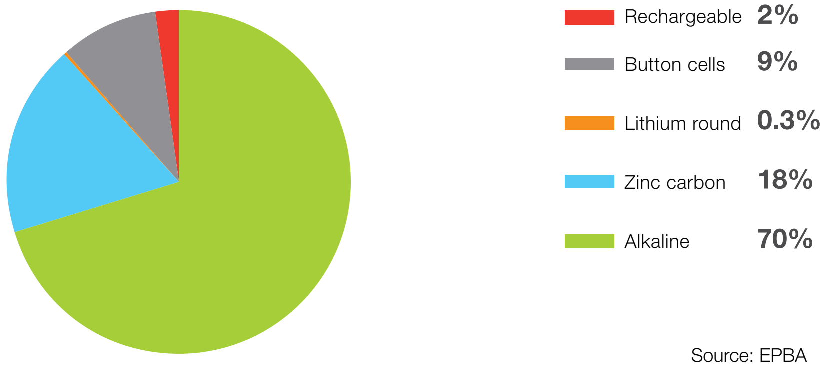
EPBA collaborates extensively with its counterparts worldwide, particularly the National Electrical Manufacturers Association (NEMA) in the USA and the Battery Association of Japan (BAJ), participating in regular exchanges and events.

6. European Battery Market

In 2009, just over 5 billion batteries were placed on the market by EPBA members, with alkaline manganese batteries accounting for the largest market share by far. It is worth pointing out that the statistics for the rechargeable segment only includes batteries sold in the most popular D, C, AA, AAA and 9V sizes, and not batteries or battery packs sold with devices like mobile phones, computers, MP3 players, power tools, etc..

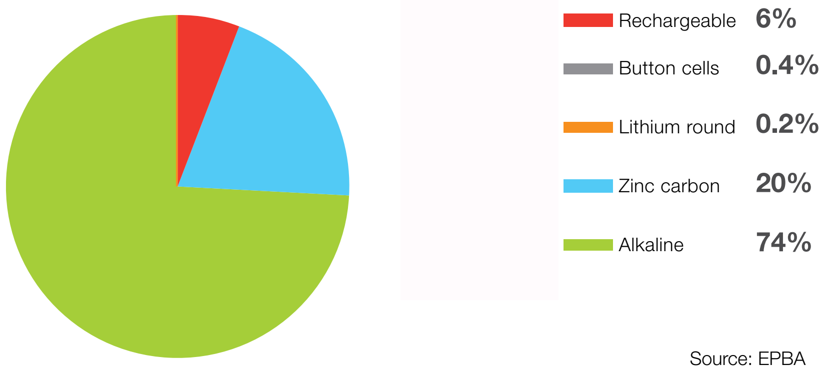
In 2009, just over 5 billion batteries were placed on the market by EPBA members

Total market by volume - 2009

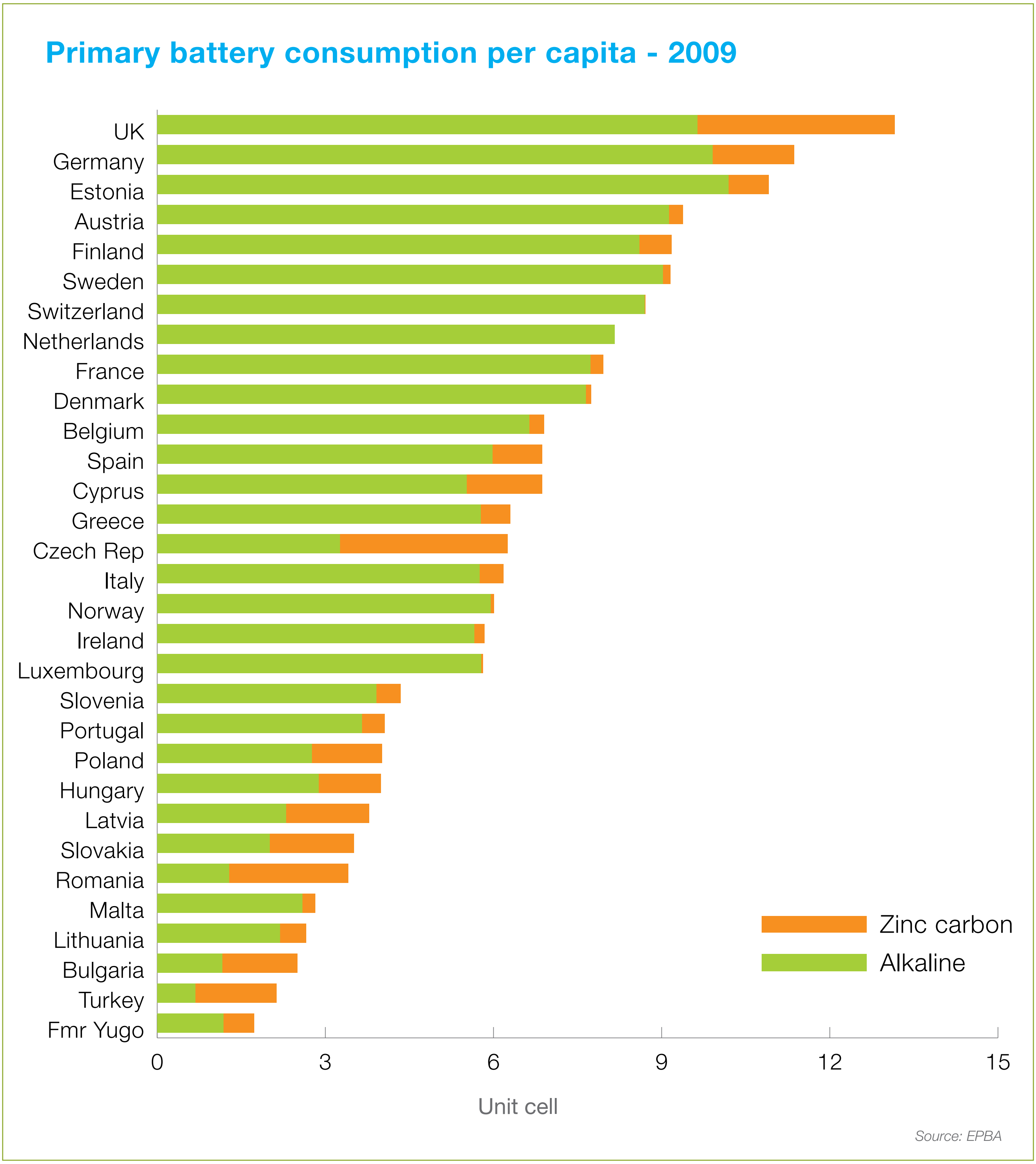


Source: EPBA

Total market by weight - 2009

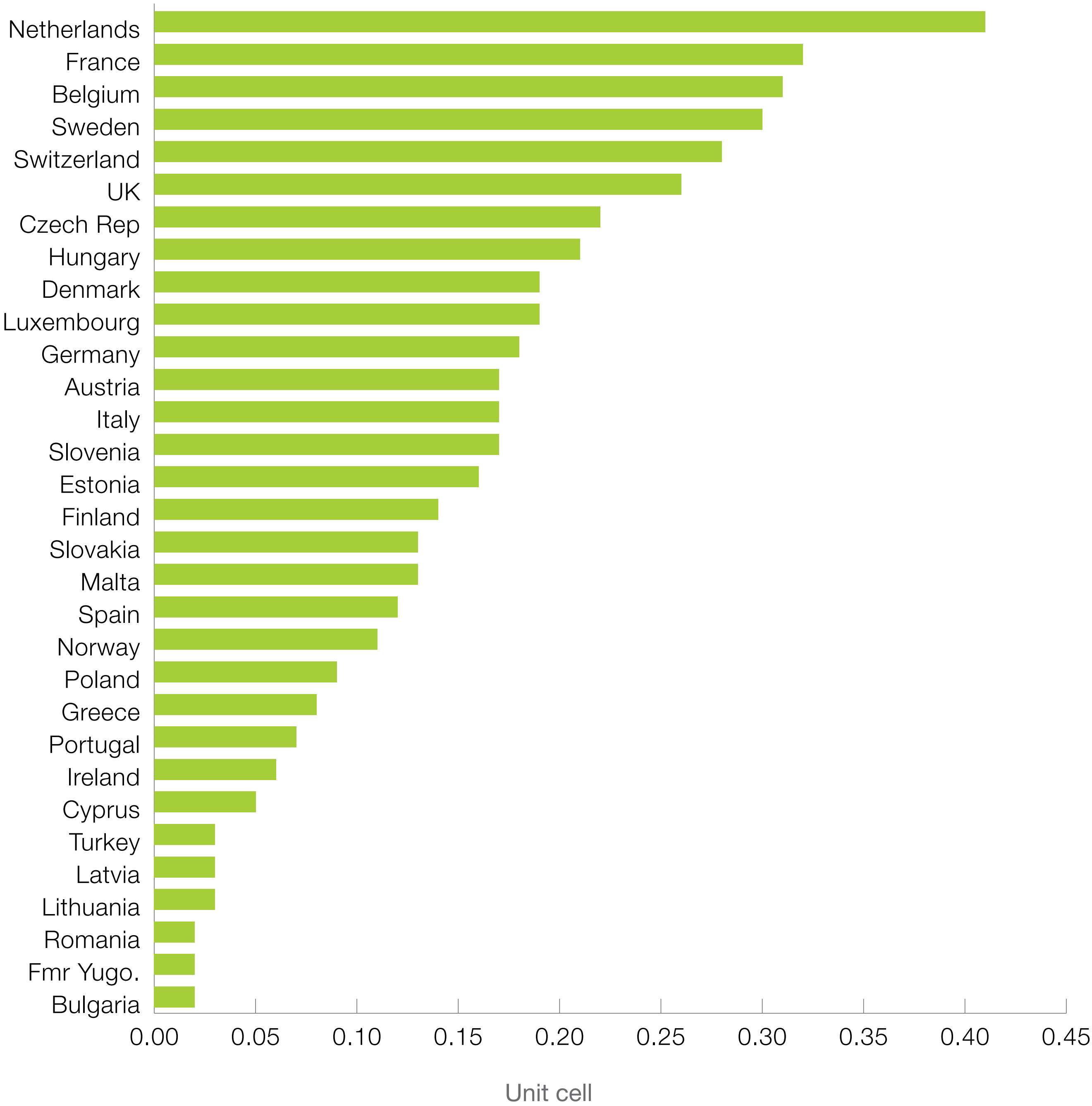


Source: EPBA



Primary battery consumption per capita per annum varies considerably within Europe, ranging from 13 in the UK to less than 2 in the former Yugoslav republics. Zinc carbon batteries are principally sold in Eastern Europe, whereas in the majority of Western European countries, the market is largely dominated by alkaline batteries, as shown above.

Rechargeable battery consumption per capita - 2009



Source: EPBA

While the rechargeable replacement battery market is comparatively small, it is interesting to note that the east-west divide is less clear-cut in this instance, with countries like the Czech Republic, Hungary, Slovenia and Estonia outpacing Spain, Norway and Portugal.

NB: These statistics only reflect consumption of batteries placed on national markets by EPBA members, which may not be representative of the European market as a whole.

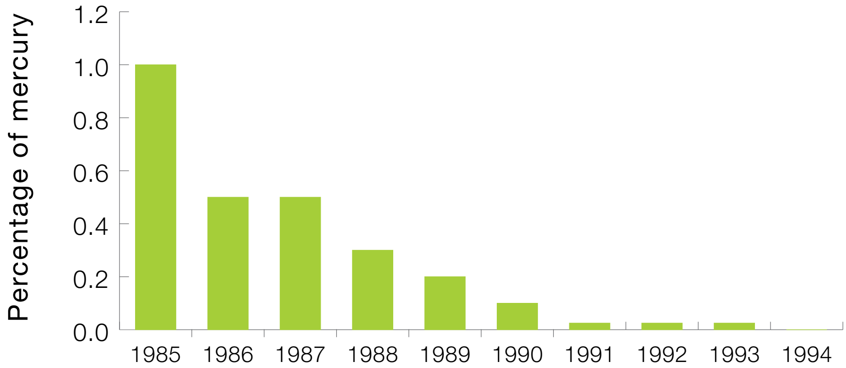
7. Industry Vision, Values and Landmark **Achievements**

7.1 Voluntary removal of mercury from **alkaline and zinc batteries**

In 1985, EPBA members launched an initiative to remove mercury from alkaline manganese batteries. At the time, mercury accounted for 1% of the total weight of these batteries, and it was decided that it would be phased out in a series of steps until complete elimination was achieved. Zinc carbon batteries also contained mercury, but at a much lower concentration of 0.1%, and its removal was also incorporated into the programme. This programme was successfully completed in 1994, when all alkaline and zinc carbon batteries sold by EPBA members were totally free of mercury, a full six years before legislation to this effect (Directive 98/101/EC) came into force in 2000. This initiative was undertaken on an entirely voluntary basis by EPBA producers, and involved an investment of more than €100 million.

In 1985, EPBA members launched an initiative to remove mercury from alkaline manganese batteries

Decline in mercury levels in alkaline manganese batteries



Source: EPBA

7.2 **Substitution** of mercuric oxide batteries

These developments resulted in a significant fall in mercury levels in Europe

During the 1980s, the mercuric oxide battery was the dominant battery chemistry used in photographic applications and hearing aids. This battery contained more than 30% mercury, which could not be removed because mercury was a key ingredient and its removal would have meant the battery would no longer function. It was clearly not possible to simply stop selling these batteries without finding alternative sources to power cameras, hearing aids and other such appliances.

The battery industry rose to the challenge and set about developing new battery chemistries to replace the mercuric oxide battery. As a result, the lithium manganese dioxide battery, containing 0% mercury, and the zinc-air battery, containing no more than 2% mercury, were introduced onto the consumer market. These developments resulted in a significant fall in mercury levels in Europe, decreasing the release of mercury of almost 54 tonnes annually.

7.3 Mercury elimination and the **two-step plan**

EPBA set up a working group in 1991 to investigate available technologies for the recycling of primary batteries. It quickly became apparent that if recycling were to be implemented across Europe, existing facilities and capacity would be insufficient to meet anticipated demand. The industry concluded that, once mercury use had been phased out, the most effective and environmentally sound means of recycling would be to utilise existing infrastructures within the metals industry to recycle zinc, steel and manganese from batteries.

However, this approach would only be possible if collected batteries could be guaranteed to contain less than 0.0005% by weight (background level) of mercury. Under Battery Directive 91/157/EEC, batteries containing up to 0.0025% by weight of mercury could still be imported into the European Union. These imported batteries, and the continued availability of mercuric oxide batteries, threatened the feasibility of using recycling facilities already in place in the metals industry.

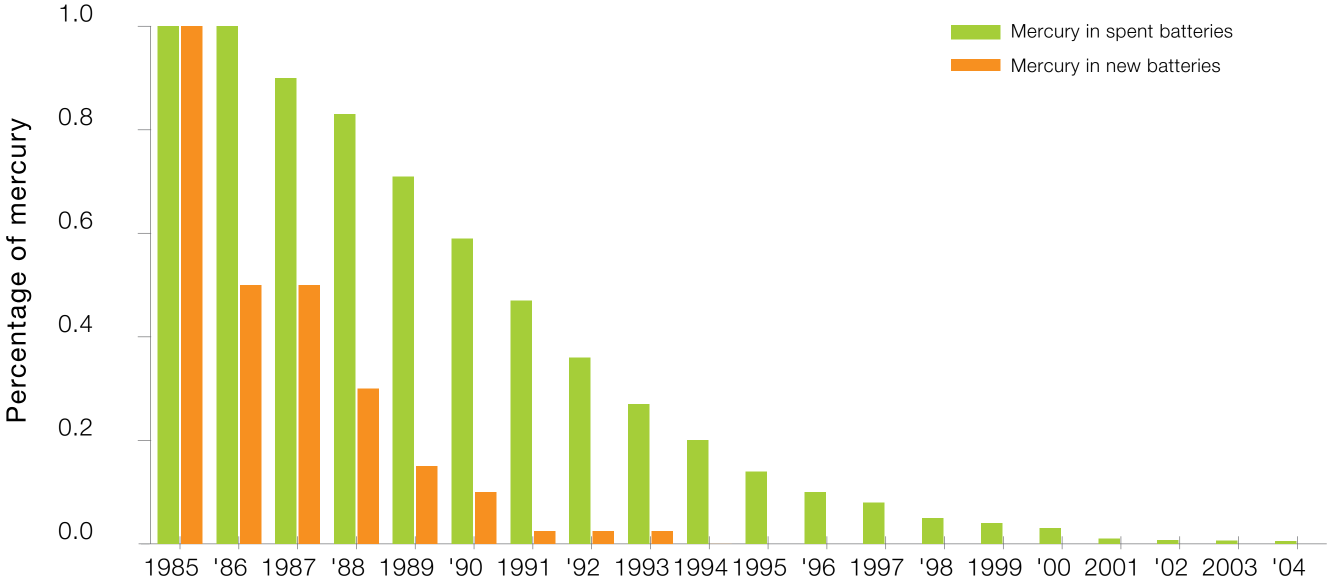
Consequently, the battery industry approached the European Commission with a proposal for a two-step plan aimed at ensuring recycling of all spent batteries.

- The first step involved legislation for a ban on primary batteries containing more than 5ppm mercury (adopted under Directive 98/101/EC).
- The second step involved legislation for the recycling of all batteries four years later (adopted under Directive 2006/66/EC).

The most effective and environmentally sound means of recycling would be to utilise existing infrastructures within the metals industry

The four-year delay between the two steps was necessary to allow batteries sold before the legislation came into force to pass through the waste stream.

Mercury in spent and new batteries



Source: EPBA

The graph above shows the falling trend in mercury content in spent batteries, on the assumption that all manufacturers of batteries sold within Europe followed the industry's lead of discontinuing mercury addition to new batteries from 1994 onwards. EPBA is proud to have led the way in the progressive decline in mercury use in batteries manufactured by its member companies and remains at the forefront of such initiatives to decrease the environmental burden in this domain. The same cannot be said of all non-EPBA members, some of whose batteries still contain high levels of mercury (up to 0.0155% by weight based on a study conducted by UK authorities in 2007).

7.4 Development of **sorting and recycling technologies**

EPBA supports battery recycling as long as:

- It allows effective recovery of materials.
- It proves itself to be environmentally sound, generating acceptable impact levels with the potential for further reductions.
- It is economically viable with competitive costs.

Unless these principles are adhered to, recycling schemes are not sustainable in the long term.

Extensive trials undertaken by EPBA in a number of European facilities showed that alkaline manganese and zinc carbon **batteries could be successfully recycled within the existing infrastructure of the metals industry** to recover zinc, manganese and steel fractions of batteries, as well as carbon as energy or reagent in smelting processes. We were also able to identify specific recycling processes for other chemical compositions of portable batteries sold in Europe, such as nickel-cadmium (NiCd), nickel-metal hydride (NiMH) and lithium-ion (Li-ion) rechargeable batteries, silver oxide and other button cells, and lead-containing batteries.

However, before any of this could happen, collected batteries, which are a mixture of different chemical systems, needed to be sorted according to their individual chemistry. EPBA therefore set about designing and developing an automatic, high-speed battery sorting machine to reliably sort spent batteries into their different chemical types.

This approach was shown to have a number of benefits:

- The recycling technology applied is tried and tested.
- Existing plants and infrastructures could be used.
- There is sufficient capacity to recycle all spent batteries in Europe.
- Recycled materials would have ready access to established markets.
- Additional environmental impact would be minimal (e.g. from construction of new facilities).
- Capital and operating costs would be low.
- The system would be sustainable in the long term.

7.5 Development of **alternative battery technologies**

In the majority of applications, NiMH accumulators have successfully replaced NiCd accumulators

The battery industry has always engaged in research to enhance its performance and decrease the environmental impact of both its primary and rechargeable products. In recent years, the development and improvement of NiMH and lithium-based technologies has shown that both these objectives can be achieved simultaneously.

In the majority of applications, NiMH accumulators have successfully replaced NiCd accumulators, because their energy density is almost twice as high and they do not contain the heavy metal cadmium. Initially, NiMH accumulators faced the problem of high self-discharge and were therefore unsuitable for use in appliances with low discharge rates (e.g. wall clocks or remote controls). This has now been resolved and, since 2006, pre-charged NiMH accumulators, which self-discharge only about 15% per year, have also become available to consumers.

Lithium accumulators were developed for appliances with an even higher energy demand and are today used in many consumer electronics like notebooks or digital cameras. The first commercially marketed lithium accumulator had an energy content 4 times that of an NiCd accumulator, as well as a greater number of recharge cycles. Another plus is that lithium accumulators are very energy-efficient, meaning that almost all the energy stored in the accumulator can be used to power an appliance.

The original li-ion accumulator has since been improved and a number of different lithium-based technologies have been developed to suit the specific needs of today's consumers. Several chemistries of li-ion in batteries are now available, including lithium cobalt dioxide, lithium manganese spinel, lithium titanate and lithium iron phosphate, which differ in energy density, life expectancy and charge range. Lithium polymer foil cells were developed in the mid 1990s to allow optimal use of limited space. They can therefore be adapted to individual requirements when space is at a premium, for example in mobile phones or digital music players.

Lithium technology has also been developed for primary batteries (LiFeS2), providing an additional power solution for certain types of applications. Similarly, alternative alkaline batteries using nickel oxyhydroxide (NiOOH) have been marketed to offer a new power service to device users.

The industry is currently working on ultra-thin film lithium batteries for use in even smaller appliances, such as multi-function smart cards or electronic paper.

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7.6 Concept of **compliance organisation**

The purpose of CROs is to provide appropriate, effective and cost-efficient solutions

Since 1995, EPBA has gained a wealth of experience in setting up and working with national waste battery collection and recycling organisations (CROs) to help our members meet their producer responsibility obligations. The purpose of CROs is to provide appropriate, effective and cost-efficient solutions to fulfil legal requirements for collection and recycling of spent portable primary and rechargeable batteries. In several countries, producers have a choice of CROs.

Essentially, CROs are funded by battery producers at national level and deal with all the practical elements related to producer responsibility obligations, such as collection, sorting, treatment, recycling, consumer communications and completion of reports submitted to national authorities on behalf of members.

Subsequent to Battery Directive 2006/66/EC, compliance organisations were set up in (almost) all member states. An important recent development is that in most countries, multiple and competing schemes are up and running.

In 2007, EPBA and RECHARGE (the international association for the promotion and management of portable rechargeable batteries through their life cycle) developed a compliance blueprint for the creation of such organisations, which is available from www.epbaeurope.net.

7.7 Support of **EU member states**

Since adoption of the first directive on batteries back in 1991 (Directive 91/157/EEC), EPBA has worked closely with the member states on transposing battery legislation at national level.

Member states normally have some leeway in reaching objectives set by EU directives in order to ensure that national specificities are taken into account, and to allow them to go beyond the EU's minimum requirements if the country's development already exceeds regulation requirements.

For transposition of Battery Directive 2006/66/EC, EPBA specially created the position of transposition manager to help the member states define national targets and ensure EU-wide free movement of goods.

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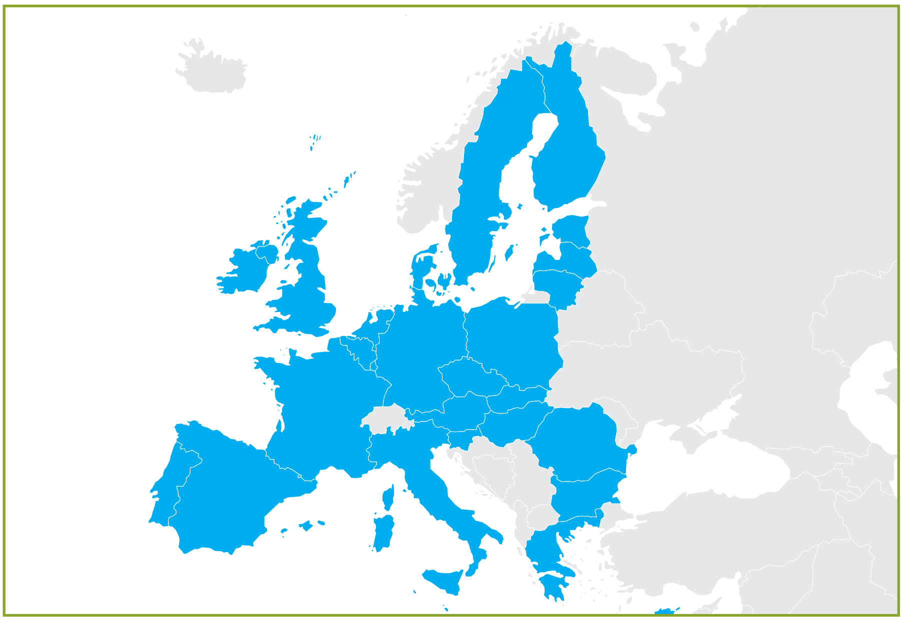


8. Business Framework

8.1 Sustainability and the **single market**

Our mission is to provide consumers with complete power solutions that are sustainable across their life cycle, whether in the form of primary batteries or rechargeable replacement batteries. What is important is that the needs of the customer be met in the most sustainable way possible. The portable power industry has already reduced the environmental impact of primary batteries sold in Europe between 1997 and 2007 by up to 27%, while eliminating the use of cadmium in rechargeable batteries and increasing their sales by 120%.

Our mission is to provide consumers with complete power solutions that are sustainable across their life cycle

We also fund waste management systems that allow European consumers to dispose of their used batteries in a way that enables their further recycling in accordance with European standards. Spent batteries are included within the definition of goods whose free movement across national boundaries for recycling purposes is protected by the Single European Act, and we look to the member states to continue supporting this important pillar of the single market.

However, the industry's ability to supply sustainable power solutions to consumers across Europe is not entirely in its own hands. Indeed, cooperation is required from national governments, retailers and customers themselves to be able to introduce new products and technologies, as well as implement sustainable take-back solutions at end-of-life. It is also up to individual member states to enforce their own legislation.

The launch of the single European market in 1992 was meant to eliminate barriers to trade and movement between EU member states, while ensuring a high level of environmental protection. Unfortunately, weak enforcement by governments of their own laws still prevents the industry from delivering the full benefits of its sustainability measures to all consumers. For example, because of differing market sizes within the EU, it makes sense to send collected batteries from some countries to recycling facilities in others, in order to ensure the most efficient use of facilities and best available technologies.

As an industry, we are concerned by a surge in unregulated product labels and, by often focusing on a specific criterion at the expense of the rest, its potential to confuse rather than enlighten the consumer

But in some cases, this economically and ecologically superior solution is hindered by barriers to trade, such as export bans on collected batteries or imposed fees and penalties for collection and recycling, which are higher than the actual costs themselves. This situation clearly needs to be addressed if we are to achieve our sustainability objectives.

Back in 1985, the battery industry embarked upon a bold and global benchmark-setting voluntary process of eliminating mercury from its alkaline manganese and zinc carbon batteries, an initiative completed in 1994, which led to the adoption of 0.0005% by weight as the maximum legal limit from 1 January, 2000, under Directive 98/101/EC. However, an analysis of collected batteries conducted in 2007 showed that, while the concentration of mercury in EPBA members' products was as low as 0.0001% of their average weight, in non-EPBA members brands it was around 0.0155%. Such discrepancies often result in consumers making environmentally and economically inferior purchasing choices through no fault of their own. Stronger enforcement of laws would therefore go some way to reducing the environmental burden.

There is also a developing trend to provide consumers with information on the environmental impacts of the products they are buying, and thereby attempt to influence their choice towards more sustainable goods. This has led to a surge in unregulated product labels, supported by their respective criteria, such as the carbon footprint. As an industry, we are concerned by this departure from the norms of a single market and, by focusing on a specific criterion at the expense of the rest, its potential to confuse rather than enlighten the consumer.

While EPBA supports measures that enable customers to select products not only on the basis of price and quality, but also on their sustainable production, usage and disposal, we feel it is vital to identify the most accurate way of doing so. We therefore advocate defining a set of common guiding principles on voluntary environmental assessment and communication, which could then be applied throughout the EU, to avoid proliferation of national approaches that may create new barriers, fragmenting the single market. Indeed, we are strong advocates of the single European market and support all concerted efforts to enable customers to access appropriate product information, but oppose measures that impede that goal.

We are nevertheless confident that all existing obstacles can be surmounted by ongoing cooperation at both national and EU level, and look forward to bringing the benefits of our sustainability mission to consumers all over Europe.

We therefore advocate defining a set of common guiding principles on voluntary environmental assessment and communication



8.2 **Life cycle analysis** in the portable power industry

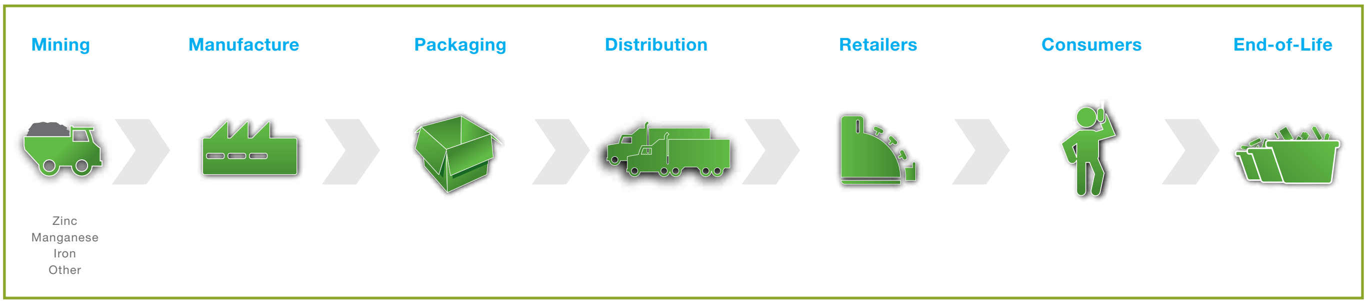
Product development, manufacture, distribution, use and end-of-life management should be driven by science, to allow prioritisation of actions resulting in the greatest sustainability benefits

Consumers have a wide range of portable power needs and these are met by the industry through both primary and rechargeable battery technologies. From a sustainability perspective, primary batteries are most suitable for applications involving slow discharge of power, such as clocks and door bells. They are also preferable for safety and emergency devices, like smoke detectors, torches and radios, as well as for equipment used in outdoor activities, such as camping and mountaineering, where mains power is not available for recharging. Rechargeable batteries, on the other hand, are most appropriate for heavy users of portable power and for devices requiring a great deal of power, like electronic games and digital cameras.

An LCA study conducted by Energizer on its own products in 2009 concluded that when used in low, moderate and high-drain electronic devices, no single battery type has the lowest impact on the environment across a wide range of environmental impact categories. However, all battery chemistries have both benefits and shortcomings.

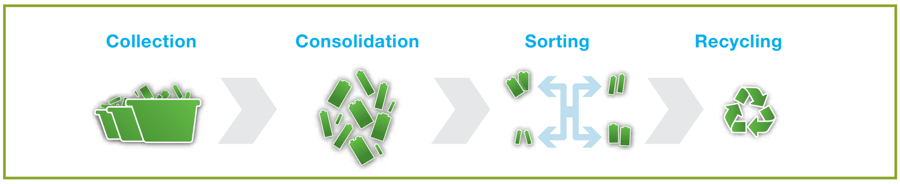
The battery industry believes that product development, manufacture, distribution, use and end-of-life management should be driven by science, to allow prioritisation of actions resulting in the greatest sustainability benefits, avoid trade-offs between environmental impacts, and meet consumer demand for portable power in the most efficient way.

LCA is a globally recognised and widely used tool to identify potential environmental impacts and scope for improvement across the life cycle of products and services. For both primary and rechargeable portable batteries, the typical life cycle includes the following stages:



The arrow between each stage represents transport.

End-of-life can be further broken down for analysis. Using methodology developed by the International Organization for Standardization (ISO 14040), the industry conducted two LCAs on primary and rechargeable batteries to identify impacts sustained during the various life cycle stages, in order to establish and prioritise actions required to reduce them.



The most striking finding of these studies was that mining and refining of raw materials used in alkaline manganese batteries account for 74%-86% of impacts in terms of cumulative energy demand (CED) and global warming potential (GWP). By comparison, end-of-life accounts for just 3%-16%. As shown below, the life cycle impact of an AA alkaline manganese battery is comparable to that of other common products and activities.

The life cycle impact of an AA Alkaline manganese battery is comparable to that of other common products and activities

Product or process	CED (MJ)	GWP (kg CO_2 eq)
AA alkaline manganese battery	2.0	0.11
25g PET beverage bottle	2.1	0.074
14g aluminium beverage can	2.7	0.171
100km fuel consumption in a European passenger car	348	23.9
Coffee pot: 5-year use	5402	222

Source: NEMA

Factors influencing primary battery recycling are complex and include a whole range of elements, like distance, means and intent of travel by the consumer to the drop-off point, transportation and sorting impacts generated in the course of delivering the batteries to the recycling facility, the recycling technology itself, and efficiency of the recycling process and materials involved. It is therefore vital that all stakeholders work together to make recycling of these

products sustainable in the long term. Among other things, this will require the industry to carefully assess all factors impacting end-of-life management, including product and process design. This work is still in its infancy and is set to be developed and extended in the future. The main challenge facing the portable power industry and its stakeholders today is establishing a methodology to effectively quantify impacts, making battery recycling a net positive for the environment.

In case of rechargeable NiMH batteries, on the other hand, studies show that the majority of impacts are split between the extraction and refining of raw materials for battery and charger components, and the way these batteries are utilised and recharged by the consumer. Consumers therefore have an important role to play in reducing the environmental impact of these batteries. The industry has compiled clear and simple instructions to help consumers use rechargeable batteries more sustainably and these will be made more widely available in the near future. Recycling of NiMH batteries is a net positive for the environment, mainly because of the reuse of high-impact metals such as nickel.

By allowing comprehensive investigation and evaluation of the full extent of environmental impacts, LCA has for the first time provided the portable power industry with a means of assessing the overall potential impact of its products and services across a wide range of environmental parameters. This knowledge, together with invaluable input from our stakeholders, is taken to develop action plans to minimise our footprint and increase the sustainability of our industry.

The main challenge facing the portable power industry and its stakeholders today is establishing a methodology to effectively quantify impacts, making battery recycling a net positive for the environment

9. Sustainability Progress

9.1 Life cycle analysis

DURACELL STUDY:

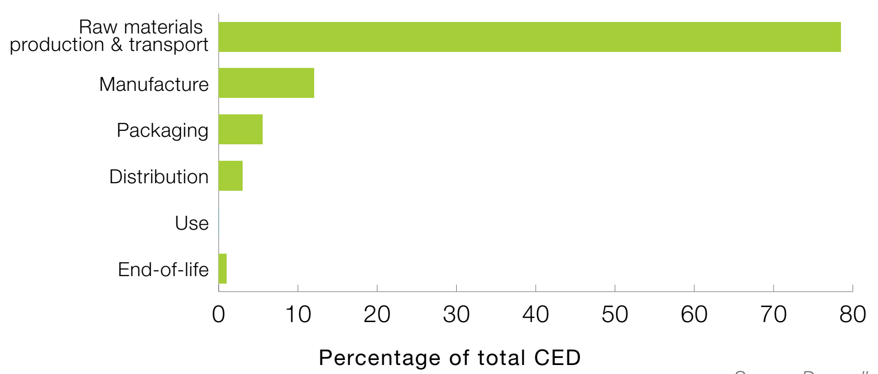
LCA of alkaline manganese and NiMH batteries

LCA of AA-size alkaline manganese and NiMH rechargeable batteries was carried out by Massachusetts Institute of Technology (Boston, USA) with the aim of identifying primary drivers of environmental impacts and determining strategies to minimise them. The geographic scope of both assessments was the European Union and impacts included those related to the collection and recycling of spent batteries.

AA alkaline manganese batteries

LCA results in terms of CED are summarised in the graph below.

LCA was carried out with the aim of identifying primary drivers of environmental impacts and determining strategies to minimise them



Source: Duracell

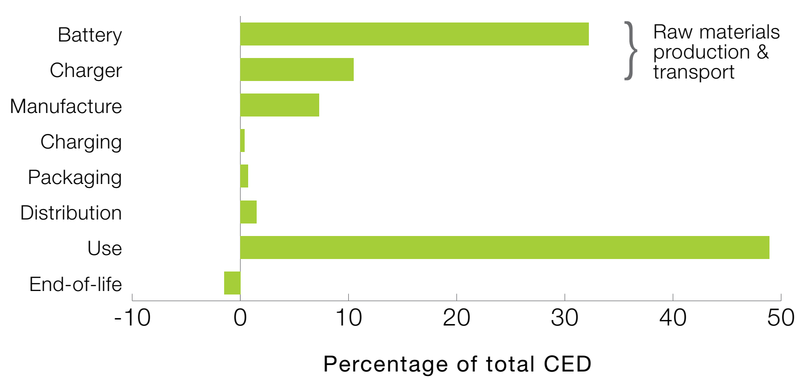
Almost 80% of environmental impacts across the life cycle of these batteries were found to occur during the mining and refining of materials used to make them. The biggest contributors were mining and refining processes of manganese dioxide, zinc and steel, while transportation impacts during this phase of the life cycle were very small.

Almost 80% of environmental impacts across the life cycle of these batteries were found to occur during the mining and refining of materials

Among impacts directly under the control of battery manufacturers were those linked to energy consumption during the manufacturing phase, while packaging impacts were shown to be driven more by production of the packaging materials than actual packaging operations. End-of-life impacts, based on the collection and recycling of 30% of batteries sold (the remainder being landfilled or incinerated), accounted for a small net negative environmental burden.

AA NiMH rechargeable batteries

The baseline functional unit in this analysis was a rechargeable battery used for 80 cycles. The production phase of the NiMH rechargeable battery also included a share of the production impact of materials used in the charger.



Source: Duracell

Environmental impacts from the use phase were found to account for almost 50% of CED across the life cycle. Total impact was sensitive to different parameters of the use phase, including the number of charge cycles, charger idle time, energy efficiency and electricity mix. Extending the number of charge cycles increased the dominance of the use phase. Extraction, refining and transportation of raw materials required for the manufacture of both battery and charger were the next largest contributors. Metal hydride and nickel were responsible for the largest impacts during raw material production, while transportation accounted for a small percentage of total impacts. Relatively low impact rates were identified during manufacture, charging, packaging and distribution. End-of-life impacts yielded a 1.5% net positive to CED, due chiefly to the recycling of nickel. Increased collection and improved recycling efficiency of NiMH batteries would therefore make a positive contribution to the preservation of our environment.

Increased collection and improved recycling efficiency of NiMH batteries would make a positive contribution to the preservation of our environment

ENERGIZER STUDY:

LCA of its own products

LCA is the only way of establishing a baseline for the current footprint in order to identify i) the most significant environmental impacts, ii) the main hotspots requiring further attention and improvement, and iii) a strategy and roadmap to reduce the global footprint of our activities and enhance use of our products.

This study, initiated in 2008, yielded the following conclusions:

- Defining a functional unit is probably one of the most important factors in allowing an LCA to determine the impact of a product, as used by consumers, in the most accurate way.
- Unlike most consumer goods, general purpose batteries do not have a single use, but multiple applications that vary greatly according to the intrinsic characteristics of a given device and the way in which, and intensity at which, it is used. This means no one single figure can reflect the environmental footprint of a battery.

Unlike most consumer goods, general purpose batteries do not have a single use, but multiple applications

The majority of impacts on the environment derive from the extraction of raw materials and production of batteries, accounting for 78% of greenhouse gas emissions

- The more data that can be generated from primary sources (suppliers, etc), the more accurate the end result will be.
- The relative impact of batteries on the environment, regardless of type, is very low compared to other daily activities. Over a five-year period, the total impact of battery use in a device will vary according to application and battery type, but will typically be less than driving 8km in a car during that same time period.
- The majority of impacts on the environment derive from the extraction of raw materials and production of batteries, accounting for 78% of greenhouse gas emissions.
- Among the different categories of environmental impact, depletion of non-renewable resources, global warming and acid rain are the most pertinent.
- No one single battery chemistry (primary or rechargeable) has the lowest impact across the full range of consumer applications. The choice of technology, be it primary or rechargeable, depends greatly on the device in question and usage patterns.

9.2 Market trends

Analysis of European market trends, using data provided by EPBA members for portable primary and rechargeable batteries over an 11-year period (1997-2007)*, reveals that the portable power industry has substantially reduced the environmental impacts of its products. Indeed, by the end of this period, the industry was using 24% less in terms of resources to meet European consumer needs compared to 1997. In effect, the industry was supplying more portable power in smaller packages.

This analysis confirms, for the first time, the **environmental significance of industry-led market trends** including:

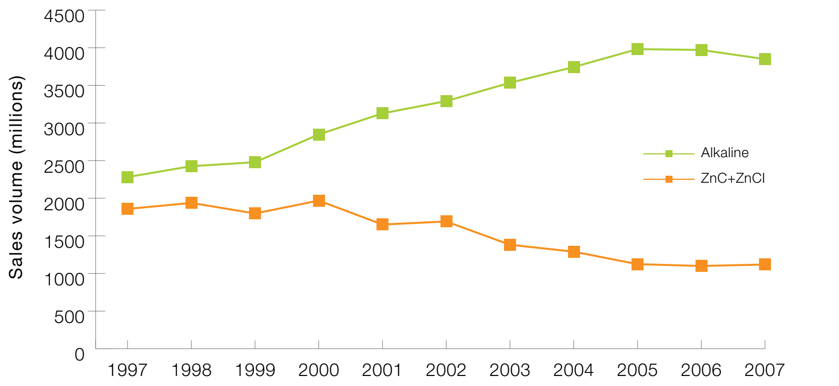
- Substitution of zinc carbon and zinc chloride batteries with high-performance alkaline manganese batteries.
- Replacement of larger-size batteries with smaller ones, providing more power at lower weight.
- Substitution of rechargeable NiCd batteries with NiMH batteries.
- Increase in sales of rechargeable batteries.

By the end of 2007, the industry was using 24% less in terms of resources to meet European consumer needs compared to 1997

* On an annual basis, all EPBA members communicate data to the EPBA secretariat. As an independent third party, the secretary then collects these data, so that they can be released to members in a consolidated format. As with all EPBA activities, statistics are compiled in accordance with applicable competition laws.

Substitution of zinc carbon and zinc chloride batteries with high-performance alkaline manganese batteries

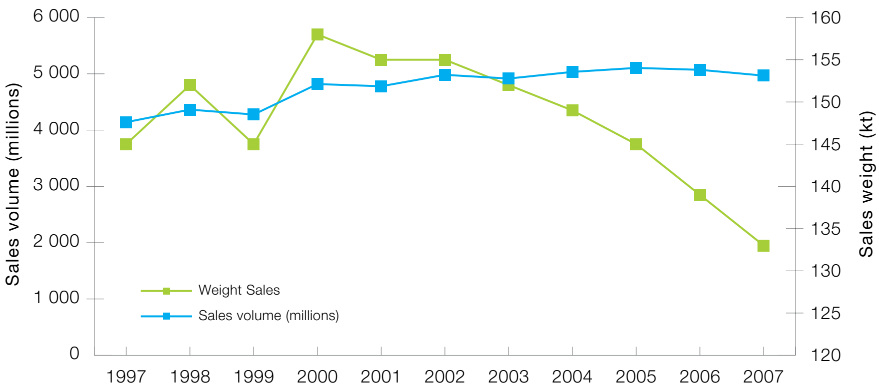
Figure 1 - Primary Battery - Volume Sales



Source: EPBA

Starting from a position of near parity with zinc carbon batteries in 1997, sales of high-performance alkaline manganese batteries steadily increased, accounting for 78% of the European market by 2007. Today, the majority of zinc carbon batteries are sold in emerging markets in Eastern Europe.

Figure 2 - Primary Battery Sales – Volume and Weight

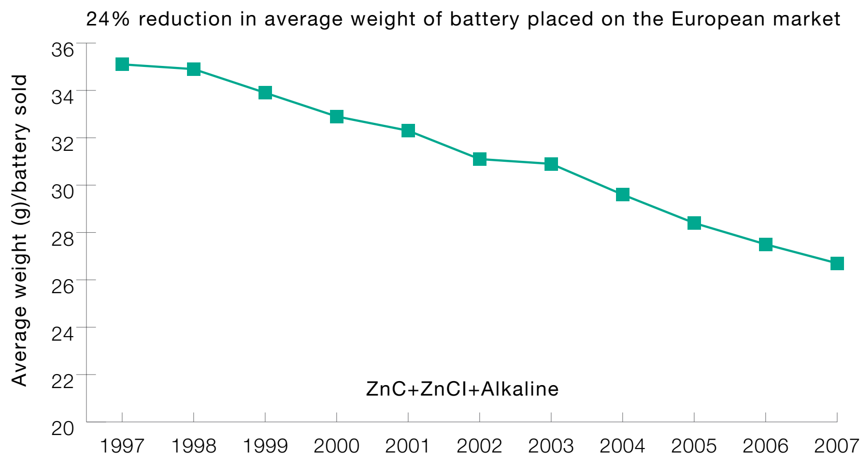


Source: EPBA

Increasing sales of alkaline batteries led, in 2000, to a decoupling between sales by volume and by weight. From 2003, there was an accelerating decline in the weight of primary battery materials used to meet consumer demand. The environmental significance of this trend is analysed below.

Replacement of larger-size batteries with smaller ones, providing more power at lower weight

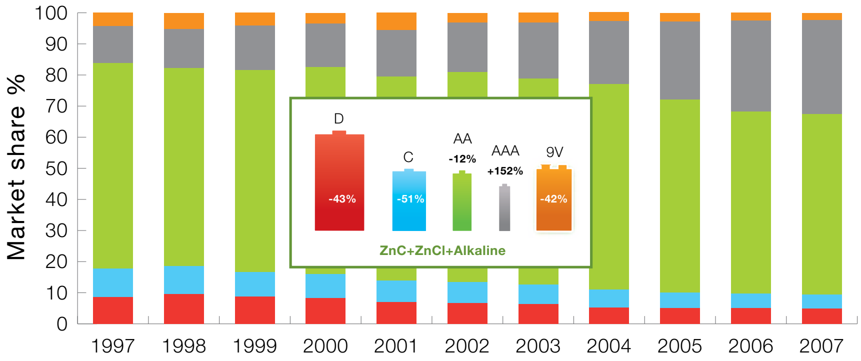
Figure 3 - Primary Batteries - Materials Efficiency



Source: EPBA

Between 1997 and 2007, the average weight of a primary battery on the market fell by 24%, while its energy density increased. As a result, by 2007, the industry was using 5450t less zinc, 6390t less manganese dioxide and 2600t less steel than at its peak.

Figure 4 - Primary Batteries – Volume Sales

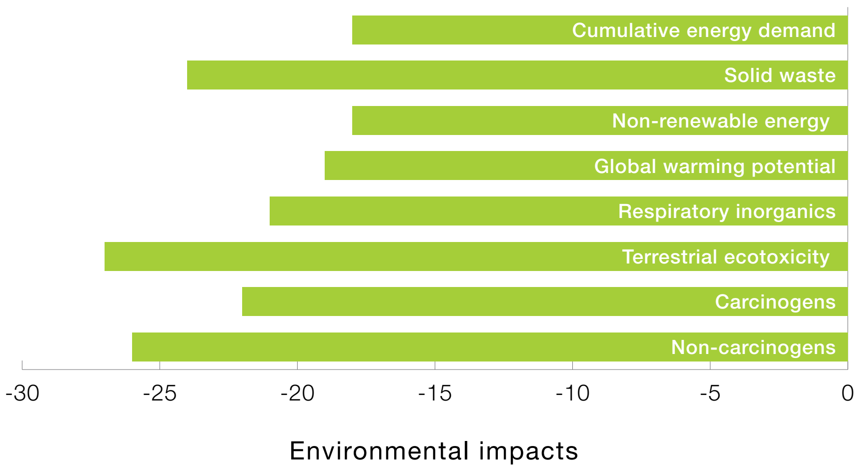


Source: EPBA

Another factor contributing to the more efficient use of resources to meet the demands of European consumers is the move towards miniaturisation of devices and subsequent need for smaller battery sizes. Over the period in question, AAA-size batteries were the only ones to see an increase in sales (+152%), whereas demand for the larger D and C sizes decreased by 43% and 51% respectively, and for the most popular AA size (weighing 24g), by 12%.

Environmental consequences of mining and refining of raw materials

Figure 5 - Primary Batteries - Environmental consequences

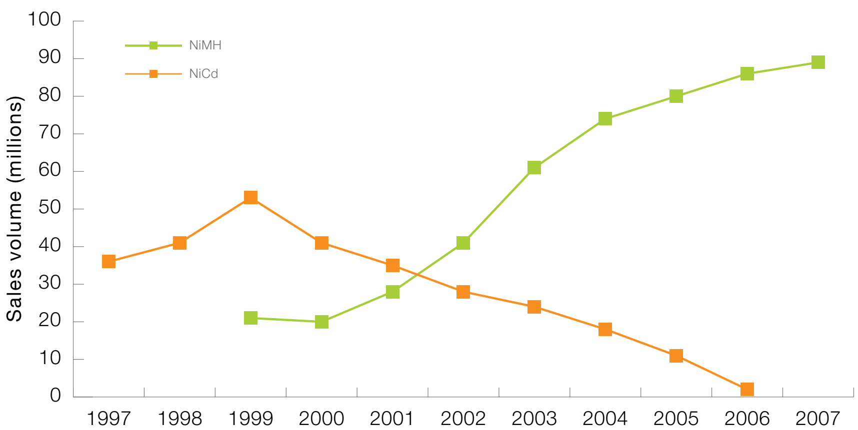


Source: EPBA

The industry has succeeded in reducing, by between 18% and 27%, eight key environmental impacts (all those measured) related to the mining and refining operations of zinc, steel and manganese used in batteries. Reductions in CED and GWP equate to removing 27 million and 38 million car kilometres respectively from European roads per year.

Substitution of rechargeable NiCd batteries with NiMH batteries

Figure 6 - Rechargeable Batteries - Volume Sales

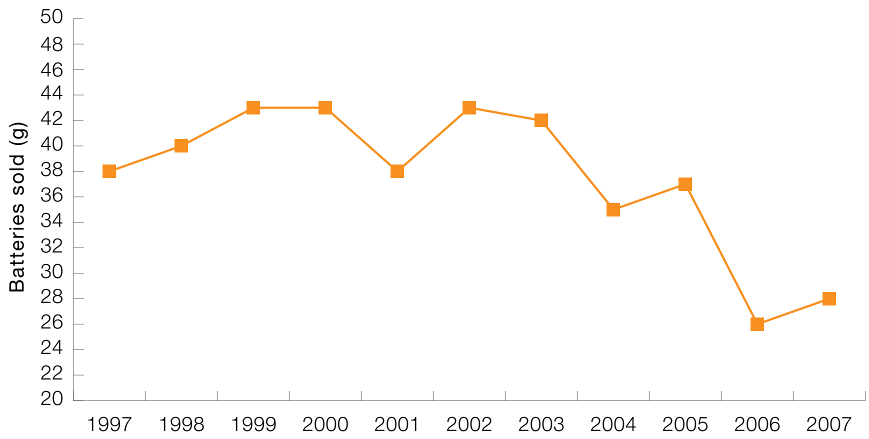


Source: EPBA

The introduction of NiMH rechargeable batteries in 1999 eventually led to a partial ban on NiCd batteries by the EU from September 2008, according to Directive 2006/66/EC. While sales of NiCd batteries declined dramatically between 1997 and 2007, sales of NiMH batteries increased by 120%.

Material efficiency

Figure 7 - Rechargeable Batteries - Materials Efficiency

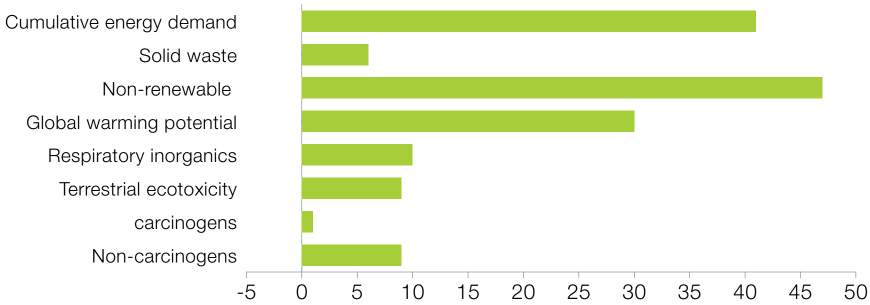


Source: EPBA

Due to increased material efficiency of NiMH batteries, the average weight of rechargeable replacement batteries on the European market fell by 26% between 1997 and 2007, from 38g to 28g.

Environmental consequences of mining and refining of raw materials

Figure 8 - Rechargeable Batteries - Environmental consequences



Source: EPBA

In contrast to primary batteries, trends in the rechargeable replacement battery market have led to an increase in environmental impacts arising from the mining and refining of nickel, cadmium, iron and rare earth metals. Between 1997 and 2007, impacts actually increased by between 6% and 47%, except for a 1% reduction in carcinogens. This is chiefly due to 11% more nickel being used in NiMH batteries on average, compared to their NiCd counterparts, and increasing sales volumes. However, since 2003, a positive trend has been identified for all impacts due to a levelling-off of sales.

The battery industry has managed to successfully meet the increasing power demands of European consumers by providing more portable and rechargeable power in ever smaller packages. This has resulted in a significant reduction in the environmental impacts of our products. We look forward with optimism to addressing ongoing and future sustainability challenges in our industry with the same drive and commitment.

The battery industry has managed to successfully meet the increasing power demands of European consumers by providing more portable and rechargeable power in ever smaller packages

9.3 Consumer information

BEST BATTERY FOR INTENDED APPLICATION

Over the past twenty years, the battery industry has worked hard to develop designs and technologies to better accommodate the growing variety of applications for mobile services. Miniaturisation, wide drain range, extensive electronic circuitry, and a diversity of environmental considerations and consumer usage patterns have led to the development of specific power solutions. The industry has continually applied itself to keep up with demand, introducing different battery grades in both alkaline primary and rechargeable NiMH technologies, as well as brand new technologies (e.g. NiOOH, lithium primary). The challenge now for the battery industry is to provide consumers with information enabling them to buy the right battery for the right purpose.

The challenge now is to provide consumers with information enabling them to buy the right battery for the right purpose

At the same time, an increase in consumer awareness of sustainable production and consumption means shoppers need more support than ever to guide them through the multitude of environmental criteria on application use and related battery technology.

As previously explained, the wide range of available devices and differing patterns of usage generate a complexity of variables, making it difficult to assess environmental impact because no single functional unit can be determined to conduct appropriate analysis. Since an environmental evaluation can vary considerably according to the functional unit set-up, it is important that no shortcut nor oversimplified hypothesis be used, as this would supply misleading consumer information.

However, there are some general trends that can be identified from preliminary LCA conducted for Energizer:

- A rechargeable battery or small lithium primary battery will yield environmental benefits when used in high-drain products, e.g. electric toys, or by heavy users of portable power, regardless of device.
- A standard alkaline-grade battery will deliver a favourable environmental outcome when used in everyday devices with medium to low drains, or in case of lighter patterns of use.

Consumers need credible information and clear guidance to help them make the right choices when purchasing batteries. Developing relevant tools based on environmental impact assessment, while keeping information simple, meaningful and accurate, is one of the key challenges for our industry.

Consumers need credible information and clear guidance to help them make the right choices

Consumers can play a big role in reducing the environmental footprint

MAXIMISING CHARGING EFFICIENCY

LCA of rechargeable NiMH batteries shows that almost 50% of environmental impacts over the life cycle occur during their use phase. This is where consumers can play a big role in reducing the environmental footprint by:

- Buying the most energy-efficient charger they can afford. This will reduce energy loss during the charging period by converting more of the electricity received into stored energy inside the battery, rather than losing it as heat.
- Making sure the battery is used to its full potential. Rechargeable batteries can be charged hundreds of times, but consumers tend to dispose of them before the charging endpoint is reached.
- Not leaving the charger plugged into the mains electricity supply without batteries or after the batteries are fully charged. This always leads to loss of energy, so it is worth considering the purchase of smart chargers that switch off when the charging cycle is complete.
- Opting for low self-discharge batteries, such as pre-charged, ready-to-use batteries, as some batteries discharge even when not in use.
- Not recharging batteries more often than necessary. Full cycling (full discharge before recharge) is better for battery longevity than top-up charging. Repeated top-up charging can reduce battery life.
- Looking at how their electricity is generated, which is of major significance. Indeed, coal and other fossil fuels are associated with greater impacts than renewable sources, such as solar, wind or hydro.

9.4 **Voluntary elimination** of mercury from button cells

Although Directive 2006/66/EC limits the use of mercury in batteries to 0.0005% by weight, button cells are exempt from this restriction and allowed to contain up to 2% mercury. Lithium button cells do not contain mercury at all so, in practical terms, this exemption only applies to silver oxide, alkaline and zinc-air chemistries.

In 2009, EPBA members placed 375 million button cells of these three chemistries on the European market. Due to technological breakthroughs, we are now able to pledge that 95% of button cells on the market will be mercury-free by July 2011, without any loss of performance. EPBA estimates that this will prevent some 1890kg of mercury from entering the European environment.

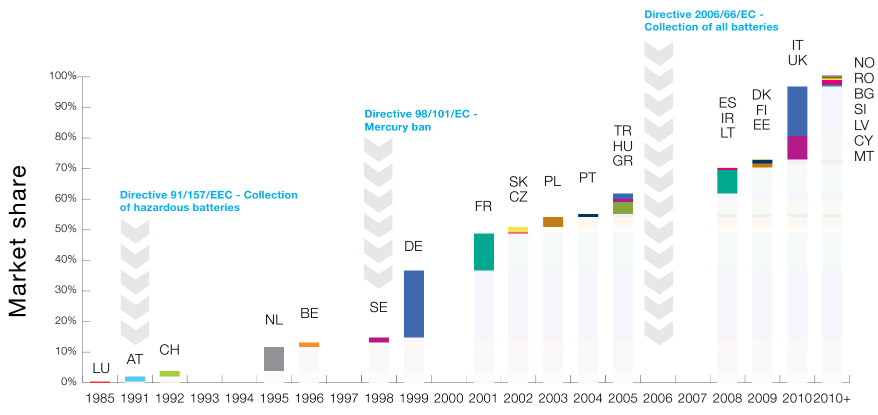
95% of button cells on the market will be mercury-free by July 2011

The remaining 5% of button cells are low-volume sizes, and eliminating mercury from these batteries has so far been hampered by significant loss of performance. We are confident, however, that these too will be free of mercury in the near future.

9.5 Battery collection and recycling **results**

Until Directive 2006/66/EC came into force, battery collection was undertaken on the basis of national initiatives and regulations

Battery collection in Europe started in 1985 in Luxembourg. At the time, there was no technology for recycling alkaline or zinc carbon primary batteries, so collected batteries were simply landfilled. Competitive recycling facilities did not appear in Europe until the second half of the 1990s.

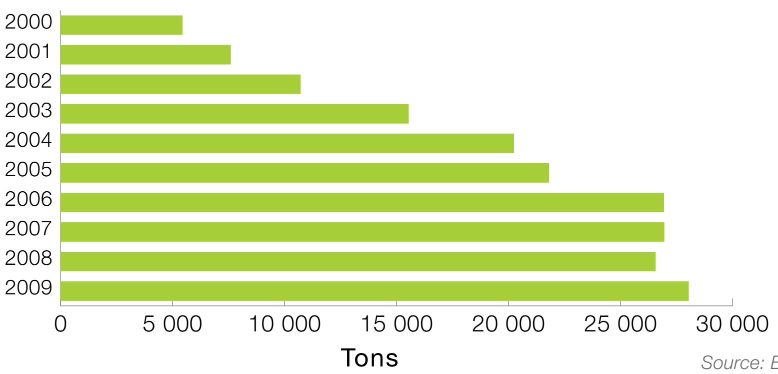


Source: EPBA

Until Directive 2006/66/EC came into force, battery collection was undertaken on the basis of national initiatives and regulations, according to the timeline shown above. Today, battery collection systems for all chemistries still need to be established in seven remaining European countries.

Nevertheless, as illustrated in the following graphs, impressive gains have been made by the battery industry in the recycling of spent batteries. We expect these positive trends to continue into the future, with the recent adoption of battery collection schemes in large markets such as Italy, Spain and the UK.

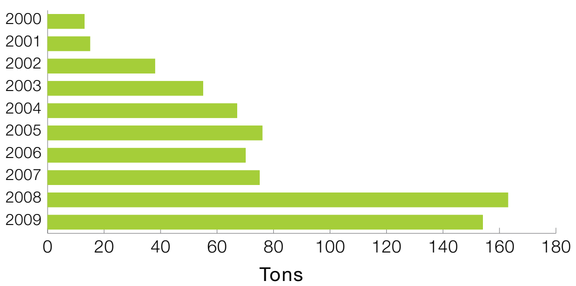
Recycled primary batteries



Source: EBRA

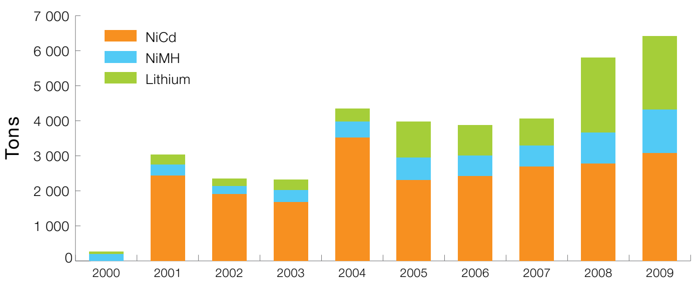
Impressive gains have been made by the battery industry in the recycling of spent batteries

Recycled button cells



Source: EBRA

Recycled NiCd, NiMH & lithium batteries



Source: EBRA

EPBA would like to thank the European Battery Recycling Association (EBRA) for allowing us to use its data in the above charts on the weight of recycled batteries.

9.6 Trends in **packaging impacts**

It is important to understand the added value that packaging confers

Like many other fast-moving consumer goods industries, the battery industry is also committed to improving the environmental footprint of packaging required to bring batteries to consumers. Packaging is a fully integrated component of the product and cannot be considered separately. It is therefore important to understand the added value that packaging confers in terms of:

- **Protection,** which is of prime importance as batteries require safe handling in the course of their delivery to consumers.
- **Information,** both regulatory and voluntary, as well as guidelines on appropriate use of batteries, including product identification, safety warnings, contact information, instructions on safe use and proper disposal, etc.
- **Convenience**, taking into account different shapes of packs, number of consumer units per pack, transport units, display at store level, etc.
- **Handling**, including transport to retailer location in optimal conditions, in-store display, and transfer to user destination.

For more than 10 years now, the battery industry has followed the positive trend in packaging material development aimed at improving quality, cost and environmental parameters. Areas considered include:

- Adaptation of packaging processes to maximise use of post-consumer recycled content (for cardboard, cartons and plastic), without compromising the end quality of products.
- Wide use of polyethylene terephthalate (PET) and other chlorine-free plastics wherever available technology allows.
- Reduction in material amounts according to Packaging Directive 2004/12/EC, but maintenance of the same standards.
- Innovation in packaging design to increase the value of packaging function during transportation and distribution processes.
- Reduction/elimination of solvent-based inks.

While packaging represents a relatively small percentage of the global product in terms of weight and volume, it is nevertheless considered to be a critical source of continuous improvement and will remain firmly on the agenda of the battery industry.

Packaging will remain firmly on the agenda of the battery industry

10. Future Sustainability **Roadmap**

EPBA is committed to cultivating a thorough understanding of the parameters that influence the sustainability of its products across their entire life cycle, in order to apply this knowledge to develop best practices in cooperation with suppliers and other stakeholder industries. This initiative will encompass the following key areas:

EPBA is committed to cultivating a thorough understanding of the parameters that influence the sustainability of its products across their entire life cycle

RAW MATERIALS

Findings of LCA conducted for Duracell show that mining and refining of raw materials account for more than 70% of total impacts across the life cycle of alkaline batteries, and over 30% in case of rechargeable NiMH batteries. Manganese dioxide, steel and zinc ingots are responsible for the greatest impacts during raw material production for alkaline batteries, and nickel for NiMH batteries.

We plan to work with supply industries to:

a. Develop sustainable mining and refining codes of practice.

b. Establish a set of sustainability guidelines for suppliers.

c. Obtain life cycle inventory data for key ingredients, such as nickel-plated steel and electrolytic manganese dioxide.

SUSTAINABILITY AT END-OF-LIFE

Assessment of environmental impacts of existing recycling processes

We will assess the recycling efficiency and environmental footprint of battery recycling processes on a worldwide scale, including pyro- and hydrometallurgical processes.

Analysis of environmental repercussions of battery collection systems

We will investigate the environmental footprint of collection systems in order to evaluate burdens related to the transportation as well as manufacture, distribution and disposal of collection containers, and develop sustainability audit protocols for national battery collection networks and battery recycling plants.

The industry is constantly engaged in reappraising its range of battery chargers and packaging

ENERGY-EFFICIENT DESIGN

The industry is constantly engaged in reappraising its range of battery chargers and packaging, and is always on the lookout for new opportunities to improve their design to enhance environmental performance. Areas under consideration are charger and standby power consumption, as well as energy used over a charger's expected lifetime. It is important to take into account the whole lifetime impact of a charger when looking to maximise energy efficiency.

In general terms, charger efficiency is directly related to energy efficiency, but other considerations also come into play. Indeed, the smaller the charger, the less material is required, the less packaging waste is generated and the less energy consumption is involved in the manufacture and transport of components and end products. A reliable and robust charger design, resulting in a longer operating life, is another factor instrumental in reducing waste. In addition, the more environmentally friendly the materials used in a product and its packaging, the less environmental damage is sustained. Optimal charger design should therefore incorporate a good balance of all these considerations. The industry is set to review all possible options in order to develop a charger that offers maximum efficiency with minimum ecological repercussions.

Decreasing energy consumption during the use phase of NiMH batteries is a further significant factor in this domain. Improving charger performance to cut energy consumption during battery utilisation and educating consumers on appropriate charger use can lead to considerable reductions in environmental impacts. The industry will continue to improve the efficiency and sustainability of its chargers through a balanced mix of innovative design, state-of-the-art technology and carefully selected materials.

Furthermore, we will engage in constructive dialogue with the electrical and electronic sectors aimed at improving the energy efficiency of the devices they manufacture.

The industry will continue to improve its chargers through a balanced mix of innovative design, state-of-the-art technology and carefully selected materials

CONSUMER INFORMATION

Battery performance and service time depend on a number of factors, such as device drain, usage patterns and environmental conditions (e.g. temperature and humidity). Primary batteries are available in different chemistries and a variety of tiers designed to maximise performance in a particular segment of the consumer goods market. While lower-tier batteries deliver reliable performance in low- and moderate-drain devices like remote controls, radios and clocks, premium batteries offer superior service time in high-drain devices like digital cameras. Use of batteries inappropriate for purpose inevitably leads to inefficient use of resources and increased battery waste.

We are wholly committed to providing relevant information in a format that is coherent, consistent and easy to understand

Implementation of the battery directive has led to collection and recycling systems being established all over Europe. Consumers are now able to dispose of their used batteries in specially designated areas, thereby reducing the amount of waste going to landfill and allowing materials inside batteries to be reused for other constructive purposes.

As an industry, we are wholly committed to providing consumers with accurate and relevant information in a format that is coherent, consistent and easy to understand. For example, EPBA has recently posted consumer information on its website on the safe use of batteries and recommended actions in case of emergency. One of our key objectives is to encourage responsible use of our products by helping consumers make informed choices.

COMMUNICATION WITH RETAILERS, DISTRIBUTORS, AND OTHER STAKEHOLDERS

The industry is fully aware that issues related to the sustainability of batteries are of major interest and consequence to European retailers, who are engaged in their own efforts and initiatives in this regard. In order to avoid giving consumers conflicting messages, the industry will undertake to keep retailers informed of all ongoing developments and align its consumer communications accordingly.

11. Conclusion

Understanding and developing the concept of sustainability is vital

This comprehensive overview of the portable power industry shows how it has adapted to changing market demands, regulatory pressures and technical challenges, while successfully reducing the environmental footprint of its products and services. It also outlines our future objectives in our sustainability roadmap. But there is still much work to be done. Indeed, existing technical, political and economic barriers to the single market will need to be dismantled, and governments will have to resist the temptation to erect new ones. Furthermore, existing requirements and regulations will need to be rigorously applied.

Understanding and developing the concept of sustainability is vital if the battery industry is to achieve its goal of continuous improvement. Identifying and evaluating indicators of sustainability, such as resource use, mining, refining and production processes, energy consumption, user patterns, toxicity, end-of-life management and product life cycle, is key. Another aspect crucial to the overall process is ongoing dialogue and stakeholder consultation.

The battery industry takes its role as provider of sustainable power solutions very seriously indeed. We remain fully committed to working with EU and national authorities to implement our vision for the future, and pledge to do all we can to fulfil our mission and obligations towards European consumers.

This report clearly demonstrates the industry's willingness to take the necessary steps to secure not only its own future, but the future of our environment for generations to come.

12. Further **Information**

If you have any questions, please contact the EPBA office:

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13. Glossary of Technical Terms

Battery: Any source of electrical energy generated by direct conversion of chemical energy.

Battery pack: Any set of batteries or accumulators connected and/or encapsulated within an outer casing to form a complete unit that the end-user is not intended to split or open.

Button cell: Any small round portable battery or accumulator whose diameter is greater than its height, used for specific applications such as hearing aids, watches, small portable equipment and back-up power.

Cumulative energy demand: Measure of all direct and indirect energy consumption associated with a product or process used in LCA studies. CED values are calculated in terms of energy (e.g. joules).

Ecotoxicity: Quality or condition of being poisonous to the environment.

General purpose batteries: Alkaline manganese and zinc carbon batteries in D, C, AA, AAA and 9V sizes.

Human toxicity: Quality or condition of being poisonous to human beings.

Hydrometallurgical process: Battery recycling process where chemicals are used to separate and recycle materials.

Portable battery: Any battery, button cell or battery pack that is sealed and can be hand-carried.

Primary battery: Any battery not designed to be recharged.

Pyrometallurgical process: Battery recycling process where high temperatures are used to separate and recycle materials.

Rechargeable battery: Any battery designed to be recharged numerous times.

ABBREVIATIONS/ACRONYMS:

BAJ: Battery Association of Japan

CED: Cumulative energy demand

CRO: Collection and recycling organisation

DALY: Disability-adjusted life years (lost)

DIGITALEUROPE: Advocacy group of the European digital economy acting on behalf of the information technology, consumer electronics and telecommunications sectors

EBRA: European Battery Recycling Association

EPBA: European Portable Battery Association

EUROBAT: Association of European Automotive and Industrial Battery Manufacturers

GWP: Global warming potential

LCA: Life cycle analysis

Li-ion: Lithium-ion

NEMA: National Electrical Manufacturers Association (USA)

NiCd: Nickel-cadmium

NiMH: Nickel-metal hydride

NiOOH: Nickel oxyhydroxide

ORGALIME: European Engineering Industries Association

PDF m^2 yr: Potentially disappeared fraction

PET: Polyethylene terephthalate

PRBA: Portable Rechargeable Battery Association

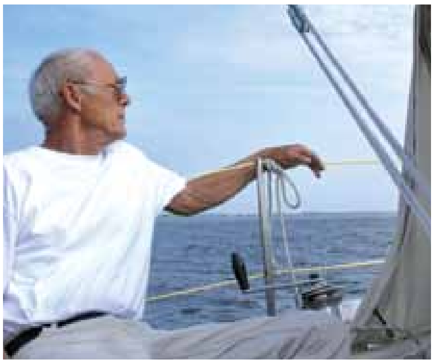
REACH: Registration, Evaluation, Authorisation and Restriction of Chemicals (regulation)

RECHARGE: International association for the promotion and management of portable rechargeable batteries through their life cycle

RoHS: Restriction of Hazardous Substances (directive)

UNECE: United Nations Economic Commission for Europe

WEEE: Waste Electrical and Electronic Equipment (directive)



14. References

1. EPBA, 2010, EPBA Membership Information, Brussels, Belgium.

2. EPBA, 2009, EPBA Statistical Report, Brussels, Belgium.

3. EPBA, 1998, Two Steps Towards a Better Environment, Brussels, Belgium.

4. EPBA, 2010, EPBA Statistical Reports 1985 – 2009, Brussels, Belgium.

5. EPBA & Recharge aisbl, 2007, Compliance Blueprint: A guidance document for setting up a battery compliance organisation, Brussels, Belgium.

6. G&P Batteries Ltd., 2008, UK portable battery research, ICBR Congress, Düsseldorf, Germany.

7. Duracell, 2010, LCA Study, Boston, USA.

8. Life Cycle Assessment of ENERGIZER Batteries, Energizer, Sept 2009, ERM (Environmental Resources Management), project number 0888739, Illinois, USA.

9. EBRA, 1 October 2010, source: www.ebra-recycling.org

10. Critical review according to ISO 14040 and 14044, August 2009, prepared by Walter Klöpffer (Chair), Scott Cassel and Neil Watson.

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