

EXPERT OPINION CONCERNING PROHIBITION OF HAZARDOUS SUBSTANCES IN CERTAIN VEHICLE MATERIALS AND COMPONENTS

PB/22875bis

PART 1: Regarding entry 2, 8 and 21 in Annex II of the ELV Directive

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Cr⁶⁺ Hg
Pb

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1. Introduction

The purpose of this report is to offer support to the judgement of the authorities in EU member states about the possible review of three entries (2, 8 and 21) of annex II of the ELV Directive by means of an independent expert opinion.

In addition an independent assessment of industry opinion regarding the other entries of the same annex is also offered in a second report.

Basically the procedure to formulate the independent expert opinion has included the following steps:

- 1) Read input, comments and position from the concerned industry and independent studies on the subject.
- 2) Contact relevant Universities, Research Institutes, manufacturers and suppliers in relevant branches to discuss the latest state of research activities, trends and future development.
- 3) Based on input, in combination with own experience in the field, make an assessment of available information and input and formulate the expert opinion.

Received answers and input have been kept anonymous in most cases. This is done to protect the individual in the case the statement is not fully in line with the common industry opinion.

1.2. Summary

Entry 2 allows the use of lead as an alloying element in aluminium for machining purposes (2% until July 2005 and 1% until July 2008).

Most stakeholders acknowledge a reduction and phase out of lead as an alloying element in aluminium. The long-term goal should be that no lead is intentionally added. It should also be acknowledged that material changes in car industry are a complex issue. Extensive testing is needed. The car industry supply chain is complex with several supplier levels. An additional issue is also the availability of alternative aluminium qualities on a worldwide scale

Meeting the 1% Pb limit July 2005 is to optimistic. With the reason above as a background the lead content limit of 2% (or reduced to 1,5%) ought to extended until July 2008 and be reviewed before the phase-out date. A threshold level up to 0.4% by weight of lead, unlimited in time, is necessary to allow future recycling of aluminium.

Entry 8 allows the use of lead and lead compounds in vulcanising agents and stabilisers for elastomers in fluid handling and power train applications until July 2005.

Lead-stabilisers are already replaced in elastomer types. For vulcanising agents including the bonding agents however, some issues still need to be resolved. There is no long-term reason why lead should be added to rubber. Alternatives are available.

Taking these opinions and factors into account there are no reasons to change the current wording in entry 8.

Entry 21 allows the use of cadmium in batteries of electrical vehicles until December 2005.

The environmental impact of cadmium is high. Substitution of cadmium containing batteries in vehicles as well as in other applications should be a priority item. Replacing NiCd batteries by NiMH batteries (or Pb batteries) in EVs (electric vehicle) is not a technology problem. However phase out of NiCd batteries by 2005 will require organisational and major economic efforts for the companies concerned.

Weighting advantages and disadvantages with a phase out of NiCd is difficult. From an environmental point of view cadmium should be phased out as soon as possible. Maintaining the ban of cadmium in batteries in electrical vehicles from December 2005 will in the short-term lead to a reduction of EVs offered on the market. In the longer term more cost efficiently produced NiMH batteries for EVs will be offered and the number of HVs (hybrid electric vehicle) will increase leveraging the short-term effect.

2. Entry 2 allows the use of lead as an alloying element in aluminium for machining purposes

Entry	Exemption	Current Phase-out date	Scope of the Review	Timing for the review
2 (a)	Allows the use lead as an alloying element in aluminium for machining purposes with a lead content up to 2% by weight	1 July 2005	In relation to the availability of substitutes for lead.	1 January 2005
2 (b)	Allows the use of lead as an alloying element in aluminium for machining purposes with a lead content up to 1% by weight	1 July 2008	In relation to the availability of substitutes for lead.	1 January 2005

2.1. Summary from relevant stakeholders, i.e. their answers to questions 1-4 in the a consultation round on the revision of certain entries of Annex II of the ELV Directive (see also attachment 1)

Some aluminium grades according to international standards have Pb content up to 2% by weight added for machining purposes. Currently substantial quantities (50,000 t/year estimated) of aluminium alloys with lead contents of between 1% and 2% by mass are placed on the market. A major part (35,000 t/year estimated) is used by the automotive industry.

These grades are still required within the automotive industry for several safety related parts e.g. brake system, steering system, chassis and power train parts. These relatively small aluminium parts can only be machined if the chips are small enough and break away during machine operation, this is achieved by adding lead.

The metal producing industry considers tin, zinc and bismuth as possible substitutes for lead in some applications. Pilot runs and components tests at suppliers confirmed that some lead free alternative alloys are more difficult from a machining point of view. In addition the fatigue strength is lower and problems are suspected with creep behaviour.

Aluminium alloys with Sn (tin) in contact with brake fluid and fuel with ethanol did not meet all corrosion and durability requirements for concerned applications. It is argued that alloys with less than 1% lead cannot be machined into products of the required quality and to the desired cost.

Comments related to possible phase out of lead vary. Some stakeholders argue it is not possible at all, i.e. the limit of 2% Pb needs to be unlimited. Some argues problems with the 1% limit after July 2005. A major component supplier also proposes July 2012 as the final phase out limit.

2.2. Reflections and comments from other industries and relevant sources

Opinion 1: Air and Space industry

Lead in cast aluminium alloys is not an issue in their applications. Other added materials such as bismuth solve the machinability issue. However the demands for high speed mass volume production of components are quite different in their industry compared to the car industry. This could be one reason why it is not necessary to use aluminium alloys with lead in the air and space industry.

Opinion 2: Scandinavian Research institute

Lead not present in alloys used by airplane manufacturing industry, except for some few exemptions where lead is present up to 0,5%.

Opinion 3: European car manufacturer

European car manufacturers should not experience any difficulties with the current entries in Annex 2. The use of aluminium alloys with lead is more widely spread in countries outside of the EU where fulfilling the 2008 limit might be more difficult. The recycling aspects are very important. As Pb accumulates in recycled aluminium remnants of Pb must be allowed up to 0,4% to make it possible to recycle aluminium in the long run. Due to this aluminium alloys with 1-2% Pb are not welcome in the recycling industry.

Opinion 4: Aluminium material supplier

Replacing Pb as alloying element in aluminium is not a real technology problem. It is more a question of modifying and retuning present production lines to alternative materials. However considering the high volume production in the car industry this is an expensive and time-consuming matter for them. The worldwide availability of alloys with alternatives to Pb could also be an issue that will take some time to solve.

Opinion 5: Aluminium material supplier/component supplier

No lead is present in their cast aluminium materials offered on the market of today.

Opinion 6: Swedish Standards Institute, SIS

Very few standard alloys are present with Pb added in volumes 1-2%. Some EU and American standards are available. Availability of these alloys will be difficult in the future due to decreased demand.

Opinion 7: European truck manufacturer

Lead is an unwanted substance in their aluminium components. Their standards do not allow Pb to more than some tenths of a percent. They experience difficulties to get aluminium qualities with really low content of Pb, less than 0,1-0,2 %.

Opinion 8: Aluminium Magazine

Lead has an improving role in relation to machinability. However there are alternatives available. A large problem with lead is the enrichment in recycled qualities. It is sometimes difficult to get recycled aluminium with low levels of Pb. To solve this higher proportion of new aluminium have to be added to obtain the wanted quality.

Opinion 9: Telecom industry

Pb in aluminium is not a priority item for them. They cannot confirm whether it is a problem or not.

2.3. Conclusions and comments

It seems that the use of lead as an alloy in aluminium for machining purposes is more widely used in the car industry than other industries. One reason for this is probably that the car industry has higher demands on cost efficient and high volume production. This topic might not be so crucial in other branches.

Technically the issue with machinability can be solved by adding other substances (zinc or bismuth or simple by deleting Pb). However any material change in a present production line needs extensive testing and retuning of production parameters to function smoothly.

A material change in a component also is a time consuming issue in the car industry. Extensive testing on component level as well as on complete car level is needed to ensure conformity to all requirements, particularly for safety related parts.

Technically and environmentally lead is an unwanted material in aluminium. In recycled aluminium Pb is normally present in small quantities (less than 0,4%). Allowing a threshold for Pb is a necessity for the utilisation of recycled aluminium.

Recycling aluminium materials with high Pb content adds to the Pb content and accelerates the enrichment of lead. To solve this new aluminium needs to be added to dilute Pb content down to the desired levels. From sustainability perspective lead ought to be phased out as an alloying element in aluminium.

Taking into account present development trend in industry there is also no long term reason for adding Pb to aluminium to obtain machining properties. The trend in the industry is to phase out lead as an alloying element in aluminium components.

2.4. Expert opinion

Most stakeholders acknowledge a reduction and phase out of lead as an alloying element in aluminium. The long-term goal should be that no lead is intentionally added. However to make it possible to recycle aluminium a threshold level (unlimited in time) for Pb is needed. The allowance of a maximum concentration value up to 0.4% by weight of lead, provided that it is not intentionally introduced, is enough in this respect.

It should also be acknowledged that material changes in car industry are a complex issue. Extensive testing on component level as well as on complete car level is needed to ensure conformity to all requirements. Present production lines need retuning.

The car industry supply chain is complex with several supplier levels. Changes along the whole chain need to be ensured. An additional issue is also the availability of alternative aluminium qualities on a worldwide scale. This is likely to be a short-term problem.

Meeting the 1% Pb limit July 2005 is too optimistic. With the reason above as a background the lead content limit of 2% (or reduced to 1,5%) ought to be extended until July 2008 and be reviewed before the phase-out date. A threshold level up to 0.4% by weight of lead, unlimited in time, is necessary to allow future recycling of aluminium.

3. Entry 8 allows the use of lead and lead compounds in vulcanising agents and stabilisers for elastomers in fluid handling and power train applications

Entry	Exemption	Current Phase-out date	Scope of the Review	Timing for the review
8	Allows the use of lead and lead compounds in vulcanising agents and stabilisers for elastomers in fluid handling and powertrain applications	1 July 2005	In relation to the availability of substitutes for lead.	1 January 2005

3.1. Summary from relevant stakeholders, i.e. their answers to questions 7-10 in the a consultation round on the revision of certain entries of Annex II of the ELV Directive (see also attachment 2)

Lead-stabilisers are already replaced in elastomer types. The total replacement will be finished in time by July 2005 for all new vehicles. The future development of parts will be based on lead free products from the beginning. Zinc/zinc oxide based products will mainly be used.

Lead compounds are also used as vulcanising agents for high pressure and fuel hoses with high safety demands (e.g. in power steering, fuel tubes, hydraulic applications etc.).

For vulcanising agents including the bonding agents however, some technical issues still need to be resolved. Considerable efforts have been made to develop lead free vulcanising agents in components like fuel and power steering hoses.

The long-term performance of lead free components has a very high importance to road safety aspects because a breakdown of these parts can put the driver, passengers and other persons in the traffic environment at risk.

Testing of lead free vulcanising agents and bonding agents is running. An assessment of the present tests is not possible until November 2004.

If these tests do not provide reliable products, new long-term tests with improved vulcanising agents are necessary. In that case and taking the supply chain and distribution aspects into consideration, an extension of the entry is required until 1 Sept. 2006. If long-term tests show satisfying results, a phase out by 1 July 2005 is possible.

3.2. Reflections and comments from other industries and relevant sources

Opinion 1: Scandinavian Research institute

It is no longer necessary to add lead to obtain the required properties for fuel hoses and similar applications. Alternatives are available since some years.

Opinion 2: Research Institute

Adding lead to obtain desired properties is no longer necessary, alternatives are present on the market. Replacement should not pose any problem.

Opinion 3: European car manufacturer

Pb as a vulcanising activator and Pb as a bonding or adhesive agent has been an issue in the past. Extensive sample testing of components from their supplies have not detected any levels of lead. Further investigations are ongoing.

Opinion 4: Telecom industry

Pb in rubber is not a priority item for them. They cannot confirm whether it is a problem not.

Opinion 5: Material and component supplier

No lead in stabiliser, vulcanisation agent or accelerator. There is a very small amount of lead present as a contaminant in the zinc oxide or oil but it is present in low ppm levels.

Opinion 6: Material and component supplier

As far as we know, the lead is in the adhesive that bonds the metal part to the rubber. We have been working for more than two years to substitute this adhesive. Finally a lead free bonding agent has been released and we are going to introduce it in production in October, 2004. The rest of the plants have different timings, but all respecting the ELV Directive.

Opinion 7: Material and component supplier

There is a very small amount of lead present as a contaminant in the zinc oxide used in our formulation for rubber but it is present in low ppm levels.

Opinion 8: Industry Association, BLIC

Tests are running. It is not yet ensured whether alternatives meet the required levels of performance. Some additional time could be needed.

3.3. Conclusions and comments

Lead-stabilisers are already replaced in elastomer types. The total replacement will be finished in time by July 2005 for all new vehicles. For vulcanising agents including the bonding agents however, some issues still need to be resolved. In this respect Pb has two different functions:

- *vulcanising activator* (not the actual vulcanising agent)
- *bonding agent or adhesive agent* when vulcanising rubber onto metal (e.g. power train)

Testing of lead free alternatives is running. These results cannot be assessed until November 2004.

There is a trend to reduce the length of fuel and hydraulic high-pressure hoses in cars. Hoses are a weak point in the fuel or hydraulic system (due to potential leakage and other failures). Using steel or metal tubes improves the situation and reduces potential failures. This means that the length of rubber hoses are reduced to the minimum and are merely used to allow vibration between moving parts in the car, between engine and car body etc.

Lead added to rubber has a negative environmental impact mainly in the vehicles end-of-life stage. Fragments of hoses will leave the shredder process via the shredder light fraction (SLF) or shredder heavy fraction (SHF) and will subsequently be deposited on landfills or incinerated.

3.4. Expert opinion

Lead-stabilisers are already replaced in elastomer types. This is not a problem any more. For vulcanising agents including the bonding agents however, some issues still need to be resolved. Testing of lead free alternatives is running. A complete assessment is not yet done.

There is no long-term reason why lead should be added to rubber. Alternatives are available. In addition there is negative environmental impact from lead added to rubber. Adverse impact is likely to occur mainly during the end-of-life stage of the car.

Taking these opinions and factors into account there are no reasons to change the current wording in entry 8.

4. Entry 21 allows the use of cadmium in batteries of electrical vehicles until December 2005

Entry	Exemption	Current Phase-out date	Scope of the Review	Timing for the review
21	Allows the use of cadmium in batteries of electrical vehicles	31 December 2005. After 31 December 2005, the placing on the market of NiCd batteries is only allowed as replacement parts for vehicles put on the market before this date.	Review should analyse the progressive substitution of cadmium, taking into account the availability of electrical vehicles.	31 December 2004

4.1. Summary from relevant stakeholders, i.e. their answers to questions 11-15 in the a consultation round on the revision of certain entries of Annex II of the ELV Directive (see also attachment 3)

A little bit more than 25 000 pure EV (four wheelers) and about 3 600 hybrids are today on European's roads. The hybrid vehicles currently on the market are using NiMH batteries.

There are currently no substitutes to NiCd batteries on pure electric vehicles in Europe (or elsewhere). The few vehicles using other technologies are not mass-produced vehicles but pilot-project or prototypes. Apparently about 80 % of pure EVs today in Europe are equipped with NiCd.

At the moment alternative technologies (sodium-nickel chloride, lithium-polymer) are far from being certified for automotive traction power by vehicle manufacturers.

A revised draft battery directive is currently undergoing the co-decision procedure within the European Parliament and Council. According to the extended impact assessment procedure, this revised directive authorizes the placing on the market of industrial NiCd batteries when conforming to the specific and mandatory collection and recycling targets. It specifically forbids any ban or marketing restrictions on NiCd batteries fulfilling the requirements of the directive.

Since there are no viable alternatives some stakeholders argue that the current phase-out date is not feasible. At least five years are necessary to develop an electric vehicle once the battery technology has been validated. A re-examination of the situation in about 5 years seems reasonable.

Some other stakeholders argue there should be no phase out date at all due to legal consistency with the battery directive; NiCd batteries for electric vehicles should also be exempted without any expiry date.

4.2. Reflections and comments from other industries and relevant sources

Opinion 1: Battery manufacturer, SAFT

Since 1995, numerous car manufacturers have chosen Saft Ni-Cd batteries, which equip almost 85 % of EVs in Europe. Now the same manufacturer argues that Saft High Energy Nickel-Metal Hydride (NiMH) provides excellent performance for electric-vehicle battery system. Thanks to their enhanced specific energy and energy density, Saft NiMH batteries enable electric vehicle to extend the autonomy above 150 km (100 miles) per charge.

To meet the needs related to significantly increased performances in all vehicles (particularly operating range), Saft has also developed new advanced high-energy Li-ion batteries. With their reduced weight and volume, these batteries represent a major technological breakthrough.

Opinion 2: Research Institute

NiCd batteries can be replaced by NiMH batteries (or Pb batteries). They have similar electrical properties and NiMH can replace NiCd without great technical problems. However the NiMH battery needs more efficient cooling to work properly. SAFT now produces NiMH batteries with specific energy and energy density enough to be suitable for EVs.

Opinion 3: European car manufacturer

EVs are definitely a niche product. In the longer run HVs will be more interesting and gain in numbers. This is not due to battery technology or uncertain market conditions for batteries. HVs simply offer the customer more in terms of flexibility and driving performance.

Opinion 4: University

Approximately 2/3 of the world consumption of cadmium (ranging between 16.000-18.000 tons during the last 30 years) is used for the production of NiCd (Nickel Cadmium) batteries. Of this about 3/4 are used in smaller-sized NiCd cells. The remaining 1/4 is used for the production of large industrial cells mainly used in stationary and vehicular power backup systems.

Development of high power performance of both NiMH and Li-ion cells is, however, already made. NiMH was first. At the end of 1997 Toyota launched the HEV "Prius" using relative small consumer size NiMH D- cells for acceleration and regenerative braking. Sanyo and Toshiba have started to market NiMH high power batteries, too.

Japanese manufacturers are ahead of the competition regarding development of alternatives to NiCd batteries. Japanese forecasts estimate that the NiCd and NiMH power tool cell production will be of comparable sizes by 2006.

Not only have NiMH cells started to be marketed in other typical NiCd applications such as electrical vehicles, but other competing battery types such as Li-ion and Li-polymer have also been utilized to make prototype cells presenting even further improved performances.

NiMH batteries have proven to function well in HVs. They have also a potential to function well in pure electric vehicles. However the technical requirements are different and development needs to be done. NiMH batteries have a cost disadvantage compared to NiCd batteries.

Another problem for NiMH batteries suitable for EVs is that no manufacturer offers high volume production today. From an industrial point of view it would be easier to continue to manufacture NiCd batteries suitable for EVs in present facilities.

Opinion 5: Battery manufacturer

Small NiMH batteries are already used in various applications. As batteries for electrical vehicles, they are becoming commercial. Compared with a common NiCd-battery, the NiMH battery has better energy closeness and better cycling qualities. For the time being NiMH batteries are considerably more expensive.

Opinion 6: Technical magazine

NiMH batteries are now a real competitor to NiCd batteries. They have somewhat different technical properties. Batteries should never get hot while charging or discharging. If it does happen to a NiCd battery, it will have less residual effects than as if it happened to a NiMH battery. NiMH under extreme daily heat of charging or discharging will create gas bubbles within the cell thus ruining performance. Both NiCd and NiMH are readily available with many MaH ratings although most NiMH batteries will have the higher performance ratings (MaH, Volts, and Run times).

4.3. Conclusions and comments

An electrical vehicle (EV) is a vehicle with only a battery as power source to operate an electrical engine. The main arguments brought forward in favour of EVs in general are their "zero emissions" at the location of use.

The hybrid electric vehicle (HV) is running on a combination of two power sources, i.e. a thermal engine and an electric motor. In a HV the power in the battery is complementary to the power from the thermal engine.

The hybrid vehicles currently on the market today are using NiMH batteries. Apparently about 80 % of pure EVs today in Europe are equipped with NiCd. According to figures submitted by SAFT, more than 60 per cent of the pure electric vehicles are registered in France. SAFT also states that the majority of vehicles (94,6 %) registered in France are equipped with NiCd batteries.

NiMH batteries, which do not contain cadmium, are well established on the market for hybrid vehicles. It is now argued that High Energy Nickel-Metal Hydride (NiMH) provides excellent performance also for electric-vehicle battery system. Their main disadvantage is their higher price.

Another problem for NiMH batteries suitable for EVs is that no manufacturer offers high volume production today. From an industrial point of view it would be easier to continue to manufacture NiCd batteries suitable for EVs in present facilities.

Different stakeholders see NiMH availability for series production of pure electrical vehicles controversially, which appears to be mainly the result of economic considerations rather than a technical problem.

Some manufacturers have introduced EVs with NiMH battery technology. General Motors have an electric vehicle, the EV1. Toyota has introduced the RAV4 EV, an electric vehicle powered by a NiMH battery. Honda's electric vehicle, the EV Plus, was the first production electric vehicle to use the NiMH battery technology, providing a city driving range of 125 miles.

The Honda EV Plus and the Toyota have both been discontinued. The question is whether this is due to problems with the battery technology or other reasons.

Honda has declared there is no future in producing and marketing completely electric vehicles as there was not much interest other than in the state of California, US. Toyota has declared no business case could be made for continuing sales of the RAV4 EV at low volumes. They believe that advances in hybrid technology and other advanced systems have a much greater potential for the environment and Toyota.

Some European car manufacturers presently do not work on electric vehicles at all. The French automobile manufacturers, on the other hand, see electric vehicles as a strategic development in order to collect experience with electrical traction and electrical drive.

The environmental impact of cadmium is high. Substitution of cadmium containing batteries in vehicles should be a priority item. The weight of a typical NiCd battery for an electric vehicle is 255 kg [SAFT, 2000] with cadmium content of circa 15 % or 38 kg. However a great advantage from an environmental point of view is the efficient collecting and recycling system for EV NiCd batteries.

A revised draft battery directive is currently undergoing the co-decision procedure within the European Parliament and Council. This revised directive authorizes the placing on the market of industrial NiCd batteries when conforming to the specific and mandatory collection and recycling targets. It specifically forbids any ban or marketing restrictions on NiCd batteries fulfilling the requirements of the directive. This is a different approach compared to measures taken in the ELV Directive.

4.4. Expert opinion

The environmental impact of cadmium is high. Substitution of cadmium containing batteries in vehicles should be a priority item. A continued use of NiCd batteries could create severe economic disturbances in the future when cadmium is expected to have a negative market value. In this respect continued use of cadmium batteries in other applications (not in EVs) will have the same negative effect.

Replacing NiCd batteries by NiMH batteries (or Pb batteries) is not a technology problem. Their main disadvantages are their higher price. Another problem for NiMH batteries suitable for EVs is that no manufacturer offers high volume production today. Phase out of NiCd batteries by 2005 will require organisational and major economic efforts for the companies concerned.

A phase out by December 2005 will in the short-term lead to reduced number of EVs offered on the market. From an emission point of view this will be negative. In the longer term more cost efficiently produced NiMH batteries for EVs will be offered and the number of HVs will increase leveraging the short-term effect.

Weighting advantages and disadvantages with a phase out of NiCd is difficult. From an environmental point of view cadmium should be phased out as soon as possible. Maintaining the ban of cadmium in batteries in electrical vehicles from December 2005 will in the short-term lead to a reduction of EVs offered on the market.

ATTACHMENT 1

Question 1: Are there currently leaded aluminium alloys with more than 1% lead by weight put on the market? If so, in which applications? What are the predicted market evolutions for the next 5-10 years?	
ACEA, JAMA:	Yes, some aluminium grades acc. to Aluminium Association (AA) or acc. to international standards (e.g. EN 573-3) have an Al content up to 2% lead by weight for machining purposes. These grades are still required within the automotive industry for several safety related parts e.g. brake system, steering system, chassis and power train parts. These Al-grades are needed also for the next 5 to 10 years. However, the application patterns of these alloys are predicted not to increase.
VDA	Ja. Einige Aluminiumlegierungen haben einen Anteil von bis zu 2 Prozent Blei. Dies entspricht verschiedenen Standards (Aluminium Association, ISO- oder EN-Normen). Diese meist zur maschinellen Bearbeitung eingesetzten Legierungen werden für mehrere sicherheitsrelevante Teile eingesetzt, insbesondere Bremssysteme, Steuerungssysteme, Chassis und Antriebssysteme. Diese Aluminiumlegierungen werden mittel- bis langfristig benötigt (5 bis 10 Jahre). Wir erwarten jedoch, daß in dieser Zeit die Einsatznotwendigkeiten für diese Legierungen zurückgehen. Translation: Some aluminium alloys have a lead content up to 2% according to various standards. These alloys are particularly used in safety related components such as steering and brake systems and chassis components. These alloys will still be needed for another 5-10 years. However the use is decreasing.
KAMA	Currently lead aluminium alloys are being used in over 20 kinds of auto parts such as master cylinder pistons, drum brake wheel cylinder bodies, etc. that contain over 1% of lead content. As substitute materials are being developed, lead-free Al-alloy parts are expected to be produced in about 10 years.
EAA	Currently, substantial quantities (50,000 tpa estimated) of aluminium alloys with lead contents of between 1% and 2% by mass are placed on the market. A major part, (35,000 tpa estimated), is used by the automotive industry. As the use of aluminium in automobiles is rising, an expansion of this market can be assumed. Aluminium use significantly contributes to light weighting and reduces greenhouse gas emissions.
CLEPA	Yes, some aluminium grades acc. To Aluminium Association (AA) or according to international standards (e.g. EN 573-3) have an Al content up to 2% lead by weight for machining purposes. These grades are still required within the automobile industry for several safety related parts e.g. brake system, steering system, chassis and power train parts. These AL-grades are needed also for the next 5 to 10 years. However, the application patterns of these alloys are predicted not to increase.
BOSCH	At Bosch there are currently leaded aluminium alloys with an estimated purchasing stock from about 90 million EURO. Applications are for example brake piston, locking caps, and adapter, pump bodies, hydraulic pump housings. The market evolution is difficult to predict, but we suppose that the application of lead in aluminium will decrease slowly.
Summary	Some aluminium grades acc. to Aluminium Association (AA) or acc. to international standards (e.g. EN 573-3) have an Al content up to 2% lead by weight for machining purposes. Currently, substantial quantities (50,000 t/year estimated) of aluminium alloys with lead contents of between 1% and 2% by mass are placed on the market. A major part, (35,000 t/year estimated), is used by the automotive industry. Currently lead aluminium alloys are being used in over 20 kinds of auto parts such as master cylinder pistons, drum brake wheel cylinder bodies. The market evolution is difficult to predict, but probably the application of lead in aluminium will decrease slowly.

Question 2: Are there any technical impediments to phase-out the use of leaded aluminium alloys? If so, for which applications?	
ACEA, JAMA:	Yes. The metal producing industry considers tin as a possible substitute for some applications, but it is not clear if AlSn alloys can substitute AlPb alloys for all intended applications. Pilot runs and components tests at suppliers confirmed this and reported that those AlSn alloys did not meet all corrosion and durability requirements for applications as listed in answer 1. E.g. in the brake systems and fuel system especially when alternative fuels are added or used (e.g. ethanol). Only if all requirements of substitute alloys can be met, the automotive industry can apply these.
VDA	Ja. Die entwickelten und auch getesteten alternativen Legierungen verwenden Zink oder Bismut. Diese können nach unseren Erfahrungen jedoch nicht die Korrosionsanforderungen einhalten, insbesondere bei flüssigkeitsführenden Systemen. Dies gilt gerade bei biogenen Kraftstoffen. Hier hat die Kommission eine weitere Steigerung des Anteils in Kraftstoffen vorgeschrieben, so daß sich hieraus eine inkonsistente Politik ergeben könnte. Translation: There are alternative alloys using zinc or bismut instead of lead. These alternatives do not meet all requirements regarding corrosion, particularly in contact with alternative fuels. The Commission expects an increase in the use of alternative fuels, which is not in harmony with the ban of pb in aluminium.
KAMA	Even though some alternative materials have been being developed, they have not been fully evaluated yet in the performance of relevant auto parts made of those substitutes. Application of the alternative materials, without sufficient evaluation, to onuse vehicles will be possible to adversely affect vehicle performances. Especially, in the case of parts related to safety, the problems will be more serious.
EAA	Yes, there are technical impediments. Small aluminium parts can only be machined if the chips are small enough and break away during a certain operation. Otherwise the machining process is disturbed and the machined product may result in a rough surface. Moreover, drilling deep holes into a part is also hampered if the chips are not small enough. The addition of lead helps to keep the chips small because at the machining temperatures the chips become brittle. Alloys with less than 1% lead cannot be machined into products of the required quality and with the required costs.
CLEPA	Yes. The developed and tested alternative alloys using Sn or Bi however, still could not meet corrosion and durability requirements for applications as listed in answer 1. E.g. in the brake systems and fuel systems especially when alternative fuels are added or used (e.g. ethanol) Sn and Bi however have detrimental properties as alloying element compared to lead.
BOSCH	Yes, we have tested at Bosch some lead free alternative alloys for free machining purposes (with Sn and Sn/Bi) and have established that the fatigue strength is much lower. Further problems are suspected with creep behaviour, with corrosion in brake fluid and corrosion in fuel with ethanol; the influence of temperature at operation is not tested enough. The reason of the different material properties is that the inclusion of Sn is much harder (Mg will be diffused into Sn) than the Pb-inclusion. A carefully test with the alternative materials is necessary. On the other hand there are not enough material data available for the alternative materials at suppliers yet.
Summary	The metal producing industry considers tin, zinc and bismuth as possible substitutes for some applications. Small aluminium parts can only be machined if the chips are small enough and break away during a certain operation. Moreover, drilling deep holes into a part is also hampered if the chips are not small enough. Good machining properties in this respect also enable the design to be optimised from a weight point of view. Pilot runs and components tests at suppliers confirmed that some lead free alternative alloys are more difficult from a machining point of view. In addition the fatigue strength is lower and problems are suspected with creep behaviour. Alloys with AlSn in contact with brake fluid and fuel with ethanol did not meet all corrosion and durability requirements for applications as listed in answer 1.

Question 3: Is the scheduled phase-out date (1 July 2008) feasible? If not, please give detailed reasons and specify for which applications this is not feasible.	
ACEA, JAMA:	No. At this point in time it seems not feasible to phase out Al-alloys for safety related parts e.g. break system, steering system, chassis and power train parts. A detailed analysis should be made what the implications are to the total supply chain, especially to small enterprises. The global availability of alternative alloys meeting all requirements is still not ensured.
VDA	Nein. Nach heutigen Erkenntnissen ist es nicht möglich, per 1.7.2008 auf bleihaltige Aluminiumlegierungen für sicherheitssteile, wie Bremssysteme, Steuerungssysteme, Chassis und Kraftübertragungssysteme zu verzichten. Die Automobilindustrie mit ihren weltweiten Verbindungen sieht nicht nur technische, sondern auch logistische Probleme. Die weltweite Verfügbarkeit von Substituten ist nicht gegeben. Kleine, aber bedeutende Unternehmen in der Zulieferkette sind noch nicht in der Lage, rechtzeitig auf Ersatzstoffe umzustellen. Weiterhin sind, um den weiteren Einsatz von Sekundäraluminiumlegierungen im Fahrzeugbau zu erhalten, auch in Zukunft entsprechende Rahmenbedingungen erforderlich, die praxisorientiert den Gehalt an Fremdelementen berücksichtigen und zulassen. Translation: It is not possible to phase out lead in applications as mentioned earlier. In addition to technical problems with alternatives there is also a logistic issue. The global availability of aluminium alloys without lead is not secured particularly taking the long supplier chain of car manufacturers into consideration. It is also important to consider the content of impurities (Pb etc.) in aluminium in the future in order to facilitate recycling.
KAMA	Lead free substitute materials are being developed by car manufacturers in order to meet the entry 2 regulations. Therefore, KAMA expects that vehicles to be newly type approved after 1 July 2008 will be adopted with lead-free Al-alloy. However, it's not possible to reduce lead content down to 1% after 1 July 2005.
EAA	No, the scheduled phase-out date of 1 July 2008 is not feasible.
CLEPA	No. At this point in time it seems not feasible to phase out Al-alloys for safety related parts e.g. break systems, steering systems, chassis and power train parts. A detailed analysis should be made what the implications are to the total supply chain, especially to small enterprises. The global availability of alternative alloys meeting all requirements is not assured.
BOSCH	The scheduled phase-out date 01.07.2008 (instead of 01.07.2005) would improve the situation for aluminium alloys with lead up to 2 %. For safety parts the phase-out date of 01.07.2008 will be too short, because we must test carefully the parts and have to get approvals from the customers.
Summary	It is not feasible to phase out lead free aluminium alloys in safety related parts, like brake systems, steering systems, chassis and power transmission systems. The global availability of alternative alloys meeting all requirements is still not ensured. Lead free substitute materials are being developed by car manufacturers in order to meet the entry 2 regulations. Therefore, KAMA expects that vehicles to be newly type approved after 1 July 2008 will be adopted with lead-free Al-alloy. However, it's not possible to reduce lead content down to 1% after 1 July 2005. The scheduled phase-out date 01.07.2008 (instead of 01.07.2005) would improve the situation for aluminium alloys with lead up to 2 %. For safety parts the phase-out date of 01.07.2008 will be too short, because we must test carefully the parts and have to get approvals from the customers.

Question 4: If the scheduled phase-out date is not feasible (for certain applications), which phase-out date would be appropriate?	
ACEA, JAMA:	No phase out date at all is recommended at this point in time. Lead is fully inert in the Al-matrix, is not water-soluble, cannot be released into the environment and is finally going with the non-iron metal fraction to the Al-mills and to the remelting process. A review date for this entry is recommended again for 2008.
VDA	Zur Zeit kann hierüber noch keine detaillierte Auskunft gegeben werden. Neben den oben erwähnten technischen und logistischen Schwierigkeiten, sehen wir doch auch keinen dringenden Handlungsbedarf, da Blei als Legierungsbestandteil nicht löslich ist und somit nicht in die Umwelt gelangt. Der Verwertungsweg für diese hochwertigen und sehr begehrten Schrotte führt automatisch zur Rückgewinnung der Metalle. Aus den verschiedenen Gründen schlagen wir vor, diese Ausnahme im Jahr 2008 erneut zu überprüfen. Translation: At the moment it is difficult to give a prediction. There are technical and logistical problems with a phase out. As lead is not released to the environment but recycled in an efficient way we see no immediate environmental problem. We propose a new review in 2008.
KAMA	Application of alternative materials is expected to be feasible after 1 July 2008, but requested to be necessarily reviewed before the scheduled phase-out date. However, it's virtually impossible to reduce lead content to 1% since July 2005. Therefore, KAMA proposes that lead content be limited up to 2% by 1 July 2008 and be reviewed before the phase-out date.
EAA	The European aluminium industry cannot, at this point, deduce an appropriate phase-out date since we are still facing major technological impediments. We would recommend to the European Commission to examine whether a complete phase out is scientifically appropriate, based on a risk assessment. Aluminium in automobiles is highly recycled, aluminium does not corrode and therefore the use of lead as an alloying element cannot be "set free" in the environment.
CLEPA	No phase out time at all is recommended at this point in time. Lead is fully inert in the AL-matrix, is not water-soluble, cannot be released into the environment and is finally going with the non-iron metal fraction to the Al-mills and to the remelting process. A review date for this entry is suggested to be incorporated again for 2008.
BOSCH	We would require at least until 01.07.2012 as phase-out date, because we need to perform basic investigations and we do not know when suppliers and users will be able to provide us with the necessary required material data for material selection. The time to test the products and for customers to release them is also difficult to evaluate. Remark: If we compare in Annex II the exemption for Aluminium alloys with the exemption for Copper alloys, the exemption for copper alloys is open-ended although the allowed lead-content in copper alloys is higher with 4 %. This is also the reason why we would propose 01.07.2012. As phase-out or to cancel the expiry date of the exemption for aluminium alloys up to 2% by weight and to have it open-ended (similar to copper alloys).
Summary	No phase out date at all is recommended at this point in time. Lead is fully inert in the Al-matrix, is not water-soluble, cannot be released into the environment and is finally going with the non-iron metal fraction to the Al-mills and to the remelting process. KAMA proposes that lead content be limited up to 2% by 1 July 2008 and be reviewed before the phase-out date. BOSCH would require at least until 01.07.2012 as phase-out date or to cancel the expiry date of the exemption for aluminium alloys up to 2% by weight and to have it open-ended (similar to copper alloys, however with 4%).

ATTACHMENT 2

Question 7: Which substitutes have been developed and are currently in use? What are the predicted market evolutions for the next 5-10 years?	
ACEA, JAMA, CLEPA:	Lead-stabilisers are already replaced in elastomer types (e.g. ECO). The total replacement will be finished in time by July 2005 for all new vehicles. The future development of parts will be based on lead free products from the beginning on and zinc/zinc oxide based products will mainly be used. The amount of lead in elastomers has been replaced almost completely by this approach. For vulcanising agents including the bonding agents however, some issues still need to be resolved.
KAMA	Alternative materials are being developed by the auto parts suppliers in cooperation with auto manufacturers, but not been in use currently. After 10 years the newly developed materials are expected to be used in automobiles.
Summary	Lead-stabilisers are already replaced in elastomer types (e.g. ECO). For vulcanising agents including the bonding agents however, some issues still need to be resolved. In ten years from now alternatives will be in use.

Question 8: Are there other substitutes still being developed and tested?	
ACEA, JAMA, CLEPA:	Considerable efforts were made to finally develop lead free vulcanising agents. However long-term risks regarding safety related aspects are not assessable at this moment. Some substitutes failed, others provided positive results. This implies that probably the performance levels have to be adjusted. The long-term performance of lead free developments has a very high importance to road safety aspects because a breakdown of the affected parts can put other traffic participants at risk. Only long-term tests, which are currently in progress, can ensure the reliability of new products in respect to material interactions, component position/function, temperature profiles and influence of fluids. These requirements are all in a complex relation. Substitutes are based on zinc or magnesium.
KAMA	Specific information on substitutes is not available for now.
Summary	Considerable efforts were made to finally develop lead free vulcanising agents. The long-term performance of lead free developments has a very high importance to road safety aspects because a breakdown of the affected parts can put other traffic participants at risk. Substitutes are based on zinc or magnesium.

Question 9: Is the scheduled phase-out date (1 July 2005) feasible? If not, please give detailed reasons.	
ACEA, JAMA, CLEPA:	An assessment about the results of the present tests is not possible until November 2004 (see time schedule)
KAMA	Development of alternative substances is at the final phase, but actual application of the substances to vehicles will require sufficient tests of durability and reliability. Therefore, it's not practicable to meet the phase-out date as requested.
Summary	Testing of lead free alternatives is running. An assessment about the results of the present tests is not possible until November 2004

Question 10: If the scheduled phase-out date is not feasible, which phase-out date would be feasible and why?	
ACEA, JAMA, CLEPA:	If these tests do not provide reliable products, new long-term tests with improved vulcanising agents are necessary. In that case and taking the supply chain and distribution aspects into consideration, an extension of the entry until 1. Sept. 2006 is required. If long-term tests show satisfying results, a phase out by 1. July 2005 is possible.
KAMA	In consideration that 2-3 years are required for performance tests, it will be feasible after 2007 at the earliest.
Summary	If current tests do not provide reliable products, new long-term tests with improved vulcanising agents are necessary. In that case and taking the supply chain and distribution aspects into consideration, an extension of the entry until 1. Sept. 2006 is required.

ATTACHMENT 3

Question 11: How many electrical vehicles are currently registered and in circulation in the EU? What are the predicted market evolutions for the next 5-10 years	
ACEA, JAMA, CLEPA:	<p>Currently, the number of EV (<3,5t) on European roads is estimated to be approximately 13 000, of which about 10 000 are registered in France (80%). We consider electrical vehicles as a niche market. Such a niche market can only grow within the framework of International, European and National policies promoting the development of clean transportation.</p> <p>Such policies are not mature enough today to give a mid term perspective to our members and to vehicle manufacturers. This situation does not allow them to commit additional research and manufacturing resources. Under these circumstances, it is quite impossible to generate any market forecast.</p>
CollectNiCad, EUROBAT, SAFT, Ravel	<p>Currently, the number of EV (<3,5t) on European roads is estimated to be approximately 13 000, of which 10 100 are registered in France (80%). We view the Electrical Vehicle as a niche market. Such a niche market can only grow within the framework of International, European and National policies promoting the development of clean transportation.</p> <p>Such policies are not mature enough today to give a mid term perspective to our members and to vehicle manufacturers. This situation does not allow them to commit additional research and manufacturing resources. Under these circumstances, it is quite impossible to generate any market forecast.</p> <p>This environment is not conducive to a growth in electric vehicle sales. Moreover, the 2000/53/EC Directive on ELV and its annex 2 prohibiting the sale of Ni-Cd powered vehicles starting 31 December 2005 create an additional burden on this niche market. This can be seen in the very weak 2003 sales figures of electric vehicles in France where they have historically been strong:</p> <p>2000 : 1040 units 2002 : 650 2003 : 348</p>
Avere France	<p>A little bit more than 25 000 pure EV (four wheelers) and about 3 600 hybrids are today on European's roads. About the evolutions of the market, there is a need to politic support to let the market to take off.</p>
BIL Sweden	<p>Currently, the number of Electrical Vehicles (EV), with a gross vehicle weight <3,5 tons, on European roads is estimated to be approximately 13 000, of which 10 100 are registered in France. The EV so far represents a niche market in the EU, also in Sweden.</p> <p>Any growth will be up to changed harmonized prerequisites for market conditions and technical progress. No such development is clear at this time. Will battery technology be used for a longer time, or will other technologies take over the environmentally adapted car market?</p> <p>Also for the Swedish market any growing market is difficult to predict. An educated guess is that most people in the scarce populated country of Sweden (9 cars/km²) find the range of EVs too short. The hybrid vehicles currently on the market are using NiMH batteries.</p>
Summary	<p>A little bit more than 25 000 pure EV (four wheelers) and about 3 600 hybrids are today on European's roads. The hybrid vehicles currently on the market are using NiMH batteries. Given uncertain market conditions for batteries it is impossible to generate any market forecast for EVs.</p>

Question 12: How many electrical vehicles are currently being equipped with substitutes for NiCd batteries? What are the predicted market evolutions for the next 5-10 years	
ACEA, JAMA, CLEPA:	There are currently no substitutes to Ni-Cd batteries on vehicles in Europe (and elsewhere). The few vehicles using other technologies are not mass-produced vehicles but pilot-project or prototypes. Regarding market evolutions for technologies other than Ni-Cd, it is even more difficult to create market forecasts than for the whole electric vehicle market (see answer to question 11), since such technologies need to go through substantial investments in manufacturing facilities.
CollectNiCad, EUROBAT, SAFT, Ravel	<p>There currently are no substitutes to Ni-Cd batteries on vehicles in Europe (and elsewhere). The few vehicles using other technologies are not mass-produced vehicles but pilot-project or prototypes. Indeed, a substitute is a product which passes the following tests:</p> <p>Comparable performance, which includes, amongst other items</p> <ul style="list-style-type: none"> - Reliability - Life span - Recyclability - Similar operational profile, including but not restricted to: - Energy stored - Power stored - Temperature span - Comparable weight - Comparable cost to end-user - Comparable impacts on the environment at production, use and recycling phases - Ability to be certified by vehicle manufacturers and regulatory agencies - Industrial and commercial availability. <p>On other markets, some prototypes such as the Toyota RAV 4 have been discontinued within months of their announced availability. For details, see: www.toyota.com/html/shop/vehicles/ravev/rav4ev_0_home/index.html "Toyota has sold more than 100,000 hybrid vehicles worldwide, and 52,000 Prius hybrids in the United States"</p> <p>Regarding market evolutions for technologies other than Ni-Cd, it is even more difficult to create market forecasts than for the whole electric vehicle market (see answer to question 11), since such technologies need to go through substantial investments in manufacturing facilities.</p>
Avere France	It looks like that about 80 % of pure EV is equipped with Ni-Cd in Europe. And a substitute must pass many tests which the least won't be industrial and commercial availability.
BIL Sweden	Currently there are no substitutes to Ni-Cd batteries in dedicated EV fleets in Europe, according to the producers. The few vehicles using other technologies are not mass-produced vehicles but pilot-project or prototypes. Hybrid vehicles (for combined battery and combustion engine propulsion) are mainly today using NiMH. Regarding market evolutions for technologies other than Ni-Cd, it is even more difficult to create market forecasts than for the whole electric vehicle market (see answer to question 11).
Summary	There are currently no substitutes to Ni-Cd batteries on vehicles in Europe (or elsewhere). The few vehicles using other technologies are not mass-produced vehicles but pilot-project or prototypes. On other markets, some prototypes such as the Toyota RAV 4 have been discontinued within months of their announced availability. It looks like that about 80 % of pure EV is equipped with Ni-Cd in Europe.

Question 13: Are other substitutes than NiMH and Li-ion still being developed and tested?	
ACEA, JAMA, CLEPA:	Many different technologies are currently under development and test at various stages, such as sodium-nickel chloride, lithium-polymer as well as others. At this time, these technologies are far from being certified for automotive traction power by vehicle manufacturers, and there currently is no manufacturing infrastructure that can produce the 10,000 units per year which are required for a commercial launch.
CollectNiCad, EUROBAT, SAFT, Ravel	Many different technologies are currently under development and test at various stages, such as sodium-nickel chloride, lithium-polymer...as well as others. At this time, these technologies are far from being certified for automotive traction power by vehicle manufacturers, and there currently is no manufacturing infrastructure that can produce the 10,000 units per year which are required for a commercial launch.
Avere France	At this time, all these technologies (sodium-nickel chloride, lithium-polymer) are far from being certified for automotive traction power by vehicle manufacturers. More over, there no manufacturing infrastructure that can produce the 10,000 units par year which are required for a commercial launch.
BIL Sweden	Answer to Question 13: Many different technologies are currently under development and test at various stages. Among these are sodium-nickel chloride, lithium-polymer as well as others. At this time, these technologies are far from being certified for automotive traction power by vehicle manufacturers, and there is currently no manufacturing infrastructure that can produce the 10 000 units per year which are required for a commercial launch.
Summary	At this time, all these technologies (sodium-nickel chloride, lithium-polymer) are far from being certified for automotive traction power by vehicle manufacturers. More over, there is no manufacturing infrastructure that can produce the 10,000 units per year which are required for a commercial launch.

<p>Question 14: Is the scheduled phase-out date (31 December 2005, with an exemption for replacement parts) feasible? If not, please give detailed reasons.</p>	
ACEA, JAMA, CLEPA:	<p>No. A revised draft battery directive is currently undergoing the co decision procedure within the European Parliament and Council. According to the extended impact assessment procedure, this revised directive authorizes the placing on the market of industrial (motive power) NiCd batteries when conforming to the specific and mandatory collection and recycling targets.</p> <p>It specifically forbids any ban or specific and mandatory collection and recycling targets. It specifically forbids any ban or marketing restrictions on NiCd batteries fulfilling the requirements of the directive. These NiCd batteries have to be dismantled and recycled separately acc. to the obligation from the ELV directive.</p>
CollectNiCad, EUROBAT, SAFT, Ravel	<p>Today, the only technology commercially available for electric vehicles remains Ni-Cd. The current phase-out date is not feasible because today no car manufacturer has launched a marketable vehicle using an alternative technology.</p> <p>At least five years are necessary to develop an electric vehicle once the battery technology has been validated. Any future projects depend on the car manufacturers' willingness to invest in new technologies. This market is also directly affected by public policies relating to clean transportation.</p>
Avere France	<p>Today, the only technology commercially available for EV still remains Ni-Cd. The current phase-out is not feasible because no car manufacturer has launched a marketable vehicle using alternative technology. No alternative technology will either be available in the quantities needed to meet the market or still at a development stage.</p>
BIL Sweden	<p>Answer to Question 14: The only technology commercially available today for EV seems to be NiCd. Thus, a ban would be practically equal with a ban of dedicated electric vehicles. Once a battery technology has been validated the assessed time to develop an EV is at least five years. Any conditions in the proposed battery directive connected to phase out must be considered in this context.</p>
Summary	<p>A revised draft battery directive is currently undergoing the co-decision procedure within the European Parliament and Council. According to the extended impact assessment procedure, this revised directive authorizes the placing on the market of industrial (motive power) NiCd batteries when conforming to the specific and mandatory collection and recycling targets. It specifically forbids any ban or marketing restrictions on NiCd batteries fulfilling the requirements of the directive.</p> <p>Today, the only technology commercially available for electric vehicles remains Ni-Cd. The current phase-out date is not feasible because today no car manufacturer has launched a marketable vehicle using an alternative technology. At least five years are necessary to develop an electric vehicle once the battery technology has been validated.</p>

Question 15: If the scheduled phase-out date is not feasible, which phase-out date would be feasible and why?	
ACEA, JAMA, CLEPA:	No phase out date at all. As stated under answer 14 and for the sake of legal consistency, NiCd batteries for electric vehicles have to be exempted without any expiry date.
CollectNiCad, EUROBAT, SAFT, Ravel	Given the above-mentioned circumstances, it is clearly impossible to predict a feasible "phase-out date". Future clean transportation policies, possible technological breakthrough, increased willingness from the public to select zero-emission vehicles, are a few of the many factors which will decide if and when the electric vehicle market can start growing again. We recommend a minimum of 5 years extension for the scheduled phase out date.
Avere France	A re-examination of the situation in about 5 years seems more reasonable. A shorter term will continue to hamper the market due to the generated uncertainties for the availability of replacement batteries.
BIL Sweden	Answer to Question 15: If dedicated EVs are wanted in the near future, it seems that phase out will have to wait until new technology is available. As stated under answer 14 and for the sake of legal consistency, NiCd batteries for electric vehicles have to be exempted without any expiry date. Political factors and future transport policy may of course affect this, as has already been mentioned.
Summary	No phase out date at all. As stated under answer 14 and for the sake of legal consistency, NiCd batteries for electric vehicles have to be exempted without any expiry date. A re-examination of the situation in about 5 years seems more reasonable. A shorter term will continue to hamper the market due to the generated uncertainties for the availability of replacement batteries.